# Ethiopian Economic Association (EEA)


# PROCEEDINGS OF THE THIRD INTERNATIONAL CONFERENCE ON THE ETHIOPIAN ECONOMY

EDITED BY

Getnet Alemu
Alsede Assefa
Edilegnaw Wale
Yihenew Zewdie

Volume II

# Ethiopian Economic Association (EEA)


## PROCEEDINGS OF THE THIRD INTERNATIONAL CONFERENCE ON THE ETHIOPIAN ECONOMY

Edited by

Getnet Alemu
Atsede Assefa
Edilegnaw Wale
Yihenew Zewdie

## Volume II

Published: May 2006



Sponsored by the African Capacity Building Foundation (ACBF), Department for International Development (DFID), Swedish International Development Agency (SIDA), the Norwegian Agency for Development Cooperation (NORAD), The Netherlands Embassy, Development Cooperation of Ireland and Friedrich Ebert Stiftung (FES).

# FOREWORD

Ethiopian Economic Association (EEA) has been organizing annual conference on the Ethiopian Economy every year as part of its overall objectives and institutional mandate to the advancement of economic development and the study of economics in Ethiopia since its inception. So far EEA has conducted 14 annual conferences. The first 11 annual conferences primarily focused on encouraging local research on different thematic areas. Since then the annual conference has been upgraded to an international level by inaugurating the First International Conference on the Ethiopian Economy in January 2003.

As a result of this and other efforts of the Association, EEA has established itself as a truly independent source of socio-economic policy options and data base in Ethiopia for the Ethiopian Government, the Ethiopian people and the International Community at large.

The 3rd International Conference on the Ethiopian Economy was held during June 2 – 4, 2005 at the United Nation Conference Centre at Addis Ababa. The conference attended by about 400 participants. The conference was organized in four Plenary Session and five concurrent sessions. The Plenary Sessions were co-organized by the World Bank, Forum for Social Studies, Environmental Economics and Policy Form, WeD and ECA-ESPD. The Plenary Sessions accommodated about 15 papers on Poverty, Land Policy and Environment. Similarly in the concurrent sessions about 52 papers were presented in the area of macro and sectoral issues.

Out of the total 67 papers presented in the 3rd International Conference, the editorial committee received 45 papers from authors and reviewed them. Comments and suggestions including editorial comments were communicated to authors for improvement. Among the 45 papers, the editorial committee selected 28 papers to be included in this edition. These papers are organized in two volumes. Volume I contains growth and development and Volume II contains sectoral issues.

I would like to take this opportunity to express my heartfelt gratitude, on my own behalf and on behalf of the Ethiopian Economic Association to the many people and organizations who made the conference a resounding success. First and foremost are the authors of the papers and the audience whose active participations made the conference meaningful and dynamic. The UN Economic Commission for Africa deserves great thanks for granting us the free use of the UN Conference Centre. Ethiopian Bankers Association and Ethiopians Coffee Exporters Association are acknowledged for sponsoring the conference. The many professionals who dedicated their time to the conference and served as chairpersons deserve thanks for their special contributions.

The staffs of the EEA/EEPRI deserve a special recognition for their enthusiasm and perseverance in managing the conference from inception to completion.

I would like to extend my personal gratitude to the Organizing Committee and members of the Executive Committee of the Ethiopian Economic Association for the dedicated service and the leadership they provided to the Association.

Finally, I would like to take this opportunity to express our gratitude to the Consortium of Donors who have funded the conference and all other activities of EEA/EEPRI and have continued interest in our Association. These are: Friedrich Ebert Stiftung of Germany (FES), Development Cooperation of Ireland, embassies of UK, Sweden, Norway, the Netherlands, and the African Capacity Building Foundation (ACBF).

Wolday Amha (Ph.D)
President of the Ethiopian Economic Association

# CONTENTS

Part II: Industry and Finance

---

Part III: Social Sector

# Part I

# Agricultural Sector Development

# TREE PLANTING FOR POVERTY REDUCTION IN LESS-FAVOURED AREAS OF THE ETHIOPIAN HIGHLANDS [1]

Stein Holden[2], Samuel Benin[3], Bekele Shiferaw[4] and John Pender[5]

*Abstract*

*This paper assesses the potential impact of planting of eucalypt trees as a strategy to reduce poverty in a less-favoured area of the highlands of Ethiopia. Results from simulations with a bio-economic model for a less-favoured case study area in the highlands are combined with survey data at community, household and plot level to assess how general the results of the bio-economic model are. Application of the bio-economic model shows clearly that land degradation, population growth, stagnant technology and drought threaten food security. Household welfare and land quality are deteriorating rapidly in the area and interventions are urgently needed to avoid human disaster. Planting of eucalypts on land unsuitable for crop production may substantially increase household incomes if market outlets for trees can be found. Tree planting will not have severe negative effects on food production or land conservation. A policy combining promotion of tree planting and conservation of cropland may achieve win-win benefits in terms of increased household incomes as well as more sustainable land-use. Analysis of survey data from the Amhara Region of Ethiopia reveals that there is a large area of land that is unsuitable for crop production located close to all-weather roads in the less-favoured areas of the region. Few trees have been planted on this type of land up to now. The past policy seems to have discouraged tree planting except on homestead plots that are more suitable for food crops.*

[1] This paper reports part of the IFPRI/ILRI project 'Policies for Sustainable Land Management in the East African Highlands'. These two agencies have provided funds and logistical support for the work. The Norwegian Ministry of Foreign Affairs has provided funds for this research in the Amhara Region in Ethiopia. The authors also draw on earlier work funded by Research Council of Norway. Any correspondence should be directed to the first author.

[2] Department of Economics and Resource Management Norwegian University of Life Sciences ÅS, Norway E-mail: stein.holden@umb.no

[3] International Food Policy Research Institute (IFPRI) Kampala, Uganda E-mail: s.benin@cgiar.org

[4] International Crops Research Institute for the Semiarid Tropics (ICRISAT) Nairobi, Kenya E-mail: b.shiferaw@cgiar.org

[5] International Food Policy Research Institute (IFPRI) Washington, DC, USA
E-mail: j.pender@cgiar.org

# 1. Introduction

Poverty, low agricultural production, and natural resource degradation are severe interrelated problems in less-favoured areas of the tropics (Pender and Hazell 2000). Almost 1.8 billion people live in less-favoured areas which include most of the semiarid and arid areas of Asia and Africa, the highlands of East and Central Africa, hillsides in Central America and Southeast Asia, and large portions of the humid tropics of Africa and Latin America.

Less-favoured areas have for long been neglected by policy-makers and technology development agencies. The International Food Policy Research Institute (IFPRI) has challenged the conventional wisdom that public investments in developing countries should emphasize investment in favoured areas. Based on a comparative advantage argument they asserted that specific types of agricultural and non-agricultural activities can generate high returns and contribute substantially to poverty reduction. A precondition is sufficient investment in infrastructure and local institutional capacity. More research is, however, necessary to investigate how great this potential is.

Stimulation of crop production through provision of credit for adoption of fertilizer has not been highly successful in less-favoured areas of Ethiopia,[6] however. This has led to increased interest in alternative activities, including tree planting although it is emphasized strongly that the trees must not replace food crops.

This paper reports the development of a bio-economic model for a 'less-favoured', severely degraded, densely populated area with relatively favourable market access in the Ethiopian highlands, specifically Andit Tid in the Amhara Region. Even though the area is located near the main road between Tigray and Addis Ababa, market imperfections exist that reduce opportunities for productive land use in the area (Holden *et al*. 2001). The bio-economic model has been used to assess the potential impact of promotion of planting of eucalypts on land unsuitable for crop production, on household welfare (poverty-reduction), agricultural production, conservation investments and soil erosion in the case study area. The suitability of this strategy for more general application in less-favoured areas in the Amhara Region of Ethiopia has been assessed using community, household and plot survey data.

[6] Less-favoured areas in Ethiopia are defined by the Disaster Prevention and Preparedness Commission (DPPC).

The next of the paper presents a brief history of tree planting in Ethiopia, and especially in the Amhara Region. The case study area for the bio-economic model is then described. The basic structure of the bio-economic model is next outlined, including a description of how trees have been included in the model. Results of simulation experiments using the model are then presented. In the next section, survey data from the Amhara Region are analyzed to assess the relevance of findings from the case study for the less-favoured areas in this region of Ethiopia. Concluding comments follow.

## 2. Tree planting and demand for trees in Ethiopia

Much of Ethiopia is already deforested, less than 3% of the land being covered by natural forest in 1989 (EFAP 1993), and deforestation continues in areas where natural forest remains. The wood harvested far exceeds the incremental yield of forest resources, according to various sources (EFAP 1993, TGE 1994). Farm forestry contributes about 20% of the incremental yields of forest resources (EFAP 1993).

During the Derg regime[7] tree planting was stimulated through industrial and peri-urban plantations and community woodlots. The community woodlots were implemented as centrally managed afforestation schemes in the 1980s. Many of them were partly cut down before or after they were handed over to local communities with the change of government in 1991.

The private sector was not encouraged to plant trees, the land tenure policy with frequent land redistributions created tree planting disincentives. Some private tree planting still took place, however, mainly on homestead plots (Mekonnen 1998). Mekonnen studied tree-planting behaviour of farm households in four locations in the Amhara Region, using survey data collected in 1996. He found that larger households, male headed households, households with heads with some basic education, and households with more livestock wealth were more likely to plant trees. Households with more male labour, households with more income, and households with a higher share of off-farm income were also more likely to plant trees (Mekonnen 1998).

[7] The Derg regime ruled Ethiopia from 1974 to 1991 after a military coup by Mengistu Haile Mariam.

Biomass fuels, mainly wood, dung and crop residues, represent 90% of the total energy consumption in Ethiopia and 99% of the energy consumption in rural areas (EFAP 1993). Wood provides about 62% and 66% of this energy in urban and rural areas respectively. Use of dung and crop residues also contributes to land degradation in form of nutrient depletion. If tree planting could reduce the use of dung and crop residues for fuels, this would have a positive indirect effect in terms of reduced land degradation. Mekonnen (1998) found, however, that woody biomass and dung are either complements or independent. Nevertheless, he found that fuel choice and mix are influenced by scarcity and concluded that a policy directed at reducing the relative price of wood and encouraging increased use of dung as fertilizer could reduce land degradation. Policies focusing on cooking habits and cooking technologies may also stimulate substitution from dung to wood for fuel.

The survey of communities, households and plots in the Amhara Region gave the following findings (see Appendix A for a description of the data). Although tree planting is common in the region, trees are mainly planted on homestead plots or a few scattered ones on field plots. Private woodlots are not common, and tree planting on field plots are generally not allowed, since they can interfere with the government's policy of land redistribution. In addition, eucalypt trees, the species most favoured by farmers, are highly discouraged on field plots (mainly reserved for food crops), because of the belief that this species has negative impacts on the plots and crop yields, although the evidence is unclear. Table 1 summarises characteristics of the plots on which trees were located. Trees were classified as 'planted' or 'natural', if the farmer planted them or if they were already on the plot when the farmer obtained the plot, respectively. About 26% of all the plots had trees (natural or planted) on them. Planted trees were found on 12% of all plots, but were more likely to be found on homestead plots. This suggests farmers' prefer planting trees on plots that are closer to the home so that investments can be easily monitored and protected. However, this may also confirm the discouragement of planting trees on field plots and the higher tenure insecurity on field plots. There were also differences in the soil characteristics of plots with trees, compared to those without trees. In general, farmers reported higher fertility levels and lower erosion problems associated with plots on which trees were located. This indicates that trees have been planted on land suitable for food crops since trees were planted more on homestead land, which also tends to have more manure applied and be flatter. Compared with the averages for all plots, those with trees were located more in high agricultural potential areas

and in villages with higher rainfall, lower altitude, lower population pressure and better access to the *wereda* (district) market.

There were also differences between households involved with tree planting and other households. Compared with the averages for all households, those involved with tree planting activities had more members and higher proportion of males, suggesting the high labour requirements associated with tree planting activities. However, tree-planting households were also headed more by females and had lower educated household heads. These two associations may be interrelated, because in Ethiopia females tend to be less educated. However, these associations may also reflect the effort of females in tree planting for fuelwood, given that they are primary gatherers of fuelwood in Ethiopia. The most important difference between tree-planting households and others was access to markets. The distance in walking time to the nearest market or all weather road was up to 30% less for tree-planting households, compared to the average for all households (Table 2). This suggests the importance of market access in the success of promoting tree planting activities.

There were several types and varieties of tree species, whether planted or natural, and trees had many functions and benefits. Table 3 reports the number, species, uses and benefits of planted trees found on each plot.[8] There were 169 plots with planted trees, averaging 15 trees per plot. Eucalypt species formed the largest single group (36%) of the planted trees. Fruit trees accounted for 7%, while the traditional acacia species accounted for only 3%. Most of the trees were planted to provide materials for building construction and household fuel, and making farm implements (components of the traditional ox plough). Together, these uses accounted for 49% of all the uses of trees. Trees were also important for shading (especially for livestock), windbreaks, and food (fruits). Harvesting of trees for timber products occurred on less than 30% of the 169 plots. Poles were the main product of trees, and an average of 62 poles per plot (returning 176 ETBirr per plot) were harvested, over the 33 plots on which any harvesting of poles occurred. Collection of fuelwood was also important, returning about 38 ETBirr per plot for the 50 plots from which fuelwood was collected.
Over the 33 plots on which any harvesting of poles occurred. Collection of fuelwood was also important, returning about 38 ETBirr per plot for the 50 plots from which fuelwood was collected.

[8] Generally, farmers are not allowed to harvest natural trees, although these may provide secondary benefits such as windbreak, shading and fuelwood.

**Table 1: Sites characteristics where private trees are planted**

| Site factor | All plots | | Plots with trees (both natural and planted) | | Plots with planted trees | |
|---|---|---|---|---|---|---|
| | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** |
| *Plot level factors* | | | | | | |
| Size (ha) | 0.410 | 0.021 | 0.434 | 0.033 | 0.332 | 0.032 |
| Slope (degrees) | 5.682 | 0.302 | 5.549 | 0.442 | 4.735 | 0.443 |
| Homestead (0=no; 1=yes) | 0.225 | | 0.390 | | 0.621 | |
| Irrigated (0=no; 1=yes) | 0.049 | | 0.103 | | 0.178 | |
| Presence of gullies (0=no; 1=yes) | 0.055 | | 0.035 | | 0.030 | |
| Waterlogging problem (0=no; 1=yes) | 0.076 | | 0.058 | | 0.071 | |
| Position on slope (proportion; cf. top) | | | | | | |
| Middle | 0.290 | | 0.216 | | 0.225 | |
| Bottom | 0.189 | | 0.093 | | 0.095 | |
| Not on slope | 0.380 | | 0.550 | | 0.530 | |
| Soil colour (proportion; cf. black) | | | | | | |
| Brown | 0.286 | | 0.303 | | 0.355 | |
| Grey | 0.081 | | 0.060 | | 0.053 | |
| Red | 0.358 | | 0.514 | | 0.432 | |
| Soil erosion problem (proportion; cf. no problem) | | | | | | |
| Mild problem | 0.352 | | 0.225 | | 0.234 | |
| Severe problem | 0.089 | | 0.066 | | 0.054 | |
| Soil fertility (proportion; cf. highly fertile) | | | | | | |
| Moderately fertile | 0.728 | | 0.654 | | 0.685 | |
| Infertile | 0.192 | | 0.154 | | 0.131 | |
| Agro-ecology (proportion; cf. wurch) | | | | | | |
| Dega | 0.195 | | 0.074 | | 0.124 | |
| Weina dega | 0.714 | | 0.721 | | 0.716 | |
| Kolla | 0.077 | | 0.197 | | 0.142 | |
| *Village level factors* | | | | | | |
| Average annual Rainfall (mm) | 1,190 | 13.930 | 1,316 | 23.978 | 1,327 | 32.448 |
| Altitude (m.a.s.l.) | 2,440 | 23.780 | 2,205 | 20.225 | 2,311 | 37.730 |
| Household density (number/km$^2$) | 42 | 1.658 | 31 | 3.208 | 40 | 3.680 |
| Distance to *wereda* town (km) | 34 | 1.754 | 28 | 1.930 | 26 | 2.719 |
| **Number of observations** | **1,422** | | **367** | | **169** | |

Notes: Sample means and standard errors (SEs) are adjusted for stratification, weighting and clustering of sample.

**Table 2: Characteristics of households planting private trees**

| Household level factor | All plots | | Plots with trees (both natural and planted) | | Plots with trees (planted) | |
|---|---|---|---|---|---|---|
| | **Mean** | **SE** | **Mean** | **SE** | **Mean** | **SE** |
| Gender of household head (0=female; 1=male) | 0.954 | | 0.921 | | 0.917 | |
| Received external credit (e.g., ACSI: 0=no; 1=yes) | 0.579 | | 0.536 | | 0.521 | |
| Received local credit (e.g., *equb*: 0=no; 1=yes) | 0.226 | | 0.240 | | 0.195 | |
| Extension contacts (0=no contact; 1=contact) | 0.668 | | 0.613 | | 0.592 | |
| Farmland (ha) | 1.710 | 0.094 | 2.056 | 0.186 | 1.768 | 0.147 |
| Education of household head (years) | 2.477 | 0.270 | 1.974 | 0.396 | 2.168 | 0.502 |
| Size (number) | 5.739 | 0.202 | 7.092 | 0.371 | 7.054 | 0.356 |
| Proportion of males | 0.438 | 0.017 | 0.538 | 0.026 | 0.563 | 0.029 |
| Tropical livestock units | 3.796 | 0.204 | 4.107 | 0.385 | 3.949 | 0.589 |
| Distance to nearest market (minutes) | 91.05 | 4.74 | 84.05 | 6.25 | 70.97 | 4.39 |
| Distance to nearest all weather road (minutes) | 182.00 | 10.60 | 145.92 | 11.62 | 128.04 | 14.17 |
| **Number of observations** | **1422** | | **367** | | **169** | |

Note: Sample means and standard errors are adjusted for stratification, weighting and clustering of sample.

Community woodlots were also common, occurring in one-half of the communities (Table 4). Comparing biophysical factors, population pressure and market access, it seems that the size of the community and market access are the most distinguishing factors between communities with and without communal woodlots. Compared to the average for all communities, those with woodlots are smaller in size, closer to an all weather road, and farther from markets (local and districts).

## 3. The case study area for the bio-economic model

The case study area for the bio-economic model, Andit Tid, is located in the less-favoured areas of the Amhara Region, approximately 60 km east of Debre Berhan, along the main road between Addis Ababa and the Tigray Region. This implies that the market is reasonably accessible. The area is classified as belonging to the low potential cereal-livestock zone and the land is severely degraded. It is a high altitude area (> 3000 m.a.s.l.). The area is located in two altitude zones, namely the *dega* zone (< 3200 m.a.s.l.) and *wurch* zone (> 3200 m.a.s.l.). The average annual rainfall is 1336 mm distributed over two growing seasons, the *meher* season from June to November and the *belg* season from January to May. Droughts have not been common in the area till recently when the *belg* rains failed in two consecutive years (1999 and 2000). Hailstorms and frost have, however, frequently damaged crops.

The human population density was estimated to be 145.5 persons per $km^2$ in 1986 against the average of 61 persons per $km^2$ for the Ethiopian highlands (Yohannes 1989). The population density was about 230 persons per $km^2$ cultivable land. The population growth rate was estimated to be 3.0% per year, indicating a high and increasing population pressure in the area.

Production of crops and livestock is well integrated in the area. Oxen are the dominant source of traction power. Hand cultivation is used only on very steep slopes inaccessible by oxen. Animal manure is used for fuel or as fertilizer on crops. Sale of animals is an important source of cash income. Crop residues are used as animal fodder. Fodder is otherwise obtained from fallow land and grazing land but only a small share of this (5%) is from communal land.

The case study area has no access to long-term credit, and farmers may not feel secure that they will obtain the benefits from their tree planting efforts (Holden and Shiferaw 2000). The land redistribution in 1997 may have undermined the feeling of tenure security and reduced the incentives to plant trees. Poverty, credit constraints and lack of access to tree seedlings may be other reasons for under-investment in tree planting compared to what would be socially optimal.

**Table 3: Number, species, uses and benefits of private planted trees on each plot in 1999**

| Item | No. of observations | Mean | SE |
|---|---|---|---|
| Number of trees per plot | 169 | 15.161 | 4.055 |
| Type of trees planted (percent) | | | |
| Eucalypt spp. | 169 | 35.5 | |
| Grawa (*Vernonia amygdalina*) | 169 | 6.9 | |
| Bisana (*Croton macrostachyus*) | 169 | 6.5 | |
| Gesho (*Rhamnus prinoids*) | 169 | 6.1 | |
| Wanza (*Cordia africana*) | 169 | 4.8 | |
| Fruit trees | 169 | 6.5 | |
| Acacia spp. | 169 | 3.0 | |
| Other | 169 | 30.7 | |
| Uses of trees (percent) | | | |
| Construction | 169 | 16.1 | |
| Fuelwood | 169 | 15.2 | |
| Construction, fuelwood and farm implements | 169 | 17.3 | |
| Shade and wind break | 169 | 10.8 | |
| Fruits and seeds | 169 | 6.5 | |
| Other | 169 | 34.1 | |
| Benefits (0=if not collected; 1=if collected) | | | |
| Poles | 169 | 0.133 | |
| Branches | 169 | 0.298 | |
| Leaves | 169 | 0.115 | |
| Fuelwood | 169 | 0.075 | |
| Bark | 169 | 0.019 | |
| Bees/honey | 169 | 0.015 | |
| Poles harvested (number/plot) | 33 | 61.81 | 33.15 |
| Value of products (birr/plot) | | | |
| Poles | 33 | 175.56 | 103.10 |
| Branches | 42 | 12.12 | 2.85 |
| Leaves | 22 | 8.38 | 3.34 |
| Fuelwood | 50 | 37.95 | 11.99 |
| Bark | 3 | 4.18 | 0.26 |
| Honey | 5 | 57.47 | 9.77 |

Note: Sample means and standard errors are adjusted for stratification, weighting and clustering of sample. Number of observations is number of plots with trees and is used to calculate average number of trees per plot with trees.

**Table 4: Characteristics of location of community woodlots**

| Item | All communities | | Communities with woodlots | |
|---|---|---|---|---|
| | **Mean** | **SE** | **Mean** | **SE** |
| Characteristics of communities | | | | |
| Agricultural potential (0=low; 1=high) | 0.576 | | 0.565 | |
| Average annual Rainfall (mm) | 1193.7 | 32.9 | 1208.3 | 45.4 |
| Altitude (m.a.s.l.) | 2160.7 | 79.8 | 2197.8 | 107.4 |
| Area ($km^2$) | 58.6 | 16.3 | 43.0 | 6.6 |
| Household density (number/$km^2$) | 41.4 | 5.0 | 41.6 | 7.0 |
| Distance to nearest all weather road (minutes) | 322.2 | 93.2 | 204.0 | 33.0 |
| Distance to nearest market (minutes) | 121.7 | 14.3 | 138.2 | 18.9 |
| Distance to *wereda* town (km) | 37.4 | 5.7 | 42.6 | 9.1 |
| Characteristics of woodlots | | | | |
| Number of woodlots | 1.59 | 0.34 | 2.72 | 0.45 |
| Number managed at higher PA level | 0.99 | 0.33 | 1.69 | 0.54 |
| Number managed at lower village level | 0.60 | 0.25 | 1.02 | 0.37 |
| **Number of observations** | **98** | | **48** | |

Note: Sample means and standard errors are adjusted for stratification, weighting and clustering of sample.

The main reasons for selecting this case study area for bio-economic modelling was the unique availability of both biophysical and socio-economic data covering more than 15 years. Collection of biophysical data commenced with the Soil Conservation Research Project (SCRP) when a field station was established in 1982. These data include soil erosion records at plot and watershed levels, yield measurements, results of conservation technology experiments, soil chemical and physical analyses, and meteorological data. Household surveys were conducted in 1986, 1993-94, 1997-98 and 1999-2000. These surveys included detailed data collection at farm plot level. The data provided a unique opportunity to analyze carefully the relationship between population pressure, poverty, land degradation and conservation, household production and welfare, including food security.

## 4. The bio-economic model

This model is an extension of that used by Holden and Shiferaw (in press) to analyse the impact of land degradation, drought and price risk and the suitability of the standard fertilizer-credit extension approach, in the study area. The model was extended to allow assessment of alternatives to the traditional fertilizer-credit development strategy, in the form of stimulation of tree planting on land unsuitable for crop production. While the previous model has a five-year planning horizon, these new version simulates management policies over 10 years.

A simple conceptual representation of the model is presented in Figure 1. (A more detailed technical description is provided in Holden and Shiferaw (in press)). Households are assumed to maximize their welfare (measured as utility of certainty equivalent full income) subject to a number of constraints. For example, land degradation in the form of soil erosion and nutrient depletion is endogenous in the model, being affected by household production and investment decisions. Soil erosion affects soil depth, which affects yields and output in following years, which in turn affect income and welfare. Weather risk affects production as well as prices and this may also affect production decisions. Households make production decisions based on expectations about prices and output and the risk involved. Imperfections in markets (limited access, high transaction costs) affect production decisions and cause non-separability of production decisions from consumption decisions. Population growth affects both the labour force and household welfare, with more people sharing the outcome of a constant land area that is affected by land degradation. This leads to a Malthusian development path when technology, prices and other exogenous factors are constant. This poverty-environment trap can only be broken through availability of new technologies, improved access to markets and better investment opportunities.

The model is a dynamic optimisation model, programmed in GAMS, which has 79,000 variables and 46,000 equations, and is non-linear in constraints and objective function. It has been calibrated to the biophysical and socio-economic characteristics of the case study area. Results are presented for the dominant household group with two or more oxen; this group farms nearly 70% of the land in the study area.

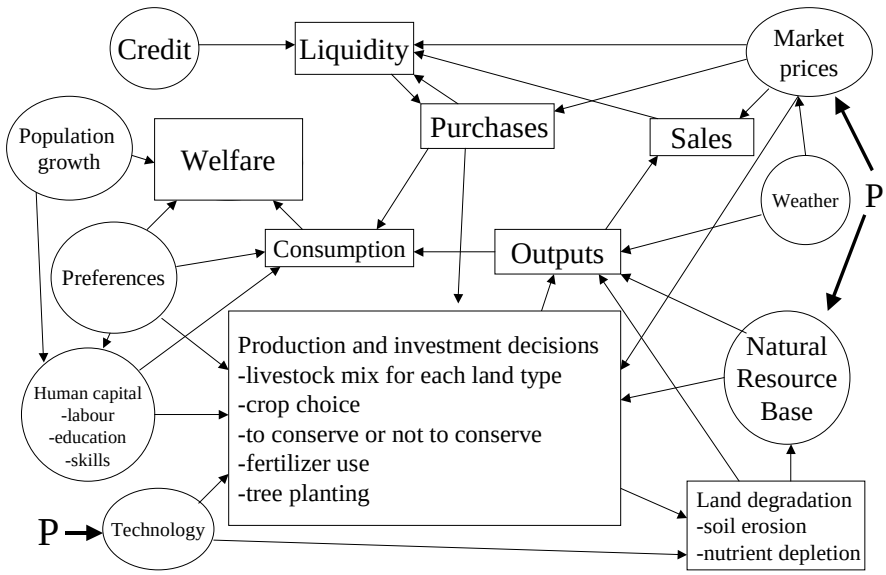
## 5. Treatment of Trees in the Model

The surveys revealed that farm households in the area are not willing to plant trees on land suitable for crop production but are positive towards tree planting on land unsuitable for cropping. The potential of this option to improve household welfare is therefore what was explored with the bio-economic model. Indirect effects on agricultural production and incentives for conservation, considering the income effect and possible competition between alternative uses of family time for agricultural production – including conservation, tree production, non-farm employment, and leisure – were also included. Alternative ways of promoting tree planting were not assessed. Instead, the constraints to tree planting have been removed and a stable tree rotation has been assumed established, given that it is profitable. Therefore, it is the potential contribution of trees to household income and the impact such production may have on other production and conservation activities that are assessed.

Tree planting is only allowed on steep slopes and shallow soils unsuitable for crop production, this land being defined as 'land suitable for tree planting'. Almost all land in the densely populated Andit Tid has been distributed to individual households. The average area of steep and shallow lands is 0.45 ha per household. The average area planted with trees is only 0.09 ha per household. It should therefore be possible to increase the area planted with trees from 3.3% to 18.2% of the average farm size without using land that is suitable for crop production.

The high elevation in Andit Tid causes the time from planting to harvesting of eucalypts to be as long as 12 years. The average price of harvested trees was 12 Birr in 1998. This is substantially below the lowest price of 17 Birr used by Jagger and Pender in their study in Tigray, even though Andit Tid is located along the main road between Addis Ababa and the Tigray Region. It is assumed there are no marketing constraints and that farm households may sell all the trees they produce at the 1998 price. However, a small transportation cost for trees of 0.5 Birr per tree is included. A planting density of 5000 trees/ha and a survival rate of 60% are assumed. Additional ecological benefits and costs of eucalypt planting are not included in the model because these are highly uncertain and complex and it is not clear whether the net effects are positive or negative (Jagger and Pender 2000).

**Figure 1: Main components of bio-economic household group model**




## 6. Results of simulation experiments

Figure 2 illustrates the potential impact of planting of a stable rotation of eucalypt trees on land unsuitable for crop production in Andit Tid. In this case it is assumed that households have unconstrained access to off-farm employment. The simulations reveal that planting of eucalypts on land unsuitable for crop production can increase household income substantially. This is in line with what has been found in other studies. Even though land for crop production is not used for tree planting, growing of eucalypts reduces self-sufficiency in food production to some extent (as can be seen in Figure 2). This is mainly due to higher demand for food when income is higher. Planting of trees has little impact on incentives for conservation of land used for crop production and therefore has little impact on total soil erosion on farms. Growing of trees reduces the demand for off-farm employment because the return from tree growing is much higher than the wages in the labour market for unskilled labour.

It appears that stimulation of planting of eucalypts may be a promising policy option for degraded drought prone areas in the Ethiopian highlands provided that market outlets can be found. Interventions may be necessary to promote this through stimulation of seedling production, mobilization of labour and identifying suitable areas.

Finally, the combined effects of Food-For-Work (FFW) projects[9] to promote land conservation and planting of eucalypts, in the case with unconstrained access to off-farm employment, and when conservation investment reduces initial yields, were simulated. The results are presented in Figure 3. The impact of FFW on income is small compared to the planting of trees when access to off-farm employment is constrained. This indicates that the payment through FFW is only marginally higher than the local wage rate observed in the area while the return to labour in eucalypts growing is considerably higher. When tree planting is included, FFW also stimulates land conservation and reduces soil erosion. Combination of tree planting and FFW for conservation therefore appear to produce superior outcomes, with substantial increases in household income and conservation of cropped land. The analysis has not, however, taken into account the external costs of stimulating tree planting and using FFW.

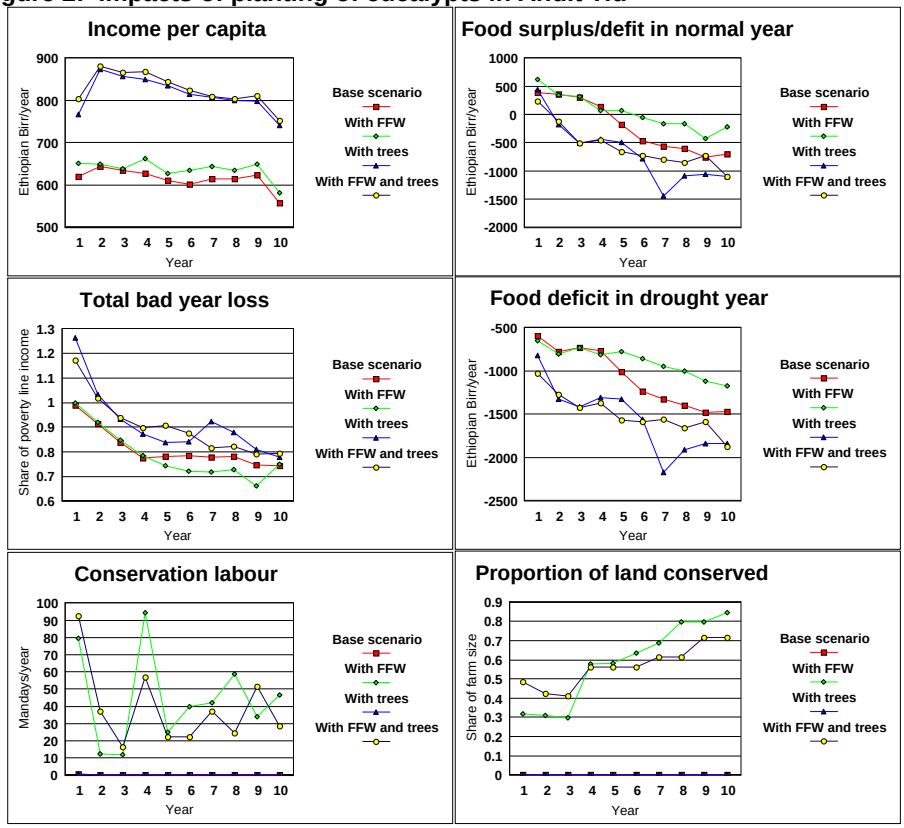
## 7. Relevance of the results of the bio-economic model

There is a need to scale up or to assess the general relevance of the findings in the simulations for the case study area. The case study area was initially selected by the Soil Conservation Research Project to represent a severely degraded low agricultural potential area in the Ethiopian highlands. Survey data from the less-favoured areas of the Amhara Region in Ethiopia have been used to assess whether the model results are of general relevance there. First, the survey data are used to estimate the area of land that farm households own which is unsuitable for crop production in the less-favoured areas of the Amhara Region (steeply sloping, shallow soils, severely eroded and infertile lands), because these lands may be planted with trees without replacing crop production (to minimize competition between tree planting and food crop production). Secondly, land is divided by distance to road, where land more than 30

[9] Food-for-work projects have been commonly used in Ethiopia to stimulate investment in soil and water conservation, reforestation, irrigation and road construction.

minutes walk from an all-weather road is assumed to have less potential for tree growing for sale. As indicated in Table 5, 31% of the land is located within a distance of 30 minutes walk from a road. Furthermore, as much as 47% of the land falls in the category of being suitable for tree planting because of either shallowness of the soil, steepness, severity of erosion or general low fertility. About 24% of this land is located within a distance of 30 minutes walk from a road. This implies that 11-12% of the land in the less-favoured areas in the region may be suitable for tree production for the market.

**Figure 2: Impacts of planting of eucalypts in Andit Tid**



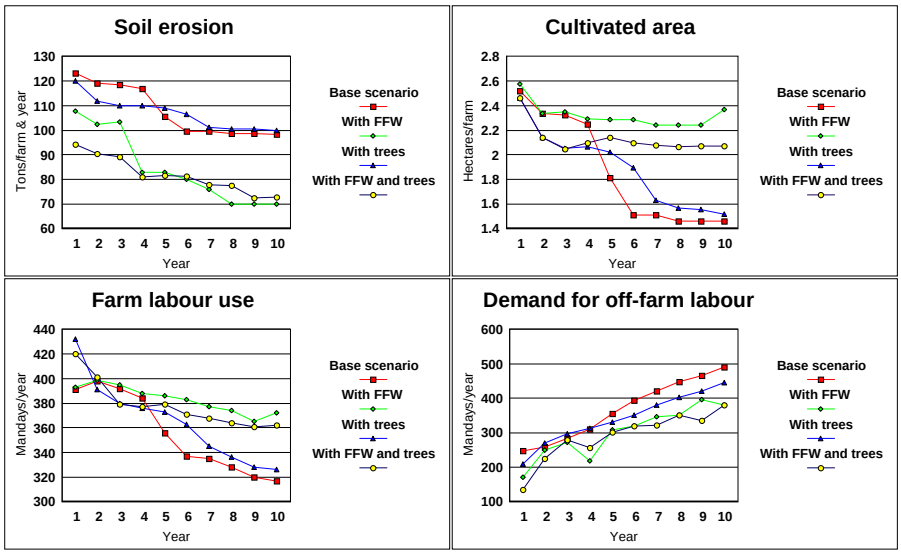
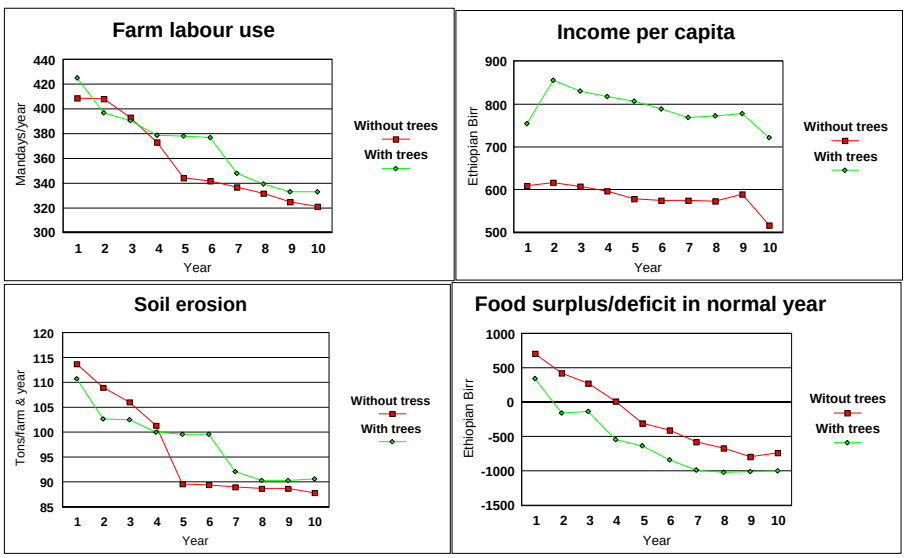



**Figure 3: The impact of tree planting and Food-For-Work for land conservation**



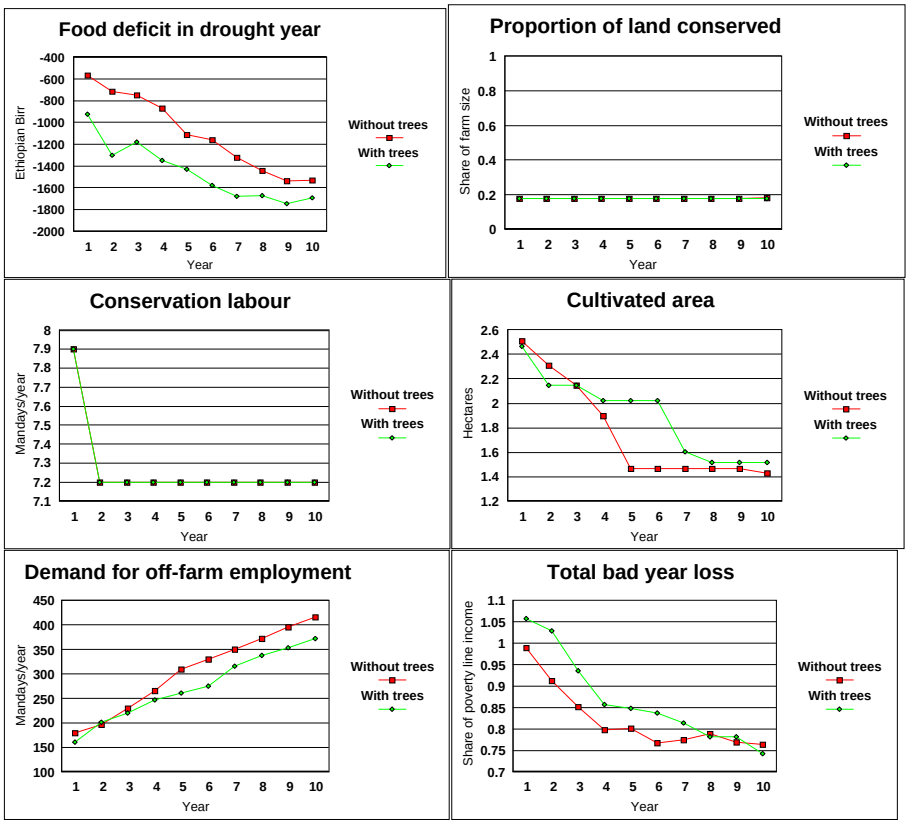



**Table 5: Land suitable for tree planting in less-favoured areas of the Amhara region, close to and far from all weather road.**

| Road distance | Area of land suitable for tree planting (ha, %) | | |
|---|---|---|---|
| | No | Yes | Total |
| Less than 30 minutes walk | 16,997 | 9,832 | 26,829 |
| | 63.35 | 36.65 | 100.00 |
| | 37.00 | 24.14 | 30.96 |
| More than 30 minutes walk | 28,939 | 30,890 | 59,829 |
| | 48.37 | 51.63 | 100.00 |
| | 63.00 | 75.86 | 69.04 |
| Total | 45,936 | 40,722 | 86,658 |
| | 53.01 | 46.99 | 100.00 |
| | 100.00 | 100.00 | 100.00 |

Note: 1. Based on household plot level data collected under the project on Policies for Sustainable Land Management in the Highlands of Amhara. The data are weighted by household weights.
2. Land suitable for tree planting is defined as land is either having slope > 10 degrees, shallow soil depth, being severely eroded or infertile. Less-favoured areas are defined by the Disaster Prevention and Preparedness Commission (DPPC) and are mostly located in the eastern part of the Amhara Region.
3. Road distance is distance from plot to all weather road in minutes walking. 'Far from road' is defined as more than 30 minutes walk.

The distribution of distances of household residences to all-weather roads where trees have been harvested and sold in the region is presented in Table 6. Most of the trees sold were located close to the residence of the households. This may be due to the past policy that indirectly encouraged tree planting on homestead plots (by discouraging private tree planting on other plots). Tree products were sold from plots even at a longer distance from a road than 30 minutes walk (in local markets) so this distance may not be an absolute requirement.

**Table 6: Distribution of plots from which wood poles have been sold by distance (minutes walk) to residence of household and by distance to nearest all weather road**

| Distance to residence | 0 | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 10 | 40 | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 23 | 15 | 5 | 3 | 6 | 1 | 1 | 2 | 2 | 1 | 59 |

| Distance to all weather road | 0-9 | 10-19 | 20-29 | 30-39 | 40-49 | 50-100 | 100-499 | 500-1000 | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| Frequency | 5 | 8 | 6 | 4 | 4 | 16 | 14 | 1 | 59 |

The distribution of actual tree planting in the past as compared to the land identified as suitable for tree planting based on the plot level survey data is presented in Table 7. As much as 60% of the trees have been planted on land suitable for crop production. Only 6% of the land that was identified as suitable for tree planting has actually been planted with trees in the less-favoured areas of the region. This shows that much of the tree planting in the past has been in conflict with crop production while trees have only been planted to a small extent on land unsuitable for crop production. Scope therefore exists for policy improvements by stimulating tree planting without negatively affecting food production, as indicated by the model

simulations. Overall, only 7% of the land has been planted with trees. The tree density on the land planted with trees is also relatively low.

It should not be forgotten that the land suitable for tree production may be suitable for fodder production but the bio-economic model results and other studies indicate that tree planting can be more profitable than livestock production if a market for the trees can be found.

**Table 7: Actual tree planting in less-favoured areas of the Amhara Region versus land suitability for tree planting**

| Land planted with trees | Land suitable for trees | | |
|---|---|---|---|
| | **No** | **Yes** | **Total** |
| No | 42302 | 38286 | 80588 |
| | 52.49 | 47.51 | 100.00 |
| | 92.09 | 94.02 | 93.00 |
| Yes | 3634 | 2436 | 6070 |
| | 59.87 | 40.13 | 100.00 |
| | 7.91 | 5.98 | 7.00 |
| Total | 45936 | 40722 | 86658 |
| | 53.01 | 46.99 | 100.00 |
| | 100.00 | 100.00 | 100.00 |

Note: Based on household plot level data from the Amhara region survey. Data are weighted by household weights.

## 8. Conclusions and recommendations

Eucalypt trees can be a suitable technology for less-favoured lands in the Ethiopian highlands. If farm households are allowed and stimulated to plant eucalypts on their private land that is unsuitable for crop production in locations where the tree products can be marketed, the income they may obtain from selling of trees can contribute substantially to poverty reduction in these areas. Household incomes can be increased by 200 ETBirr per capita in the case study area and this is an income increase of about 30%, when the trees are planted on less than 20% of their land and less than 10% of this land is harvested each year (under a 12-year rotation). The high

elevation in the case study area causes tree growth to be slower than in most of the less-favoured areas so it may be possible to harvest even more frequently in many places. Tree planting was found to have little negative effect on agricultural activities and conservation incentives. Food-For-Work activities to stimulate conservation may be a useful complementary policy instrument that could also be used directly to stimulate tree planting by on private land. Tenure insecurity and high discount rates due to poverty and market imperfections may otherwise cause under-investment in tree planting. One may argue for state intervention to stimulate tree planting not only on the basis of a poverty reduction perspective but also from a global environmental perspective, as a cost-effective way to contribute to carbon sequestration.

Survey data from the Amhara Region reveal a large area of land that is unsuitable for crop production and therefore suitable for tree production. Much of this land is also located near all-weather roads and little of it is currently planted with trees. So far, most of the tree planting has taken place on homestead plots on land suitable for crop production. Past policies seem to have contributed to this. For example, land redistributions may have created tenure insecurity that discouraged tree planting in general and on plots other than the homestead plots in particular. Provision of secure long-term tenure rights, distribution of seeds and extension advice on eucalypts planting, identifying areas particularly suitable for this activity, and arranging FFW activities in close collaboration with the local communities, are important instruments that the regional government institutions should consider.

## References

EFAP (Ethiopian Forestry Action Programme). (1993). *The Challenge For Development*, V. II, Ministry of Natural Resource Development and Environmental Protection, Transitional Government of Ethiopia, Addis Ababa.

Holden, S.T. and Shiferaw, B. (2000). 'Development paths and policies for sustainable land management in Andit Tid, North Shewa: an exploration of policy alternatives', Paper presented at the national workshop on 'Policies for Sustainable Land Management in Addis Ababa', May 22-23, 2000.

Holden, S.T. and Shiferaw, B. (2004). 'Land degradation, drought and food security in a less-favoured area in the Ethiopian highlands: a bio-economic model with market imperfections', *Agricultural Economics* 30 (1): 31-49.

Holden, S.T., Shiferaw, B. and Pender, J. (2001), 'Market imperfections and land productivity in the Ethiopian highlands', *Journal of Agricultural Economics*, 52(3): 53-70.

Jagger, P. and Pender, J. (2000). The role of trees for sustainable management of less-favoured lands: the case of eucalyptus in Ethiopia', ETPD Discussion Paper No. 65, International Food Policy Research Institute, Washington, D. C.

Mekonnen, A. (1998). 'Rural energy and afforestation: case studies from Ethiopia', PhD-dissertation, Ekonomiske Studier No. 81, Department of Economics, School of Economics and Commercial Law, Göteborg University, Göteborg, Sweden.

Pender, J. and Hazell, P. eds. (2000). *Promoting Sustainable Development In Less-Favoured Areas*, 2020 Vision, Focus 4, IFPRI, Washington, D.C.

TGE (Transitional Government of Ethiopia). (1994). *National Conservation Strategy*, Vol. I and II, NCS Secretariat, Ministry of Natural Resource Development and Environmental Protection, Addis Ababa.

Yohannes, G. (1989). 'Land-use, agricultural production and soil conservation methods in the Andit Tid area, Shewa Region', Research Report No. 17, Soil Conservation Research Project, Ministry of Agriculture Soil and Water Conservation Development, Addis Ababa.

## Appendix: Survey data from the Amhara Region

Data were obtained from household and plot level surveys conducted in the highland areas (above 1500 m.a.s.l.) of the Amhara region in 2000 and 2001. The household and plot surveys follow community surveys in 98 villages (gots) conducted in 1999 and 2000. At the community level, a stratified random sample of 49 Peasant Associations (Pas) – the lowest administration unit, usually consisting of three to five villages) – and two villages were randomly selected from each PA from highland areas of the region. Using district (*wereda*) level secondary data, the stratification was based upon indicators of agricultural potential (whether the *wereda* is drought-prone or non drought-prone/higher rainfall, as classified by the Ethiopian Disaster Prevention and Preparedness Commission), market access (access or no access to an all-weather road) and population density (1994 rural population density greater than or less than 100 persons per sq km).[10] Two additional strata were defined for PAs where an irrigation project is present (in drought-prone versus higher rainfall areas), resulting in a total of 10 strata. Five PAs were then randomly selected from each stratum (except the irrigated drought-prone stratum, in which there were only four PAs), for a total of 49 PAs and 98 villages. From each village, five households, and later four to speed up the data collection, were randomly selected to give a total of 434 households. In addition, all plots (1,422 in total) operated by the households were surveyed.

At the community level, information was collected at both PA and village level using group interviews with about 10 respondents from each PA and village, selected to represent different genders, ages, occupations and (in the PA level survey) different villages. Information collected includes community management of woodlots (size, use and benefits, monitoring, penalties, violations of penalties) and access to infrastructure since 1991 (the year when the current government replaced the former Marxist government). At the household and plot levels, information collected includes household structure and endowments, access to infrastructure, plot characteristics (mode of acquisition, size, slope, quality), and tree investments and benefits since 1991. The data were supplemented by secondary information on population from the 1994 population census, geo-referenced maps of the boundaries of each sample PA and geographic attributes, including altitude and climate.

[10] *Weredas* with more than 50% of total area below 1500 m.a.s.l. were excluded from the sampling frame.

# POPULATION PRESSURE, AGRICULTURAL INTENSIFICATION AND SOIL FERTILITY MANAGEMENT STRATEGIES OF SMALLHOLDER FARMERS IN ETHIOPIA: A SIMULTANEOUS EQUATIONS ANALYSIS

Adane Tuffa Debela[1]

*Abstract*

*Increasing population pressure calls for agricultural intensification, which involves the use of various soil fertility management strategies and improved inputs. In this study we explore factors influencing the adoption and use of soil fertility management practices and improved inputs of smallholder farmers in the highlands of Ethiopia. We hypothesized that farmers' adoption and use decision of soil fertility management practices and improved inputs are mutually dependent, and that various farmer-specific socio-economic factors also influence the decisions. We employ the simultaneous equation system estimation procedure to estimate the model. Results indicate that, after controlling for exogenous socio-economic variables, fallowing and fertilizer, fallowing and intercropping, and intercropping and fertilizer appear to be substitutes while intercropping and manure and fertilizer and manure are complementary. In addition, resource endowments, human capital, and institutional factors determine the adoption and use of agricultural practices and inputs.*

**Keywords**: intensification; agricultural practices; adoption; simultaneous equations; Ethiopia;
**JEL Classification Number**: Q12; O13; R14; Q15; R34;

[1] Department of Economics and Resource Management, Norwegian University of Life Sciences, Aas, Norway. E-mail address: adantu@umb.no

# 1. Introduction

With increasing population pressure, more soil fertility management practices and intensive ways of farming are adopted by small farmers. This is also true in the highlands of Ethiopia, which is densely populated. Intensification involves adoption of different agricultural practices on the same plots of land to maintain soil fertility and the use of improved inputs to earn sustainable income or improve productivity. Thus, farmers make a mix of decisions to select an optimal over all farm management practices these includes soil fertility management, cropping pattern and input application. Depending on factors such as tradition, agro-ecological and socio-economic circumstances, farmers adopt different land use practices and cropping systems. These agricultural practices determine the productivity (and sustainability) of agriculture. Understanding how farmers make these decisions helps agricultural researchers decide on appropriate crop and soil management strategies for increased productivity and sustainable land use. Moreover, this will assist policy makers better understand the institutional and policy factors that would promote the development and diffusion of relevant improved technologies for sustainable productivity growth. In addition, consideration of these practices may be important in evaluating prospects for increasing production, either through changing existing agricultural practices, or through strengthening them.

Most previous studies on agricultural practices have focused on individual farm practices rather than considering the mix of decisions as interdependent. This means that each of the agricultural practices is studied separately regarding factors determining their adoption. Some of these studies are by Herath and Takeya (2003); Nelson and Cramb (1998); Omiti et al (1999); Brown and Shrestha (2000); Wezel and Rath (2002); Baidu-forson (1999); Zeller et al ((1998). The common feature of all these studies is that they consider the different agricultural practices separately and neglect the possible interdependence among them. Moreover, they take up few practices or innovations and analyze factors influencing their use.

Other studies have tried to analyze the interdependence between a few agricultural practices and technologies. (Grisley and Mwesingwa, 1994; Ali, 1996; Fernandez-Cornejo, 1998; Hoffmann et al, 2001; A paper by Hassan (1996) which deals with planting strategies of maize farmers in Kenya is probably the first paper to consider a large number of interdependent planting decisions.

Even though the study by Hassan considers many of the maize planting decisions, it ignores the impact of these decisions on the use of these inputs such as fertilizer, herbicide and manure.

This study is designed to bridge the gaps left by the previous studies. The major departure from the previous studies is that first, we consider all crops rather than a single crop since a planting decision for one crop affects other crops, and as a result, it is not possible to see the whole impact of the decision on the whole farm. In addition, we consider the simultaneity among the decisions, starting from whether to fallow, up to the decision whether and how much to apply of a certain input since evidences suggest that these decisions are interrelated. The agricultural practices considered in this study are fallowing, intercropping, use of manure, use of chemical fertilizer, and use of herbicides. Therefore, our objective is to analyze factors influencing the use of each of these practices and inputs and the interdependence between some of the practices and inputs themselves.

The paper is laid out as follows. After presenting the theoretical models of technology adoption and input use intensity in section two, section three describes the study area and data used in the study. Section four presents the empirical models and econometric issues of the study. Estimation methods and empirical results and discussions are presented in section five, and the paper concludes with a summary of the findings in section six.

## 2. Theoretical models of technology adoption and input use intensity

In this study we consider five agricultural practices and input uses, namely, fallowing, intercropping, manure use, chemical fertilizer use and herbicide use. They are selected on the basis of their applicability to the whole cropping system, unlike some of the practices (e.g., choice of cultivars), which apply to a single crop and agro-ecology. The current practices are appropriate for study across a large section of farmers and different agro-ecological zones. These decisions depend less on agro-ecological factors such as rainfall and temperature. In addition, these practices are not crop specific. As a result, research findings based on these practices and input

uses can be applied to wider areas other than the agro-ecological zones from which the data are collected.

The five decision variables are defined as:

**Methods of restoring soil fertility ($y_1$)**: one of the major ways of restoring soil fertility is leaving land fallow (Omiti, et al., 1999). This involves giving the land a break from cultivation for a year or longer so that its fertility will be restored. It is one of the natural ways of restoring fertility. In this study we do not distinguish between the different fallow periods. Moreover, we consider all lands under fallow other than those unsuitable for cultivation. This choice is specified as a binary decision variable **($y_1$)**, which takes a value of 1 if the household leaves land under fallow and 0 otherwise.

**Cropping pattern ($y_2$)**: farmers may grow more than one crop simultaneously on the same plot (intercropping) and hence there is competition for resources during part of the crops' growth cycle. This is the main way of multiple cropping, because in most of the survey sites rain is unimodal and irrigation is not widely used. Thus, if farmers practice intercropping, $y_2$ takes the value of unity and zero, otherwise. Some of the advantages of intercropping in the tropics are: (1) avoidance of the risks of environmental uncertainties such as diseases, pests, hailstorm prevalent in the case of sole cropping (Norman, 1974); (2) meeting demand for different farm products both for nutritional balance and sale; (3) reduction of labor for weeding; (4) complementarities between nitrogen fixing legumes and plants having a high demand for nitrogen (Charlton, 1987); and (5) reduction in soil erosion.

**Methods of maintaining soil fertility ($y_3$ and $y_4$)**: agricultural intensification involves the use of chemical fertilizer and organic fertilizer (manure) to maintain the nutrient content of soils so as to maintain or increase productivity. Omiti, et al (1999) and Brown and Shrestha (2000) indicated that farmers apply both organic and inorganic fertilizers, the later far below the recommended rate of application. One of the reasons for the low use of inorganic fertilizer was use of alternative methods of reviving soil fertility. Another reason was insufficient crop response to fertilizer at the levels that farmers can afford to apply chemical fertilizers. They also indicated that the use of inorganic fertilizer increases the need for weeding labor. Other alternatives

to the use of inorganic fertilizer are crop rotation and fallowing. On the other hand, farmers report the use of both organic and chemical fertilizer at the same time. Given this, there is lack of studies as to whether the uses of manure and chemical fertilizer are complementary or substitutes as used by farmers. Owing to the widespread use of inorganic fertilizer and manure, the two choice variables can be represented as continuous variables or binary variables. Let $y_3$ represent whether the household has applied organic manure. Thus $y_3$ = 1 for households which use manure and 0 otherwise. And let $Y_4$ represent the value of inorganic fertilizer applied by the household (or $y_4$ = 1 for households using inorganic fertilizer and 0 otherwise).

**Methods of weed control ($y_5$)**: Farmers control weeds in different ways. Deep tillage and burning of crop residues are the main ways of controlling pre-emerging weeds in Ethiopia. Weeds can also increase crop residue which can be used as animal feeds or can provide fodder to livestock by cutting and carrying the weeds from the standing crop. In Ethiopia farmers use selective herbicides. Hand weeding and use of herbicides are the two ways of controlling emerging weeds. Although there are not many economic studies in Ethiopia regarding weed control, the main reason of applying herbicides is to substitute hand picking. Experiences with the farmers in Ethiopia show that farmers prefer hand picking to herbicide for effective weed control, as this is more effective in controlling weeds given households can employ enough labor to do so. The use of herbicides can represent both a binary and continuous variable since variation in the amount of herbicides used is high regardless of the recommended rate. Thus $y_5$ is the value of herbicide used or $y_5$ = 1 if the household uses herbicide and 0 otherwise (for binary variable).

Generally we divide the above choice variables into binary variables indicating whether a given household has used a particular practice or input and continuous variables measuring the intensity of use of a particular input. Thus in the next two subsections, the theoretical models of adoption and input use intensity will be presented.

## 2.1 The model of adoption decision

Before adopting any land conserving and productivity enhancing agricultural practices, farmers consider returns from adopting or not adopting to their households in the form of consumption and income. While fallowing, manuring and intercropping are expected to enhance the future productivity of land in addition to their contribution to current production (intercropping and manuring), fertilizer and herbicide application are expected to increase the current income from production. From farmer's perspective, optimal soil use occurs under the combination of farm practices yielding the highest returns (Rahm and Huffman, 1984). This can add to household food security and overall wealth, which are important objectives of most rural households.

The adoption of a technology or any agricultural practice is a choice between this practice and the alternative practice, or a choice between the new technology and the old technology. Thus, if the return from adopting the technology (or agricultural practice) j is higher than that of the old technology (or alternative agricultural practice) for farmer i, the preference or utility for that technology (agricultural practice)[2] will be higher than that of the old technology.

Suppose farmer i's utility after adopting the technology (agricultural practice) j for a given vector of economic, social and physical factors ( $x_i$ ) determining the return from adoption and non-adoption is given by.

$$U_{ij1}(R_{ij1}) \text{ , j=1,…, 5} \quad \textbf{(1)}$$

And the utility without adoption is given by

$$U_{ij0}(R_{ij0}) \quad \textbf{(2)}$$

Where $R_{ij1}$ and $R_{ij0}$ are the perceived returns from adoption and non-adoption, respectively. However, since R is not observed and unobservable, we can postulate the linear relationship between the utility derived from adoption and non-adoption of

[2] We assume a monotonic relationship between utility and benefits.

an agricultural practice and a vector of observed farm specific characteristics x. Thus the preference for adopting or not adopting a given technology or agricultural practice j can be defined as a linear relationship[3]

$$U_{ij1}(x_i) = x_i\beta_{j1} + \upsilon_{ij1}, \text{ for adoption and} \quad \textbf{(3)}$$

$$U_{ij0}(x_i) = x_i\beta_{j0} + \upsilon_{ij0}, \text{ for non-adoption.} \quad \textbf{(4)}$$

Where $\beta_{j1}$ and $\beta_{j0}$ are parameters to be estimated and $\upsilon_{ij1}$ and $\upsilon_{ij0}$ are random disturbance terms associated with the adoption and non-adoption of the technology or agricultural practices, respectively. However, we observe only the binary random variable which can be denoted by Y taking the value of one if the technology or agricultural practice is adopted and zero, otherwise (Herath and Takeya, 2003; Fernandez-Cornejo, 1998). Thus a given farmer's probability of adopting a given technology or agricultural practice j can be expressed as a function of $x$ as follows.

$$\begin{aligned} P(y=1) &= P(U_{ij1} > U_{ij0}) \quad \textbf{(5)} \\ &= P(x_i\beta_{j1} + \upsilon_{ij1} > x_i\beta_{j0} + \upsilon_{ij0}) \\ &= P\{(x_i\beta_{j1} - x_i\beta_{j0}) > (\upsilon_{ij0} - \upsilon_{ij1})\} \\ &= P(x\beta > \varepsilon) = F(x\beta) \end{aligned}$$

Where P represents a probability function, $\varepsilon$ is the difference between the two random disturbance terms, $\upsilon_{ij0}$ and $\upsilon_{ij1}(\varepsilon = \upsilon_{ij0} - \upsilon_{ij1})$ and is a random disturbance term itself, $\beta = \beta_{j1} - \beta_{j0}$, a vector of unknown parameters which can be interpreted as the net influence of the vector of explanatory variables on adoption of the technology or agricultural practice and $F(x\beta)$ is the cumulative distribution function (CDF) for $\varepsilon$ evaluated at $x\beta$ (Herath and Takeya, 2003).

[3] This is a random utility model

We can assume different distributions for ε which determine the exact distribution of F (and hence the analytical model to assess adoption of agricultural practices). Probit model arises from assuming a normal distribution, while the logit model arises from assuming a logistic distribution for ε. The choice between probit and Logit models can be a matter of convenience since there is no a priori reason to prefer either under the standard assumption about the error term (Greene, 2000). These two models are widely used to assess the adoption of technologies. Examples of Probit model applications include Rahm and Hoffmann (1984); Herath and Takeya, 2003; Fernandez-Cornejo, 1998), whereas Logit models are used in Lyne et al (1988); Baidu-Forson (1999). While Probit and Logit specify adoption as a single dichotomous choice, Tobit can account for the difference in the intensity of use of certain technology given the technology has been adopted in the same stage. However, if data is available on the intensity levels, two-stage process can be employed to allow for the varying intensity levels once the initial decision to adopt this practice has been made (e.g., Feather and Amacher, 1994; Fernandez-Cornejo, 1998).

In this study we assume that the disturbances ( $\varepsilon_i$ ) are independently and identically normally distributed (hence F being the cumulative normal distribution function) and use a probit transformation to model the farmers' adoption decision.

## 2.2 Theoretical model of input use intensity

While adoption or non-adoption of a particular agricultural practice is based on the benefit or utilities derived from the alternative decisions, the amount of the agricultural practice or input actually adopted or used must be consistent with farmer's optimization behavior such as profit maximization or utility maximization (Fernandez-Cornejo, 1998). In this section we develop a theoretical model for chemical fertilizer and herbicide use intensity. To develop the theoretical framework for the intensity of these inputs, we start with a household model, which draws on the agricultural household model developed by Singh et al (1986). Farmers in developing countries operate under many forms of market failures including labor, credit and land markets (Sadoulet and de Janvry, 1995; Singh et al, 1986; Heltberg, 1998; Taylor and Adelman, 2003; de Janvry et al, 1991). Market failures introduce binding constraints in production where households cannot make separate decisions on consumption

and production rendering the household model non-separable. Assume the household consumes home produced commodity $x_a$, a purchased commodity $x_m$ and leisure time $x_l$. Then the problem of the household is to maximize the household's utility function

$$u\left(x_a, x_m, x_l, z^h\right) \quad \textbf{(6)}$$

Subject to:

$$\text{Time constraint: } x_l + F = T \quad \textbf{(7)}$$

Where T is the total stock of household time and F is family labor input;

$$\text{Cash constraint: } p_m x_m = p_a(Q - x_a) - p_l L - \sum_{i=1}^{N} w_i y_i + E \quad \textbf{(8)}$$

Where $p_a$ and $p_m$ are prices of produced food crops and purchased commodities, respectively; $p_l$ is wage rate and $w_i$ are prices of other variable inputs; L is total labor demand by the household, both family and hired; $y_i$ are variable agricultural inputs which include fertilizer and herbicide other than labor (i=1, …, N); E is exogenous income; $Q$ is home produced farm output used both for consumption and market, where $Q - x_a = Q_s$ (marketed surplus) Equations (7) and (8) can be collapsed into one equation (9) which is a full income constraint:

$$p_a x_a + p_m x_m + p_l x_l = \pi^* = p_l T + p_a Q - \sum_{i=1}^{N} w_i y_i - p_l L + E \quad \textbf{(9)}$$

Where $\pi^*$ is full income;
And an explicit production function constraint of the household, which can be written as

$$0 = g(Q, L, y_i, z^q) \quad \textbf{(10)}$$

where $g(.)$ is a strictly concave production function; $Z^q$ is a vector of farm characteristics, which includes fixed factors (e.g., land)

The household utility function, u, is assumed to be strictly concave and twice continuously differentiable.

Whether household models are separable or not depends on how the budget constraint is formulated depending on market environments (Taylor and Adelman, 2003). While our basic model omits various complexities and does not explicitly allow for market failures, we include household characteristics, $z^h$, in production decisions assuming that one or markets may fail for at least some households. Their inclusion can also provide a test for non-separability. If the household characteristics, $z^h$, are jointly significantly different from zero in the production functions, one can reject separability.

The Lagrangian function for the above maximization problem can be written as

$$£ = U(x_a, x_m, x_l, z^h) + \lambda[p_l T + (p_a Q - \sum_{i=1}^{N} w_i y_i - p_l L) + E - p_a x_a - p_m x_m - p_l x_l] + \theta g(Q, L, y_i, z^q) \quad \textbf{(11)}$$

Maximizing the Lagrangian with respect to all choice variables and manipulating the first order conditions of the maximization problems and solving the variables representing the inputs, we can derive the optimal input demand functions,

$$y_i^* = y(z^q, p_l, p_a, w_i, z^h) \quad \textbf{(12)}$$

Where, $y_i^*$ is the optimal demand for input i.

## 3. Study area and data

The data used for this study were collected in 1997/98 from 15 different sites in southern Ethiopia by the Episode project. These sites (clusters) were selected to include the major agro ecological, agricultural practice, institutional factors, and demographic variations in the region. Thirty to 35 households from each site were randomly selected and included in the survey (comprising 505 households) and a formal questionnaire was used to collect the data. We dropped 5 households that do not have cultivated land and 500 households are thus used for this study. Description of major variables used in the study is presented in Table A1.

Farmers in the study areas practice different agricultural practices and use different inputs. Out of 500 households who have cultivated land, the percentages of farmers who reported practicing fallowing, intercropping, manuring, use of fertilizer and use of herbicide are 8%, 29%, 54%, 71% and 44%, respectively. Site level information on the level of these activities is provided in Table A3.

The sites differ in population pressure, amount of annual rainfall, market access, the types of crops grown and livestock density. There is not much heterogeneity regarding rainfall pattern, technology, and access to extension. Description of the different sites is provided in Table A2.

We control for the unobserved effects arising from the different clusters because of differences in agro-ecological conditions, farming practices, demographic differences, market access, and prices of inputs using the panel data estimation methods applied to cluster samples. Hence we include either the dummy variables for different sites (fixed effects), random effects or cluster sample method based on their appropriateness. To control for the observed heterogeneity arising within the clusters and between clusters, we use the appropriate explanatory variables.

# 4. Empirical model, estimation methods and econometric procedure

## 4.1 Empirical model and estimation of the adoption decision

The five adoption decisions $(y_1 - y_5)$ are determined by farmers' self-choice on the basis of several criteria. Accordingly, farmers decide on whether or not to keep some of or parts of their plots under fallow, whether to intercrop, use manure, use fertilizer and use herbicide. These decisions are assumed to be interdependent. For example, in deciding whether to keep land fallow, a farmer considers many other alternative ways of maintaining soil fertility such as manuring, and use of chemical fertilizer. Fallowing reduces the size of land available for cultivation, which jeopardizes the consumption needs of the household. Therefore, to decide whether to fallow or not, other means of meeting subsistence needs such as intercropping, use of fertilizer and manure are considered. In addition, since farmers use fallowed land for grazing this can affect the use of herbicides, which leaves some of the weeds intact unlike hand weeding. While we expect a positive relationship between fallowing and intercropping, the relationship between the probability of fallowing, on one hand, and the use of manure and fertilizer, on the other, can be ambiguous; first, farmers who practice fallowing may not worry about the fertility of the soil, and this may reduce the probability of manure and fertilizer application; second, farmers who practice fallowing have less cultivated land and this may lead to a high probability of manure and fertilizer application to get high yield from cultivated plots (intensification). Hence the relationship between fallowing and the two decisions depends on the magnitude of these impacts. Fallowing may also reduce the probability and intensity of use of herbicide. The relationship between intercropping and the application of manure and fertilizer can be difficult to determine a priori. On one hand, since intercropping households are likely to have smaller operated holding they may use these inputs as a means of intensification. On the other hand, intercropping households use fallowing as a means to restore soil fertility and this may reduce the use of these inputs if they are substitutes. Intercropping can also have both negative and positive impact on the use of herbicides. Some herbicides can kill the main or intercrops and this might reduce the use of herbicide. Intercropping can also make hand weeding difficult, thereby increasing the use of herbicides.

The impact of manure on fertilizer is ambiguous a priori since it depends on whether the two inputs are complementary or substitutes. We expect the relationship between manure and the use of herbicide to be positive since the use of manure enhances the growth of weeds making hand weeding costly. The use of fertilizer is hypothesized to be positively related with the use of herbicide since fertilizer promotes weed growth. The relationship among fallowing, intercropping, use of manure, use of fertilizer and herbicide are assumed to run in two directions in this model. This shows that there is backward causation. Each of the five decision variables is both the result and the cause of others.

This fact, coupled with possible across-equations error correlation makes this model a system of simultaneous equations with discrete dependent variables. Maddala (1983) shows that the maximum likelihood estimators are not consistent in the simultaneous equation systems. The application of full information maximum likelihood (FIML) is not computationally viable with several limited dependent variable equations. On the other hand, given over-identified equations, reduced form estimation as in indirect least squares results in inefficient estimates (Nelson and Olsen, 1978). Therefore, to generate consistent and more efficient estimators of the structural parameters in simultaneous equation systems with dichotomous dependent variables, we use alternative estimation procedures. Heckman (1979), Lee et al (1980), and Nelson and Olsen (1978) applied the Logit and Probit two-stage estimation procedures (analogous to two-stage least squares) to cases of simultaneous equations models with endogenous discrete variables such as the case of sample selection bias or self selectivity, involving estimation of the reduced form equations in stage one, i.e., the regression of endogenous variables (y's) on all exogenous regressors (x's) and using reduced form estimation to compute the fitted values of the dependent variable $(y_i)$, which are then used as regressors (instruments) substituting for actual y in the relevant structural equation to estimate the structural parameters of the model in stage two. Both stages use OLS to estimate continuous dependent variable equations, and MLE to estimate limited dependent variable equations (Maddala, 1983). Nelson and Olsen (1978) and Lee et al, (1980) show that the resulting structural parameters are consistent. The standard errors are bootstrapped to correct for the use of the predicted instruments in the second stage.

Accordingly, the model equations for the simultaneous equation system can be specified as follows:

$$y_1 = f_1(x_1, y_2, y_3, y_4, y_5, \alpha_1, e_1) \quad \textbf{(13.1)}$$

$$y_2 = f_2(x_2, y_1, y_3, y_4, y_5, \alpha_2, e_2) \quad \textbf{(13.2)}$$

$$y_3 = f_3(x_3, y_1, y_2, y_4, y_5, , \alpha_3, e_3) \quad \textbf{(13.3)}$$

$$y_4 = f_4(x_4, y_1, y_2, y_3, y_5, , \alpha_4, e_4) \quad \textbf{(13.4)}$$

$$y_5 = f_5(x_5, y_1, y_2, y_3, y_4, \alpha_5, e_5) \quad \textbf{(13.5)}$$

Where $x_i$ represents the set of exogenous regressors, and $\alpha_i$ and $e_i$ are, respectively, vectors of model parameters and the random error terms. Equations (13.1)-(13.5) are probit equations. In addition, we estimate the least squares models for $y_4$ >0 and $y_5$ >0 observations.

Another econometric issue regarding estimation of the model concerns the cluster nature of the data. Since the data for this study comes from 15 different sites, we have 15 different clusters and this must be taken into account in the estimation procedure. The random effects (RE) and fixed effects (FE) panel data estimator can be applied to cluster sample to account for unobserved site constant effects (site heterogeneity) (Wooldridge, 2002). The distinction between the two estimators centers on the way the unobserved effects are treated. Whereas the RE estimator treats the cluster effects as a random variable, the FE estimator treats it as a parameter to be estimated. (Wooldridge, 2002; Baltagi, 1995; Hsiao, 1986) In addition, the fixed effects estimator is used when the unobserved effects are correlated with the exogenous variables included in the regression and the RE is used when the fixed effects are not correlated with the explanatory variables.

However, Wooldridge (2002) shows that estimating the FE probit model leads to inconsistent estimation of $\alpha$. The estimation of limited dependent variable models using panel data models is extensively reviewed in Maddala (1987). In this study we used either the RE or the pooled or the cluster corrected robust estimation of variance or the population-averaged RE depending on the tests for specific equation. When the pooled probit and the RE probit MLE are not plausible due to the significance of unobserved effects or instability of the estimates, respectively, we use

the population-averaged probit or the pooled probit with cluster-adjusted robust estimates of standard errors.

Given that the unobserved fixed effects (unobserved heterogeneity) are significant, the pooled probit ignores them and estimates the parameters without the assumptions underlying the RE probit estimators. In this case the pooled probit consistently estimates $(\beta/(1+\sigma_c^2)^{1/2})$ rather than β where $\sigma_c^2$ is the variance of the unobserved fixed effects. On the other hand, the population-averaged probit estimator takes into account only two of the assumptions underlying the RE probit estimator, relaxing the assumption that the dependent variable observations are independent conditional on the explanatory variables and the unobserved fixed effects. Thus the population-averaged estimators are likely to be more efficient than the pooled probit estimators and less efficient than the RE probit estimated under the full set of RE assumptions (Wooldridge, 2002). Hence provided the fixed effects are significant and the RE probit estimates are rejected due to their instability, the choice between the pooled probit and the population-averaged probit models is based on their significance.

Before choosing an estimator we first test for the significance of the unobserved fixed effects, whether to use RE or FE (in linear models) and then whether the estimates are stable if RE probit is chosen.

## 4.2 Empirical model and estimation of input use intensity

Having decided to adopt an agricultural practice or input based on the utility derived from adoption, farmers decide on how much of the technology or input to use. This choice is based on the farmer's optimization behavior. Thus, the demand for inputs described in the theoretical section 2.2 can be modeled econometrically as a linear regression model specified as

$$y_i^* = \beta_0 + \beta_1 \boldsymbol{Z}^q + \beta_3 y_k + \beta_4 \boldsymbol{Z}^h + \boldsymbol{U}_i, \text{ K=1,...,5, and i}\neq\text{K} \qquad \textbf{(14)}$$

Where $y_i^*$ is the optimal input demand (total cost of fertilizer and total cost of herbicide use by a farmer), $z^q$, w and $z^h$ are as explained in the theoretical section,

$y_k$ is the decision variable used as explanatory variable and $u_i$ is the idiosyncratic error term. Theoretically input demand function should include input and output prices. However, we do not have data on price variations in the study areas and hence we do not include them here. The input use intensity (input demand functions) models are estimated as part of the simultaneous equations system given in 4.1.

However, in this sample there are corner solutions ($y_i^*$=0) for those households, which do not adopt the input. These households make the adoption decisions themselves. Since adopters and non-adopters may be systematically different, these differences manifest themselves in the model introducing self-selection bias to the model. This situation, known as self-selectivity, must be corrected to prevent biasing the results. (Wooldridge, 2002; Greene, 2000). One way of modeling self-selectivity is using Heckman's selection model (Heckman, 1979). This model involves a two-step estimation procedure which involves deriving the Inverse Mill's Ratio (IMR) from the first stage fertilizer and herbicide adoption probit models using all observations and using the IMR as additional regressors in the input demand equations in the second stage using all observations with $y_i^*$>0. In this procedure we assume that the error term in the first stage probit equation is normally distributed with zero mean and unit variance {$e_4 \sim N(0,1), e_5 \sim N(0,1)$}. Thus according to this procedure equation (14) is modified as

$$y_i^* = \beta_0 + \beta_1 z^q + \beta_3 y_k + \beta_4 z^h + \gamma\lambda(.) + u_i \text{, i≠k} \qquad \textbf{(15)}$$

If $\gamma$ = 0, then there is no sample selection problem and $\beta$ can be consistently estimated in one step using the selected sample. But if $\gamma \neq 0$, regression of $y_i^*$ on $z^q$, w and $z^h$ using only the selected sample omits the term $\lambda(.)$ and generally leads to inconsistent estimation of $\beta$.

The economic estimation procedure is similar to the one outlined under the previous section. The only difference here is that since we use least squares estimators for the current models, we can also choose between FE and RE models once we find out that the fixed effects are significant. In addition, we do not face the problem of instability of estimates unlike in RE probit.

## 4.3 Exogenous determinants of farmers' adoption decisions and input use intensity

Based on economic theory, previous studies and personal experience we hypothesize other explanatory variables (factors) that influence farmers' adoption and use intensity of agricultural practices and inputs. Since households have to produce enough food for consumption especially where there are market imperfections, the total land size the household owns may influence the fallowing decision. Thus households with larger total land holding per consumer unit (tlszocu) may have higher probability of keeping their plot under fallow. The impact of operated land holding per consumer unit (olszocu) on the decision to use manure, fertilizer and herbicide is ambiguous to predict a priori since it has two opposite effects on these decisions. On one hand, land holding reduces the need for intensification, hence influencing the decisions negatively. On the other hand, land holding is a measure of wealth and may enable households to use these inputs. It can also increase the probability of manure use because households with larger land can have larger number of livestock for manure production. Thus the direction of influence may depend on the magnitudes of these opposing impacts. It may also influence the decision to intercrop negatively since it enables households to produce the type and the amount of crops needed for the household consumption and cash needs.

Household characteristics such as age and sex of household head and education of family members are also expected to influence the decision variables through their influence on farm experience, division of labor, and the ability to acquire and use information. (Hassan, 1996); Feder et al (1990). We use two education variables (edu = number of family members with educational level up to grade six and eduto6 = number of family members with educational level above grade six).[4] We include the sex of household head in herbicide and fertilizer models because in some parts of Ethiopia, weeding is considered to be female's task and male-headed households might be reluctant to apply herbicide. On the other hand, we do not expect the sex of the household head to influence other decisions since these decisions may depend on experience and education. In addition, we have included the labor endowment of

[4] Some variables were excluded from some models based on economic theory and their significance because some procedures such as cluster sample estimation require that the number of explanatory variables be equal to the number of clusters minus one

households in the regressions. We converted family members into standardized labor unit to get total labor force of households. This was divided by the total operated land holding. Labor is an important factor of production in agriculture and may influence agricultural decisions especially in places where there are labor and credit market imperfections. We expect that larger labor force influences fallowing and intercropping negatively since fallowing and intercropping reduce labor requirements of farm operations. On the contrary, larger labor force may increase household income and enables farmers to buy fertilizer to be used instead of manure. It can also enable households to carry manure into distant fields producing two opposing effects. Thus, the sign of the coefficient on this variable in the probability of manure use depends on the magnitude of these two effects and is indeterminate a priori. It is also expected to enable farmers to use fertilizer intensively through its impact on household income. We hypothesize that labor force increases the capacity of households for hand weeding, reducing the probability and intensity of herbicide use. The ratio of male labor to female labor (mfratio) is also included in the estimations to see if labor division affects decisions. We hypothesize that larger male labor relative to female labor reduces the probability and intensity of use of fertilizer because fertilizer enhances weed growth. This means that larger female labor encourages inputs, which increase weeds.

We also include the dummy variable indicating the availability of irrigated lands (irrg). Households with irrigated plots can produce more than once per year and hence have more crop yield than their counterparts. This is another means of intensification and we expect that farmers with irrigated plots to be more likely to keep some of their land under fallow. It is also expected to reduce the probability and intensity of use of manure and fertilizer since these farmers with irrigated plots may be able to produce enough without these inputs.

It has been hypothesized that land tenure determines the use of agricultural practices and inputs. Although fixed rent contract dominates the types of contracts in the study areas, this kind of contract may influence the adoption of agricultural practices. Generally we expect that households who rent in land have either lack of enough land or they need to produce more. Another equally important yet opposite argument is that these households with larger share of rented in lands are better off in satisfying their need for land through renting in and may be less land-constrained. Depending

on the magnitudes of these effects the expected impact of this variable (rrl) could be negative or positive and is not known beforehand.

We also hypothesize that households with larger consumer-worker ratio (cwr) have more mouths to feed than the available workforce to provide the family with labor and income compared to their counterparts. We therefore expect that dependency ratio influences fallowing negatively; intercropping and herbicide use intensity positively; while the effect on the probability of manure and fertilizer use can be ambiguous.

Livestock holding converted to tropical livestock unit (TLU) is used as a measure of wealth. In addition, livestock put pressure on households through its demand for feed and it also provides households with manure. Land kept under fallow serves as grazing land for livestock. Thus, in addition to its use to restore soil fertility, households might consider its use as grazing land in fallowing decision. This means that households with larger livestock size per total land holding (tlutlsz) are more probable to leave land under fallow. On the other hand, in some areas farmers cut and carry weeds from their crops for use as livestock feed. But intercropping reduces the space available for the weeds and this means that there are fewer weeds available in the case of intercropping. On the other hand intercropping may increase crop by-products used as animal feeds. This in turn leads households with larger livestock to adopt intercropping. Thus, the sign depends on the magnitudes of the two impacts. Livestock is also used as a source of manure and households with larger livestock size are more likely to use manure. We also hypothesize that households with larger wealth are less risk averse (risks associated with repayment of fertilizer credit in case of adverse weather) and might be more likely and intensive in using fertilizer and herbicide leading us to expect positive relationship between these inputs and livestock size.

Oxen holding is an indicator of operating capacity and complements or substitutes for purchased inputs. Thus the number of oxen per operated land holding (oxolsz) is used to measure the capacity of a household to cultivate land. This ability might reduce fallowing while the impact on fertilizer and herbicide can be ambiguous.

Market access can also affect adoption of agricultural practices and intensity of input use. We use distance to market in hours (mktdist) and the mode of transportation represented by three dummy variables, publict2 = if public transportation is used and

zero otherwise; cartt3 = 1 if horse cart is used and zero, otherwise; and walkpt4 = 1 if both walking and using public transportation and zero, otherwise, as measures of access to market. We assume that the farther the household from the market and the older the mode of transportation, the less is the access to market. The fact that market can be accessed on foot and public transportation tells us that the farmer has more alternative ways to go to markets than those only with walking (no public transportation) and those with only public transportation (too far to walk), while market distance tells us the general effect of distance both on walking and use of public transportation.

The availability of grazing land represented by a dummy variable (grazland) which equals one if the household owns grazing land and zero, otherwise can also affect fallowing negatively.

In rural areas of Ethiopia, manure has an alternative use as a source of energy (fuel). Thus farmers face competing uses for this product where the use of manure as fuel reduces its use as fertilizer and vice versa. We include two dummy variables to account for the impact of using manure as a fuel. One dummy variable (fuel2d1) takes a value of one if the household uses some manure as fuel and zero, otherwise. The other dummy variable (fuel2d2) takes unity if the household uses much manure as fuel and zero, otherwise. Thus we hypothesize those households using some or much manure as fuel has lower probability of using manure as fertilizer and practice fallowing as a means of restoring soil fertility.

Price data are not recorded in the survey. While we use panel data estimation procedures to control for price differences among different locations (clusters), prices within the same location are the same for different inputs and we do not expect any problem related to the omission of price variables from the regressions.

## 5. Results and discussion

*Fallow model*

The empirical maximum likelihood estimation results of fallowing adoption model with standard errors adjusted for clustering on 15 different sites are presented in Table B1. In addition to pooled probit model with cluster-adjusted standard errors, we also present the population-averaged (equal-correlation) probit model results for

comparison purpose. The two models have similar results. Prior to estimating the two models, we tested for the poolability of the data and we found out that the unobserved fixed effects were insignificant. Therefore, the pooled probit can consistently estimate the parameters of the model.

Fertilizer use reduces the probability of fallowing. This means that farmers with higher probability of fertilizer use do not need to fallow land to maintain soil fertility. Both the pooled probit model (Model II) and the population-averaged model (Model I) indicated that households with higher total land holding per consumer unit (tlszocu) are more likely to have fallow lands. This is in line with our hypothesis. (Krautkraemer (1994) shows that cropping intensity increases with population size. Grisley and Mwesigwa (1994) found similar results with empirical data from Uganda.

The availability of grazing land is negatively and significantly related with the probability of fallowing (model I). However, it is not significant in Model II.

*Intercropping*

After rejecting the poolability of the model for intercropping equation, we estimated the model using the population-averaged probit ML and the pooled probit procedure with standard errors adjusted for clustering on 15 different sites. The RE model was again rejected because the test for numerical soundness of the Gauss-Hermite quadrature approximation showed that the estimates were not stable. When the unobserved fixed effects are significant and the estimates of the RE probit model are not stable, the alternative is to use one of the population-averaged and pooled probit models. Theoretically the superiority of population-averaged estimates is that they are more efficient than the pooled probit estimates. However, if this is not the case as it is here, there is no reason to prefer the former estimates. The pooled probit model gave better results than the population-averaged model. While we present both results, the following discussions are based on the results of the pooled probit model (Model II). The estimation results are presented in Table B2.

The results show that fallowing decision has unexpected sign and is significant in Model II. Possible explanations for this include the availability of cultivated land is the main determinant of fallowing decision although other factors also contribute to the decisions. This means that farmers first keep enough land under cultivation before they fallow some of their plots and this decision, in turn, determines fallowing. This

can also be used as an argument that farmers use intercropping to meet their demand for different crops rather than as a means to increase total production from a given plot since there is trade off in terms of total production from the main crops when there is intercropping resulting from the competition for resources between the intercrops and the main crops. Herath and Takeya (2003) found no significant relationship between cropped rubber fields and the decision to intercrop by rubber farmers in Sri Lanka.

The probability of intercropping also increases with the decision to use manure and decreases with fertilizer use (Model II). This may suggest that households use intercropping as a substitute for fertilizer. The probability of intercropping increases (Model II) with the number of family members above grade six (eduto6). This could be because of the fact that households with larger number of educated members have less number of workers as these categories of members usually migrate to other areas in search of employment. Another explanation could be the increased awareness about the benefit of intercropping with education.

An interesting and unexpected result is the impact of consumer-worker ratio (cwr) on intercropping. We expected that households with larger consumers generally have higher need for consumption and higher probability for intercropping. However, according to this result larger cwr reduces the probability for intercropping. Although we have no good reason to believe that households with more consumers should use intercropping less often than their counterparts, the result may suggest that households with more consumer do not generally depend on intercropping to meet their consumption need. This may also be another evidence that the main reason for intercropping is not to maximize total production from a given plot but to meet consumption needs for different crops.

The agricultural workforce available to the household, measured by the size of workforce per operated holding (wfolsz) has an expected negative sign and is significant (Model II). This again shows the impact of household endowments on intercropping. Here the impact of this variable on the decision to intercrop is only through the demand of intercropping for labor, since we have controlled for the impact of family size through consumption using consumers (cwr) unlike the study by Herath and Takeya (2003) where both impacts are measured by one variable, family size. The size of livestock in TLU per operated land holding (tluolsz) has positive sign and

is significant. The hypothesis was that thinly planted fields could serve as sources of feed for livestock forcing households to practice single cropping. We also hypothesized that intercropping could increase agricultural byproducts which could be fed to livestock. The results support this hypothesis.

*Manure use model*

The equation for the probability of applying manure was estimated using the population-averaged probit procedure (Model I) and the pooled probit maximum likelihood estimation procedure (Model II) since we found out that the unobserved fixed effects were significant and the estimates of the RE probit model were unstable. The results of the estimation are presented in Table B3. Intercropping increases the probability of use of manure significantly. The decision to apply fertilizer increases the probability of applying manure positively and significantly suggesting the complementarity of the two inputs in the area. We should be cautious about the interpretation of this result here since other studies may find different results depending on institutional and household specific factors (e.g., Omamo et al, 2002 have found negative relationship between fertilizer and herbicide use intensities). On one hand the present result is based on the model, which estimates the probability of use of two inputs. Hence we are not talking about the complementarities and substitutability of the two inputs in pure micro-economics sense. This result is just an indication that farmers with higher probability of fertilizer use also have higher probability of manure use. On the other hand, given that farmers may not be able to purchase enough fertilizer and the fact that manure is mostly used on nearby fields because of difficulties in transportation, farmers may try to catch every opportunity to increase the fertility of their soils by using fertilizer on farther plots and manure on nearby plots at the same time. In addition, even if they know that they can buy enough chemical fertilizer, farmers may prefer to first use manure because they know it increases soil fertility for a longer time. Moreover, manure has no market and there is no way farmers compare fertilizer and manure prices. Instead, farmers first exhaust the possibility to use their available fertilizer and then turn to fertilizer depending on their abilities. We believe that our model yields the best result since we have correctly specified the model using the simultaneous equations system. This result is also in line with the guidelines for integrated plant nutrient management by Aune and Oygard (1998) where it is suggested to combine organic and inorganic fertilizers to maintain/improve soil quality.

The number of family members with education above grade six has negative sign and is significant (Model I). We do not have good explanation for this result. The dummy variable for irrigation (irrg) has unexpected positive sign, (and is significant in Model I) contrary to our hypothesis. On the other hand, consumer worker ratio has a positive sign and is significant (in Model I). The size of labor force per operated holding (wfolsz) has a positive sign and is significant (Model I).

The sign of the age of the household head is positive and significant in Model I. The dummy variables for the use of manure as fuel have negative signs but all are insignificant. The results also indicate that the larger the share of rented in land in total operated holding, the lower is the probability of using manure, suggestive of the fact that farmers consider the chance of losing the land as manure can improve soil fertility for a long time raising the question of tenure security.

*Fertilizer adoption and use intensity models*

We estimated the probability of fertilizer use by population-averaged probit model (Model I) and pooled probit ML model (Model II) having rejected the hypothesis that the unobserved fixed effects are insignificant and that the RE probit estimates are unstable. The fertilizer use intensity model was estimated using the FE least squares. The dependent variable is the log of the total cost of fertilizer normalized by total operated holding. The test for RE and FE also rejects RE in favor of FE. Estimation results of both models are presented in Table B4.

The coefficient on the IMR included in the fertilizer use intensity model is not significant indicating that there would not be selectivity bias if we did not correct for it. Fallowing and intercropping decisions influence the probability of fertilizer use negatively and significantly while both are negative and insignificant in fertilizer use intensity models. The decision to use manure has a positive sign and is significant only in fertilizer use probability model. This can be interpreted as; households with fallow land do not need fertilizer to maintain soil fertility. On the other hand, the use of fertilizer and manure may be complementary.

The size of operated land holding per consumer unit (olszocu), which measures land scarcity, has a positive sign and is significant in both models of fertilizer use probability. The result suggests that households with larger operated holding can afford to use fertilizer. In support of this result Holden and Yohannes (2002) found

that relative farm size is positively and significantly related with the probability of the use of purchased farm inputs (seed, fertilizer, herbicide and pesticide). However, operated holding is not significantly related with the intensity of fertilizer use.

The number of family members up to grade six has a positive sign and is significant in Model I of fertilizer use intensity. On the other hand, the number of members above grade six has a positive sign and is significant in both models of fertilizer use probability, suggesting the contribution of education to improved input use. However, it is not significant in fertilizer use intensity models. Whereas the number of family members up to grade six can contribute to apply fertilizer both through more income (in case of off-farm employment) and the availability of labor to help in weeding after the application of fertilizer, the number of members above grade six can increase the probability of fertilizer use because better educated members are more aware and innovative. This finding is similar with that of Asfaw and Admasie (2004).

The number of oxen has a positive sign and is significant in Model I and II of fertilizer use intensity, suggesting the two inputs are complementary. The size of consumer-worker ratio, measuring the dependency ratio, is negative and significant in both of fertilizer use probability model, suggesting that this variable reduces the probability of fertilizer use through its pressure on food demand which competes with fertilizer purchase.

The distance to market (mktdist) is negatively and significantly related to fertilizer use probability, but is positive and insignificant in both models of fertilizer use intensity. This may suggest that distance discourages the probability of use of fertilizer. On the other hand, the dummy variable for both walking and use of public transport (walkpt4) is negative and significant in fertilizer use probability.

*Herbicide probability and intensity of use models*

We present the estimation results of the probability and use intensity of herbicide models in Table B5. The fixed effects in both use probability and use intensity models of herbicide were found to be significant. In addition, the RE probit estimates for the probability model were found to be unstable. The model for the herbicide use intensity was also heteroskedastic and we used the feasible generalized least squares (FGLS) RE model to get the estimates. The dependent variable for use intensity model is the log of the total cost of herbicide divided by operated holding. Accordingly the table

includes results from the population-averaged probit and pooled probit models (Model I and Model II) for the probability of herbicide use, and the RE feasible generalized least squares (FGLS) and pooled OLS estimates for the herbicide use intensity models (Model I and Model II). The pooled probit model results in herbicide use probability and the population-averaged probit results in input use intensity are for comparison purposes. Thus our discussions are based on the population-averaged probit and the FGLS RE estimation results for the probability and intensity of fertilizer use models, respectively.

The IMR included in the regressors is significant indicating that there would be selectivity bias if we did not control for it. The results in Table B5 also indicate that intercropping has a negative sign but significant only in model II of herbicide use probability. The size of operated land holding per consumer unit (olszocu) is positively and significantly related with the probability of herbicide use decision. This might be because of the need for larger labor for weeding.

Surprisingly the size of workforce per operated holding (wfolsz) is positive and significant in the probability of herbicide use (Model I) but it is positive and insignificant in Model II. However, workforce is negative and significant only in model I of herbicide use intensity. This might indicate that although households with larger workforce are able to afford herbicide, this fact does not affect its actual use because they can weed manually.

The distance of market locations from the household locations is negative and significant in both models of herbicide use probability. Another variable indicating the mode of transportation has positive sign and is significant in Model I of herbicide use intensity model but insignificant in the use probability model. The dummy variable for the use of public transport (publict2) has a positive sign and is significant in both models of herbicide use intensity. This is in line with our expectation. The ratio of male to female workforce (mfratio) has also a positive sign and is significant in Model I of input use intensity as we expected. We also estimated the probit three-stage (Zellner's SUR) for fertilizer and herbicide use intensity models assuming that the error terms across equations are correlated. However, we did not find any efficiency gain over the two-stage single equation estimation results. The SUR results are not reported here.

## 6. Summary and Conclusion

Farmers adopt different technologies and agricultural practices to cope with the changing socio-economic, demographic and environmental conditions. These agricultural practices and technologies are interdependent and studies aimed at the understanding of these practices and technologies should take into account their simultaneity.

Better understanding of how farmers make the adoption decisions is necessary for the subsequent policy designs to ensure sustainable agriculture. This information should assist agricultural researchers and policy makers to develop more relevant technologies and design appropriate policy and institutional intervention strategies to promote land conserving agricultural practices for improved and sustainable productivity. In this study we analyzed the determinants of the adoption of five interdependent simultaneous agricultural practices and input uses. These are: fallowing, intercropping, use of manure, use of fertilizer and use of herbicide.

The choice variables were modeled as a system of simultaneous equations. We also used endogenous dichotomous choice variables that appear in other structural equations as explanatory variables. We used the two-stage limited dependent variable estimation procedure to deal with the simultaneity and endogeneity problems.

According to the results of our analysis the decision to fallow depends negatively on the decision to use fertilizer, suggesting that the two decisions are substitutes. In addition, farmers with larger land holdings were found to be more likely to keep their land under fallow. Accordingly given the high population pressure in most areas of the Ethiopian highlands, fallowing is not a feasible option as a way of restoring soil fertility and increasing productivity.

Fallowing decision has proven to be a significant determinant of intercropping decision. The other decision variable affecting intercropping negatively is the use of fertilizer whereas the use of manure increases intercropping. Other variables, which affect the decision to intercrop, are number of family members above grade six, size of livestock, dependency ratio and size of workforce. The overall result suggests that intercropping could result from the need for different crops rather than the need to get

higher yields per unit of land because dependency ratio decreases the probability of intercropping. Thus, farmers may perceive that intercropping reduces the yield of the main crop per unit of land while it gives the benefit of producing different crops from the same unit of land.

The decision to intercrop affects the decision to use manure positively, suggesting the two decision variables are complementary. The probability of fertilizer use increases the probability to use manure. The number of family members above grade six, age of household head, irrigation, consumer-worker ratio and work force are other variables significantly affecting manure use.

The probability of use of fertilizer is affected by the decision to keep land under fallow, manure and intercropping. However, the intensity of use of fertilizer is not affected by any of the decision variables. Other variables affecting the probability of use of fertilizer are the size of total land holding per consumer unit, the number of members above grade six, age of household head, market distance and the mode of transportation, and consumer-worker ratio, while variables that affect the intensity of fertilizer use include education and number of oxen. One important point to note here is that the probability and the intensity of use of an input can be affected in different ways by the same variable confirming that the Heckman two-stage procedure is appropriate.

The size of operated holding and workforce affect the probability of herbicide use positively. Age of household head and market distance affect the probability of herbicide use negatively. On the other hand, mode of transportation, the use of public transportation and the male-female labor ratio affect fertilizer use intensity positively.

Worthy of note about the interdependence between the agricultural practices analyzed is the interdependence between manure and chemical fertilizer. Farmers use manure and chemical fertilizer in such a way that those who use manure are also likely to use chemical fertilizer. This suggests that there is a room for intensification given farmers can afford either input.

In conclusion, resource constraints and institutional factors are important determinants in the adoption of agricultural practices that are important contributors to sustainable agriculture. Given that land holdings are shrinking, the future agriculture

should heavily depend on improved agricultural practices. Therefore, increasing farmers' awareness on the importance and benefit of different agricultural practices such as intercropping to increase yield per hectare and the use of productivity enhancing inputs can ensure sustainable agricultural development. Policies aimed at sustainable agricultural productivity should focus on ways of enhancing intercropping, manure use and fertilizer use. Whereas the use of manure and the practice of intercropping are positively related, intercropping and fertilizer seem to be substitutes. Increasing farmers' awareness on how to mix intercropping and fertilizer optimally can enhance intensification. Improving the provision of credit can also encourage farmers to use fertilizer and herbicide. Given improved extension and institutional services, there is a possibility of increasing productivity. The positive relationship between fertilizer and manure use provides a good opportunity for farmers to mix these inputs in an optimal way to increase productivity.

## References


Ali, M. (1996). *Quantifying the socio-economic determinants of sustainable crop production: an application to wheat cultivation in the Tarai of Nepal*. Agricultural Economics 14, 45-60.

Asfaw, A. and Admassie, A. (2004). *The role of education on the adoption of chemical fertilizer under different socio-economic environments in Ethiopia*. Agricultural economics 30, 215-228.

Aune, J. B., and R. Øygard. (1998a). *Guidelines for Integrated Plant Nutrient Management (IPNM) in smallholder farming systems*, Noragric brief no. 98/3. Ås: Noragric.

Baidu-Forson, J. (1999). *Factors influencing adoption of land-enhancing technology in the Sahel: lessons from a case study in Niger*. Agricultural Economics 20, 231-239.

Baltagi, B. H. (1995). *Econometric Analysis of Panel Data*, John Wiley & Sons.

Brown, S. and Shrestha, B., 2000. *Market-driven land-use dynamics in the middle mountains of Nepal.* Journal of Environmental Management 59, 217-225.

Charlton, C. A. (1987). *Problems and prospects for sustainable agricultural systems in the humid tropics.* Applied Geography 7, 153-174.

de Janvry, A., Fafchamps, M. And Sadoulet, E. (1991). Peasant household behaviour with missing markets: Some paradoxes explained. The Economic Journal, 101, 1400-1417

Feather, P. M., Amacher, G.S. (1994). *Role of information in the adoption of best management practices for water quality improvement*. Agricultural Economics 11, 159-170.

Feder, G., L. J. Lau, J. Y. Lin, and X. Luo. (1990). *The Relationship between Credit and Productivity in Chinese Agriculture: A Micro-economic Model of Disequilibrium*. American Journal of Agricultural Economics 72: 1151-57.

Fernandez-Cornejo, J. (1998). *Environmental and economic consequences of technology adoption: IPM in viticulture.* Agricultural Economics 18, 145-155.

Greene, W. (2000). *Econometric Analysis*, Fourth Edition, Prentice-Hall**.**

Grisley, W. and Mwesingwa, D. (1994). *Socio-Economic Determinants of Seasonal Cropland Fallowing Decisions: Smallholders in South-western Uganda*. Journal of Environmental Management 42, 81-89.

Hassan, Rashid M. (1996). *Planting strategies of maize farmers in Kenya: a simultaneous equation analysis in the presence of discrete dependent variables*. Agricultural Economics, 15:137-149.

Heckman, J. (1979). *Sample bias as a specification error*. Econometrica 47(1), 153-161.

Heltberg, R. (1998). Rural market imperfections and the farm size-productivity relationships: Evidence from Pakistan. World Development 26 (10**),** 180 1826.

Herath, P. H. M. U. and Takeya, H. (2003). *Factors determining intercropping by rubber smallholders in Sri Lanka: logit analysis*. Agricultural Economics 29, 159-168.

Hoffmann, I., Gerling, D., Kyiogwom, U.B. and Mane-Bielfeldt, A. (2001). *Farmers' management strategies to maintain soil fertility in a remote area in northwest Nigeria. Agriculture*, Ecosystems and Environment 86, 263-275.

Holden, S. and Yohannes, H. (2002). *Land Redistribution, Tenure Insecurity, and Intensity of Production: A Study of Farm Households in Southern Ethiopia*. Land Economics 78 (4), 573-590.

Hsiao, H. (1986). *Analysis of Panel Data*. Cambridge University Press, Cambridge.

Lee, L., and Maddala, G. and Trost, R. (1980). *Asymptotic covariance matrices of two-stage probit and two-stage tobit methods for simultaneous equations models with selectivity.* Econometrica 48, 491-501.

Krautkraemer, J. A. (1994). *Population growth, soil fertility, and agricultural intensification*. Journal of Development Economics 44, 403-428.

Lynne, G. D., Shonkwiler, J.S. and Rola, L.R. (1988). *Attitudes and farmer conservation behaviour.* American journal of Agricultural Economics 70, 12-19.

Maddala G. S. (1987). *Limited dependent variable models using panel data*, *Journal of Human Resources* 22, 307-338.

_____. (1983). *Limited Dependent and Quantitative Variables in Econometrics*. Cambridge University Press, Cambridge, UK.

Nelson, F. D. and Olson, L. (1978). *Specification and estimation of simultaneous equation model with limited dependent variables.* Int. Econ. Rev. 19, 695-710.

Nelson, R. A. and Cramb, R. A. (1998). *Economic incentives for farmers in the Philippine uplands to adopt hedgerow intercropping*. Journal of Environmental Management 54, 83-100

Norman, D. W. (1974). *Rationalizing Mixed cropping under Indigenous Conditions:The Example of Northern Nigeria*. The Journal of Development Studies 11, 3-21.

Omamo, S. W., Williams, J.C., Obare, G.A, Ndiwa, N:N. (2002). Soil fertility management on small farms in Africa: Evidence from Nakuru District, Kenya. Food Policy 27, 159-170

Omit, J. M., Parton, K.A., Sinden, J.A. and Ehui, S.K. ( 1999). *Monitoring changes in land-use practices following agararian decollectivization in Ethiopia*. Agriculture, Ecosystems and Environment 72, 111-118.

Rahm, M. and Huffmann, W. (1984). *The adoption of reduced tillage: The role of human capital and other variables.* American Journal of Agricultural Economics 66, 405-413.

Sadoulet, E. and de Janvry, A. (1995). *Quantitative Development Policy Analysis*. The Maddala, G.S. (1983). Johns Hopkins University Press, Baltimore, MD.

Singh, I., Squire, L., and Strauss, J. (1986). Agricultural household models: extensions, applications and policy. Johns Hopkins University Press, Baltimore, M. D.

Taylor, J. E., and Adelman, I., (2003). Agricultural household models: Genesis, evolution, and extension. Review of Economics of the Household, 1, 33-58.

Wezel, A., and Rath, T. (2002). *Resource conservation strategies in agroeco-systems semi-arid West Africa*. Journal of Arid Environments, 51, 383-400.

Wooldridge J. M. (2002). *Econometric Analysis of Cross section and Panel Data*, Massachusetts Institute of technology.

Zeller, M., Diagne, A., andMataya, C. (1998). *Market access by smallholder farmers in Malawi: implications for technology adoption, agricultural productivity and crop income.* Agricultural Economics 19, 219-229.

**Appendix A1: Definition of and summary of variables and description of study sites**

| Table A1 Definition and summary of variables Variable name | Description | mean | Std dev | Expected sign | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Fallowing | Inter-cropping | Manure | Fertilizer use probability | Fertilizer use intensity | Herbicide Use Probability | Herbicide Use Intensity |
| **a. Endogenous exp. Var.** | | | | | | | | | | |
| Fallow | 1=practices fallow, 0=otherwise | .08 | .268 | | + | ? | ? | ? | - | - |
| inter | 1=practices intercropping, 0=otherwise | .29 | .455 | + | | ? | ? | ? | ? | ? |
| man | 1=uses manure as fertilizer, 0=otherwise | .55 | .498 | ? | ? | | ? | ? | + | + |
| fertyn | 1=applies fertilizer, 0=otherwise | .71 | .452 | ? | ? | ? | | | + | + |
| fertamop | Amount of fertilizer applied per Operated land holding | 32.46 | 51.007 | ? | ? | ? | | | + | + |
| herbiyn | 1=uses herbicide, 0=otherwise | .44 | .497 | - | ? | + | + | + | | |
| herbiamop | Amount of herbicide applied per Operated land holding | 1.83 | 3.177 | - | ? | + | + | + | | |
| **b. Exogenous exp. Var.** | | | | | | | | | | |
| tlszocu | Total land holding per consumer unit | 1.28 | 1.190 | + | | ? | ? | | | |
| olszocu | Operated land holding per consumer unit | 1.16 | 1.045 | | - | ? | ? | ? | ? | ? |
| sex | 1=male, 0=female | .95 | .222 | | | | | ? | ? | ? |
| age | Age of household head in years | 44.56 | 13.824 | ? | ? | ? | ? | ? | ? | ? |
| edu | Number of household members with education up to grade six | .57 | 1.035 | ? | | ? | | ? | ? | ? |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Eduto6 | Number of household members with education above grade six | 2.21 | 1.964 | ? | ? | ? | ? | ? | ? | ? |
| wftlsz | Total workforce per total land holding | 1.13 | 1.154 | - | | | | | | |
| wfolsz | Number of worker unit per operated holding | 4.17 | 2.003 | - | - | ? | | + | - | - |
| mfratio | Ratio of male labour to female labor | 1.89 | 1.268 | | | | - | - | + | + |
| irrg | 1=has irrigated land, 0=otherwise | .09 | .295 | + | | - | - | - | | |
| rrl | Ratio of rented in to total operated holding | .06 | .135 | ? | ? | ? | ? | ? | ? | ? |
| cwr | Ratio of consumer unit to worker unit | 1.65 | .310 | - | + | ? | ? | ? | | |
| tlutlsz | Total Livestock unit per total land holding | .95 | .903 | + | | | | | | |
| tluolsz | Total Livestock unit per operated land holding | .10 | .910 | | ? | + | + | + | + | + |
| oxotlsz | Number of oxen per total land holding | .181 | .21 | - | | | | | | |
| oxolsz | | .20 | .223 | - | | | ? | ? | | |
| Walkt1 | 1=if household only walks to market, 0 otherwise-reference transport | .714 | 0.452 | | | | | | | |
| Publict2 | 1=if household uses public transport to the market, 0 otherwise | 0.096 | 0..29 | | - | - | + | + | + | + |
| Cartt3 | 1=if household uses cart, 0 otherwise | 0.026 | 0.159 | | - | | | | | |
| mktdist | Distance of household from market | 66.01 | 80.736 | | + | | + | - | - | |
| Walkpt4 | 1=both walking and using public transportation to market, 0=otherwise | .16 | .370 | | - | - | + | + | + | + |
| grazland | 1=if household has grazing land, 0 otherwise | 0.71 | 0.454 | - | | | | | | |
| Fuel2d | 1=if household does not use manure as fuel and 0 otherwise-reference use | 0.53 | 0.499 | | | | | | | |
| Fuel2d1 | 1=if household uses some of manure as fuel and 0 otherwise. | 0.47 | 0.499 | | | - | | | | |
| Fuel2d2 | 1=if household uses much of manure as fuel and 0 otherwise. | | | | | - | | | | |
| lvarname | Variable transformed to logarithm | | | | | | | | | |

**Table A2: Description of the study sites**

| Group | Site name | description |
|---|---|---|
| A | 1.Damot Waja-Kero<br>2. Abota Olto<br>3. Amburse | Very densely populated, enset[a]-maize-root crop production zone with poor market access, not much cash production |
| B | 4. Chefasine<br>5. Chuko<br>6. Dobi Gogot | Densely populated, enset-maize-beans producing areas with chat[b] and coffee produced as important cash crops |
| C | 7. Elka<br>8. Woyo Gebriel | Dry, less densely populated, maize-haricot beans producing areas with many livestock production. No major cash crop production available |
| D | 9. Beche<br>10. Gedeba | Relatively dry, maize producing areas (with some teff[c]) with many livestock. Chili pepper produced as major cash crop |
| E | 11. Woyo Medhane-alem<br>12. kersa ilala | Grain (wheat, barley, maize) producing areas with a good amount of livestock. Some amount of onions and potatoes produced as cash crops |
| F | 13.Deka Bora<br>14. Koka neghewo<br>15. Hidi | High potential grain (teff wheat, barley, pulses) producing areas with fairly large livestock production and relatively good market access |

[a] Enset (Enset ventricosum) is a tall banana-like fibrous perennial plant cultivated in southern Ethiopia whose pseudo stem and tuber processed for food.
[b] Chat (catha edulis) is a perennial shrub whose leaves are chewed as a stimulant. It is an important cash crop for some farmers in many parts of Ethiopia now.
[c] Teff (Eragrostis teff) is an annual grass-like food crop, with tiny grains, produced in the Ethiopian highlands as a major food crop.
Source: Holden and Yohannes (2002)

**Table A3: Site level information on soil fertility management practices and input use**

| Village Name (number) | Fall-owing (%) | Inter-Cropping (%) | Manure (%) | Fertilizer Use (%) | Herbicide Use | Average Total land holding (Timad) | Average Operated Land holding | Average Oxen ownership (number) | average TLU | Average Fertilizer Use (Birr per timad) | Average Herbicide Use (birr per timad) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 | 61.8 | 88.2 | 79.4 | 0 | 0.40 | 0.3 | 0.5 | 2.8 | 15.9 | 0 |
| 2 | 18.75 | 0 | 18.7 | 9.4 | 37.5 | 2.1 | 1.9 | 1.7 | 7.3 | 3.5 | 0.5 |
| 3 | 9 | 0 | 0 | 100 | 96.9 | 1.1 | 1.0 | 1.1 | 4.5 | 42.1 | 4.5 |
| 4 | 3.3 | 3.3 | 16.66 | 100 | 93.3 | 1.0 | 1.0 | 1.1 | 4.9 | 38.6 | 5.0 |
| 5 | 0 | 85.3 | 88.23 | 38.2 | 2.9 | 0.3 | 0.3 | 0.1 | 3.9 | 8.6 | 0.04 |
| 6 | 5.7 | 77.1 | 88.97 | 48.6 | 11.4 | 0.5 | 0.4 | 0.3 | 5.1 | 6.3 | 1.1 |
| 7 | 3 | 3.0 | 18.2 | 18.2 | 6.1 | 0.6 | 0.5 | 0.4 | 2.4 | 11.8 | 0.3 |
| 8 | 12.1 | 3.0 | 3 | 84.8 | 27.2 | 3.4 | 2.8 | 2.1 | 6.7 | 48.4 | 0.4 |
| 9 | 2.8 | 0 | 97.1 | 97.1 | 62.8 | 1.8 | 1.7 | 2.7 | 4.7 | 110.5 | 2.1 |
| 10 | 20.6 | 0 | 0 | 70.6 | 94.1 | 2.8 | 2.6 | 3.0 | 5.2 | 11.8 | 2.6 |
| 11 | 10.7 | 67.8 | 100 | 60.7 | 64.3 | 0.8 | 0.6 | 1.0 | 4.2 | 10.9 | 6.0 |
| 12 | 0 | 73.5 | 100 | 79.4 | 23.5 | 0.7 | 0.6 | 0.9 | 4.6 | 20.3 | 1.2 |
| 13 | 0 | 14.3 | 97.1 | 80 | 0 | 0.3 | 0.3 | 0.6 | 2.7 | 20.7 | 0 |
| 14 | 17.1 | 48.6 | 94.3 | 100 | 88.6 | 1.5 | 1.4 | 1.5 | 5.6 | 24.2 | 2.1 |
| 15 | 0 | 0 | 2.8 | 100 | 62.8 | 7.9? | 1.6 | 3.0 | 6.4 | 105.3 | 2.6 |
| total | 8 | 29 | 55 | 71.4 | 44.2 | 1.3 | 1.2 | 1.3 | 4.7 | 32.4 | 1.8 |

## Appendix B Results of empirical econometric estimation

**Table B1: Results of probit model for fallowing**

| Variable name | Description of variable | Population-averaged probit model (Model I) | Pooled probit model (Model II)[b] |
|---|---|---|---|
| | | Coefficient[a] (Standard error) | Coefficient[a] (Standard error) |
| inter | 1=practices intercropping, 0=otherwise | .4759<br>(.3650) | .3583<br>(.2871) |
| man | 1=uses manure as fertilizer, 0=otherwise | -.4758<br>(.4049) | -.3869<br>(.4029) |
| fertyn | 1=applies fertilizer, 0=otherwise | -.4343**<br>(.2108) | -.5267***<br>(.1221) |
| herbiyn | 1=uses herbicide, 0=otherwise | .5555**<br>(.2743) | .4640<br>(.2997) |
| lntlszocu | Logarithm of total land holding per consumer unit | .5005*<br>(.2718) | .5565<br>(.2968)* |
| lnage | Logarithm of Age of household head in years | -.3362<br>(.2886) | |
| edu | Number of household members with education up to grade six | -.1296<br>(.1066) | |
| eduto6 | Number of household members with education above grade six | .0839<br>(.0626) | .1115<br>(.0838) |
| lntlutlsz | Logarithm of total livestock unit per total land holding | .0884<br>(.3290) | .0617<br>(.3363) |

| | | | |
|---|---|---|---|
| cwr | Ratio of consumer unit to worker unit | -.1165<br>(.3651) | -.0564<br>(.4349) |
| irrg | 1=has irrigated land, 0=otherwise | -.3454<br>(.6488) | -.4428<br>(.2885) |
| lnoxotlsz | Logarithm of number of oxen per total land holding | .3103<br>(.2354) | .3686<br>(.3133) |
| lnwftlsz | Logarithm of total workforce per total land holding | .2397<br>(.2551) | .0501<br>(.3262) |
| rrl | Ratio of rented in to total operated holding | -2.4326<br>(6.4369) | -.6821<br>(.4354) |
| grazland | 1=if household has grazing land, 0 otherwise | -.7115*<br>(.3678) | -2.1548<br>(1.6756) |
| cons | Constant | 1.3535<br>(1.2141) | .1086<br>(.8966) |
| N | Number of observations | 493 | 493 |
| LP | Log pseudo-likelihood | - | -117.9339 |
| Pseudo $R^2$ | Pseudo $R^2$ | - | 0.1351 |
| Wald $chi^2$ (#) | Wald $chi^2$ (#) | Wald $Chi^2$ (15)=30.01 | Wald $Chi^2$ (13)=464.42 |
| Pvalue | Prob.>$Chi^2$ | 0.0119 | 0.0000 |

[a] Numbers in parentheses are bootstrap and cluster-adjusted standard errors

[b] Preferred model

*, **, and *** denote a 10%, 5%, and 1% significance level based on Z-statistics

**Table B.2: Results of probit model for intercropping decision**

| Variable name₸ | Description of variable | Population-Averaged probit (model I) | Pooled Probit (Model II)[b] |
|---|---|---|---|
| | | Coefficient[a] (Standard error) | Coefficient[a] (Standard error) |
| Fallow | 1=practices fallow, 0=otherwise | .0539<br>(.1806) | -.6712*<br>(.3616) |
| Man | 1=uses manure as fertilizer, 0=otherwise | -.0370<br>(.1627) | .6406*<br>(.3827) |
| Fertyn | 1=applies fertilizer, 0=otherwise | .0385<br>(.0915) | -.4240*<br>(.2373) |
| Herbiyn | 1=uses herbicide, 0=otherwise | -.1186<br>(.2499) | .1947<br>(.4927) |
| Lnolszocu | Logarithm of operated land holding per consumer unit | .1310<br>(.1038) | .1243<br>(.3543) |
| 1nlage | Logarithm of age of household head in years | -.0014<br>(.2455) | -.4182<br>(.3431) |
| eduto6 | Number of household members with education above grade six | .0344<br>(.0542) | .2122*<br>(.1109) |
| Cwr | Ratio of consumer unit to worker unit | -.0653<br>(.2555) | -.8449*<br>(.4563) |

| | | | |
|---|---|---|---|
| Lnwfolsz | Logarithm of number of worker unit per operated holding | -.1075<br>(.1463) | -.6332***<br>(.1932) |
| Lntluolsz | Logarithm of total Livestock unit per operated land holding | .2113*<br>(.1144) | .4053**<br>(.1610) |
| Mktdist | Distance of household from market in hours | -.0023<br>(.0027) | -.0041<br>(.0029) |
| walkpt4 | 1=both walking and using public transportation to market, 0=otherwise | -.1000<br>(.3559) | -.8826<br>(.6232) |
| Rrl | Ratio of rented in to total operated holding | 1.1126**<br>(.5027) | .657<br>(.9658) |
| Cons | Constant | -.2487<br>(1.2361) | 2.0742<br>(1.6666) |
| N | Number of observations | 480 | 480 |
| L | Log pseudo-likelihood | | -196.9931 |
| Pseudo $R^2$ | Pseudo $R^2$ | | 0.3159 |
| Wald $chi^2$ (13) | Wald $chi^2$ (13) | 415.38 | 1067.38 |
| Pvalue | Prob.>$Chi^2$ | 0.0000 | 0.0000 |

[a] Numbers in parentheses are bootstrap and cluster-adjusted standard errors
[b] Preferred model
*, **, and *** denote a 10%, 5%, and 1% significance based on Z-statistic
Ŧ some insignificant variables like edu were omitted from the pooled probit model because of the degrees of freedom requirement in the exclusion test

**Table B.3: Results of probit model for use of manure**

| Variable name | Description of variables | Population-Averaged Probit (Model I)[b] | Pooled probit (Model II) |
|---|---|---|---|
| | | Coefficient[a] (Standard error) | Coefficient[a] (Standard error) |
| Fallow | 1=practices fallow, 0=otherwise | .0971<br>(.0757) | -.2627<br>(.6514) |
| Inter | 1=practices intercropping, 0=otherwise | .3985***<br>(.1536) | .7011<br>(.6061) |
| Fertyn | 1=applies fertilizer, 0=otherwise | .1296*<br>(.0673) | .1670<br>(.2951) |
| Herbiyn | 1=uses herbicide, 0=otherwise | .0769<br>(.1078) | .0676<br>(.4666) |
| Lnolszocu | Logarithm of operated land holding per consumer unit | .1468<br>(.1058) | |
| Lnage | Logarithm of age of household head in years | .3663***<br>(.0987) | .1086<br>(.5039) |
| Edu | Number of household members with education up to grade six | -.0041<br>(.0380) | -.1610<br>(.1430) |
| eduto6 | Number of household members with education above grade six | -.0621**<br>(.0292) | -.0476<br>(.1205) |
| Irrg | 1=has irrigated land, 0=otherwise | .3351***<br>(.1151 | .0110<br>(.3905) |
| Cwr | Ratio of consumer unit to worker unit | .4912***<br>(.1764) | .3679<br>(.5534) |
| Lnwfolsz | Logarithm of number of worker unit per operated holding | .2773* | .2699 |

| | | | |
|---|---|---|---|
| | | (.1552) | (.3168) |
| Lntluolsz | Logarithm of total Livestock unit per operated land holding | -.0576<br>(.0746) | .2654<br>(.1847) |
| walkpt4 | 1=both walking and using public transportation to market, 0=otherwise | .1781<br>(.1264) | |
| publict2 | 1=if household uses public transport to the market, 0 otherwise | .1013<br>(.1722) | |
| fuel2d1 | 1=if household uses some of manure as fuel and 0 otherwise. | -.2167<br>(.2236 | |
| fuel2d2 | 1=if household uses much of manure as fuel and 0 otherwise. | -.0621<br>(.1488) | .0628<br>(.4593) |
| Rrl | Ratio of rented in to total operated holding | -.6561*<br>(.3507) | -.8955<br>(1.4012) |
| Cons | Constant | -1.7882***<br>(.6379) | **-.9354**<br>(**1.9363**) |
| N | Number of observations | 480 | 480 |
| L | Log pseudo-likelihood | - | -256.88584 |
| Pseudo $R^2$ | Pseudo $R^2$ | - | 0.2223 |
| Wald $chi^2$(#) | Wald $chi^2$(#) | $chi^2$(17)=29.90 | Wald $chi^2$(13)=1860.21 |
| Pvalue | Prob.>Chi2 | 0.0271 | 0.0000 |

[a] Numbers in parentheses are bootstrap and cluster-adjusted standard errors
[b] Preferred model
*, **, and *** denote a 10%, 5%, and 1% significance based on Z-statistics

**Table B.4: Results of estimation of probability and intensity of use of fertilizer**

| Variable name | Description of variables | Fertilizer use Probability model ǂ | | Fertilizer Use intensity model± | |
|---|---|---|---|---|---|
| | | Population-Averaged Probit (Model I) [b] Coefficient[a] (Standard error) | Pooled probit (Model II) Coefficient[a] (Standard error) | Fixed Effect (FE) Model (Model I) [b] Coefficient[a] (Standard error) | Pooled OLS (Model II) Coefficient[a] (Standard error) |
| fallow | 1=practices fallow, 0=otherwise | -1.0134*** (.3629) | -1.4614*** (.2249) | .1765 (.2901) | -.2583 (.2601) |
| inter | 1=practices intercropping, 0=otherwise | -.8984*** (.2534) | -1.1309*** (.2702) | .0672 (.3367) | -.1742 (.1889) |
| man | 1=uses manure as fertilizer, 0=otherwise | .9796** (.3862) | 1.4085*** (.5038) | -.2443 (.4992) | .0565 (.2181) |
| Imr12 | Inverse Mill's ratio | | | -.5204 (.9812) | -.1706 (.4429) |
| herbiyn | 1=uses herbicide, 0=otherwise | .1074 (.478) | .3656 (.3524) | | |
| lnherbiamop | Logarithm of amount of herbicide applied per operated land holding | | | .0554 (.0546) | .0082 (.0636) |
| lnolszocu | Logarithm of operated land holding per consumer unit | .7666*** (.2819) | .7487* (.3952) | -.3960 (.3393) | .3647 (.2825) |
| lnage | Logarithm of age of household head in years | -.6622*** (.2483) | -1.1713*** (.2443) | .0745 (.2058) | |

| | | | | | |
|---|---|---|---|---|---|
| edu | Number of household members with education up to grade six | | | .1386** | |
| | | | | (.0696) | |
| eduto6 | Number of household members with education above grade six | .1750** | .3165*** | -.0209 | .0078 |
| | | (.0876) | (.0728) | (.0599) | (.0717) |
| irrg | 1=has irrigated land, 0=otherwise | -.0981 | | .3117 | |
| | | (.6585) | | (.1935) | |
| lnoxolsz | Logarithm of number of oxen per operated holding | -.0292 | .2591 | .2742* | .4834** |
| | | (.2133) | (.2667) | (.1557) | (.2456) |
| cwr | Ratio of consumer unit to worker unit | -.5319* | -1.1850*** | .3043 | |
| | | (.3213) | (.3510) | (.3326) | |
| lnwfolsz | Logarithm of number of worker unit per operated holding | | | -.2016 | .0530 |
| | | | | (.2489) | (.2264) |
| lntluolsz | Logarithm of total Livestock unit per operated land holding | -.1263 | -.2647 | -.0455 | -.1366 |
| | | (.1455) | (.1663) | (.1588) | (.1916) |
| sex | Sex of household head: 1=male, 0=female | | | .3920 | |
| | | | | (.2852) | |
| mktdist | Distance of household from market in hours | -.0064* | -.0081*** | .0009 | .0021 |
| | | (.0023) | (.0026) | (.0023) | (.0022) |
| publict2 | 1=if household uses public transport to the market, 0 otherwise | -.2165 | | .0145 | |
| | | (.4969) | | (.3339) | |
| walkpt4 | 1=both walking and using public transportation to market, 0=otherwise | -1.2536* | -1.0165 | .1462 | .4002 |
| | | (.7038) | (.6874) | (.3913) | (.3262) |

| | | | | | |
|---|---|---|---|---|---|
| rrl | Ratio of rented in to total operated holding | -.7005<br>(.8531) | -.9872<br>(1.1118) | -.2249<br>(.6863) | -.8747<br>(.5336) |
| mfratio | Ratio of male labour to female labor | .0421<br>(.0770) | | .0049<br>(.0491) | |
| cons | Constant | 2.0561<br>(1.297) | 4.0076***<br>(1.2097) | 2.7931***<br>(.9185) | 2.9361***<br>(.5252) |
| N | Number of observations | 480 | 480 | 337 | 337 |
| L | Log pseudo-likelihood | - | -223.26318 | | |
| Pseudo $R^2$ | Pseudo $R^2$ | - | 0.2197 | Adj. $R^2$=0.5074 | $R^2$=0.3676 |
| Wald chi2 (#) | Wald chi2 test statistic | Wald chi2 (16)=38.27 | Wald chi2 (13)<br>=1732.15 | | |
| Pvalue | Prob.>$Chi^2$ | 0.0014 | 0.0000 | | |
| F (#,#) | F-statistic | | | F(20,302)=2.17 | F<br>(13,14)=1777.72 |
| Pvalue | Prob.>F | | | Prob.>F=0.0030 | Prob.>F=0.0000 |
| LR | Likelihood ratio test for heteroskedasticity. H: Constant variance | | | LR Chi2 (14)=81.34<br>Prob.>Chi2=0.000 | |

[a] Numbers in parentheses are bootstrapped and cluster-adjusted standard errors; [b]Preferred model; *, **, and *** denote a 10%, 5%, and 1% significance. [†] Significance test is based on Z-statistic. [±] Significance test is based on t-statistic

**Table B.5: Results of estimation of probability and intensity of use of herbicide**

| Variable name | Description of variables | Herbicide use Probability model | | Herbicide Use intensity model | |
|---|---|---|---|---|---|
| | | Population-Averaged RE probit (Model I) [b] Coefficienta, ∓ (Standard error) | Pooled Probit (Modell II) Coefficient[c, ∓] (Standard error) | Random effect FGLS (Model I)[b] Coefficient[c, ∓] (Standard error) | Pooled OLS (Model II) Coefficient[a, ±] (Standard error) |
| inter | 1=practices intercropping, 0=otherwise | -.2669<br>(.2753) | -.6387*<br>(.3597) | -.0501<br>(.2304) | -.1547<br>(.2646) |
| fertyn | 1=applies fertilizer, 0=otherwise | -.2060<br>(.1399) | -.2176<br>(.2959) | | |
| lnferamop | Logarithm of amount of fertilizer applied per Operated land holding | | | -.0050<br>(.0034) | -.0019<br>(.0055) |
| lmr2 | Inverse Mill's Ratio | | | 1.5500**<br>(.7856) | .8948**<br>(.3927) |
| fallow | 1=practices fallow, 0=otherwise | -.0685<br>(.3010) | -.1358<br>(.5366) | -.0589<br>(.2356) | -.1229<br>(.2766) |
| man | 1=uses manure as fertilizer, 0=otherwise | .3448<br>(.2789) | .4386<br>(.5308) | .3699<br>(.3349) | .2593<br>(.2353) |
| lnolszocu | Logarithm of operated land holding per consumer unit | .7966***<br>(.2136) | .9021*<br>(.4749) | .3533<br>(.3708) | |
| lnage | Logarithm of age of household head in years | -.2968*<br>(.1719) | -.2715<br>(.3289) | -.0821<br>(.2225) | .0939<br>(.2418) |
| edu | Number of household members with education up to grade six | .0041<br>(.0358) | | .0935<br>(.0814) | .1079<br>(.0836) |
| eduto6 | Number of household members with education above grade six | .0249<br>(.0653) | .1115<br>(.1030) | .0189<br>(.0479) | .0903<br>(.0555) |
| cwr | Ratio of consumer unit to worker unit | | | | |
| sex | Sex of household head: 1=male, 0=female | -.2129<br>(.3328) | -.0124<br>(.5057) | -.2222<br>(.2202) | .0330<br>(.1893) |

| | | | | | |
|---|---|---|---|---|---|
| lntluolsz | Logarithm of total Livestock unit per operated land holding | .1463<br>(.1231) | .1544<br>(.2042) | .1993<br>(.1799) | .1327<br>(.1367) |
| lnwfolsz | Logarithm of number of worker unit per operated holding | .4136**<br>(.2028) | .3368<br>(.3017) | -.1883<br>(.3143) | -.5190**<br>(.2202) |
| mktdist | Distance of household from market in hours | -.0028*<br>(.0015) | -.0034<br>(.0034) | | |
| walkpt4 | 1=both walking and using public transportation to market, 0=otherwise | .1509<br>(.2873) | | .6470*<br>(.3354) | .4145<br>(.2826) |
| rrl | Ratio of rented in to total operated holding | .4094<br>(.5033) | 1.3106<br>(1.3143) | -.1593<br>(.8163) | .3152<br>(.9105) |
| publict2 | 1=if household uses public transport to the market, 0 otherwise | .3168<br>(.2937) | | .9016**<br>(.4190) | .6222**<br>(.2622) |
| mfratio | Ratio of male labour to female labor | .0185<br>(.0596) | -.0364<br>(.1237) | .1217**<br>(.0555) | .0759<br>(.0613) |
| cons | Constant | .5001<br>(.8760) | -.0950<br>(1.2385) | .2452<br>(.7461) | .0319<br>(.7856) |
| N | Number of observations | 480 | 480 | 217 | 217 |
| L | Loglikelihood | - | Log pseudo likelihood=-253.8951 | -171.3025 | |
| Pseudo $R^2$ | Pseudo $R^2$ | - | 0.2318 | - | Adj. $R^2$=0.3121 |
| Wald $chi^2$(#) | Wald $chi^2$ test statistic | Wald $chi^2$(16)=34.08 | 171.08 | Wald $chi^2$(16)=115.66 | - |
| Pvalue | Prob.>$Chi^2$ | 0.0053 | 0.000 | 0.0000 | - |
| F | F test statistic(F(13,14)) | - | - | - | F(15,20)=7.53 |
| Pvalue | Prob.>F | - | - | - | 0.0000 |
| LR | Likelihood ratio test for heteroskedasticity | - | - | LR $Chi^2$ (12)=36.78<br>P>$chi^2$=0.0002 | - |

[a] Numbers in parentheses are bootstrap and cluster-adjusted standard errors; [c] Numbers in parenthesis are bootstrap standard errors; [b] Preferred model;
*, **, and *** denote a 10%, 5%, and 1% significance. ‡ Significance test is based on Z-statistic. ± Significance test is based on t-statistic

# MARKET IMPERFECTIONS AND FARM TECHNOLOGY ADOPTION DECISIONS: CASE STUDY FROM THE HIGHLANDS OF ETHIOPIA[1]

Mahmud Yesuf[2]

*Abstract*

*In this paper, we investigate the impacts of market and institutional imperfections on technology adoption in a model that considers decisions of fertilizer and soil conservation adoption as joint decisions. Controlling for plot characteristics and other factors, we found that a household's decision to adopt fertilizer does significantly and negatively depend on whether the same household adopts soil conservation. The reverse causality, however, is insignificant. We also find outcomes of market imperfections such as limited access to credit, plot size, risk considerations, and rates of time preference as significant factors explaining variations in farm technology adoption decisions. Relieving the existing market imperfections will more likely increase the adoption rate of farm technologies.*

**Key Words**: Bivariate probit, fertilizer adoption, market imperfections, risk aversion, time preferences, soil conservation

[1] The author thanks Fredrik Carlsson, Gunnar Köhlin, and Lennart Flood for their valuable comments.
[2] Department of Economics, Göteborg University

## 1. Introduction

Sustainable agricultural development is widely acknowledged as a critical component in a strategy to combat both poverty and environmental degradation. In many countries, degradation of agricultural land continues to pose a serious threat to future production potential and current livelihood of the peasant households (Scherr et al., 1996; IFPRI, 1999). Ethiopia is one of the poorest countries on earth and the country is heavily dependent on peasant agriculture and is affected by extensive degradation of agricultural lands. The problem of degradation of agricultural land is most notable in the highlands where human and livestock pressure is the highest. According to a study by the World Bank, the rate of annual on-site soil losses from soil degradation is estimated to be about 5% of the agricultural GDP (Bojö and Cassells, 1995). In the last two decades, per capita food production has been lagging behind the rates of population growth, and food shortage and rural poverty have become chronic problems in the country. The challenge that Ethiopia is currently facing is to meet food security using dissemination of yield-enhancing technology, and at the same time to slow or reverse the trend in agricultural land degradation to maintain sustainability of future agricultural production. Recognizing the seriousness of the soil fertility problems in Ethiopia and the necessity of improving agricultural productivity and food security, there have been large efforts by the Ethiopian government and donors to promote yield enhancing and soil conserving technologies. Past efforts and programs to intensify agricultural production through dissemination of fertilizers, improved seeds, and adoption of soil conservation structures have in most cases failed; the adoption and dissemination rates are low even by African standards. The average technology adoption rate of modern fertilizers, for example, is estimated to be less than 33% of the cultivated lands and the average level of use of modern fertilizer is only 11 kg per hectare, compared to 48 kg per hectare in Kenya, and 97 kg per hectare worldwide (Mulat et al., 1997; FAO, 1998). The figures are even much lower for soil conservation adoption.

Many factors contribute to the failure of past efforts and programs. Among others, first, these programs were conducted based on superficially perceived causes of land degradation and deterioration of soil productivity. In these programs, the factors often blamed for causing this apparently excessive deterioration of soil productivity were physical processes like over-cultivation, over-grazing, over-population, deforestation, climatic factors, etc. (Bojö and Cassells, 1995). However, there is a growing

consensus in recent literature that these factors tend to be physical manifestations of underlying market and institutional failures (Bojö and Cassells, 1995). Second, many of the programs failed because they did not integrate the efforts to disseminate yield-enhancing inputs (such as fertilizers) with efforts on soil and water conservation. Many of these efforts were conducted by separate programs with different objectives, resulting in poor coordination of efforts (Hurni, 1993). This is unfortunate, since the complementarities between soil and water conserving and yield enhancing technologies can be substantial. For example, the returns to soil conservation would be much higher if farmers adopt fertilizers as well and *vice versa* since the structures could help conserving soil moisture and reduce losses of other inputs through runoff.

In many of the previous studies on soil conservation and fertilizer adoption decisions, several factors that reflect personal, physical, economic, and institutional elements were identified on an ad-hoc basis, and analyzed separately in a single equation model. From an econometric point of view, a single equation estimation approach could cause bias, inconsistency, and inefficiency in parameter estimates if simultaneity in decision is detected and/or unobserved heterogeneities are correlated for these decisions (Greene, 2000; Maddala, 1983). It also obscures the possible inter-linkages and synergies that might possibly exist between the different forms of technology adoption decisions. In the context of simultaneous estimation of several adoption decisions, it becomes possible to uncover interactions that can be extremely useful in attempts to manipulate the adoption process (Feder *et al*., 1985). For example, it might be the case that a farmer is more likely to adopt fertilizers if soil conservation is adopted but not necessarily *vice versa*. These results, if forthcoming, would suggest that extension work might concentrate more on soil conservation adoption, since fertilizer use is more likely to follow. It might also be possible that a farmer would abandon one of the technologies in decision in favor of the other even if adopting both at the same time could be more beneficial in production. This could happen when the farmer faces a binding resource or liquidity constraint in his/her investment decisions (Feder *et al*., 1985). These results, if forthcoming, would suggest that resources and efforts should be geared towards relieving some of the constraints so as to reap potential gains from complementarities. Any effort to provide incentive in one of the technologies would retard the adoption of the other, and the potential gains would be lost.

In this study, we investigate the market and institutional constraints behind low adoption rate of farm technologies in a simultaneous equation model that considers soil conservation and fertilizer decisions as related decisions. The rest of the paper is organized as follows. In Section 2, we discuss the conceptual framework and hypotheses. Section 3 deals with the econometric approach. In Section 4, we discuss the data and econometric results. Section five concludes the paper.

## 2. The conceptual framework and hypotheses

In the literature, we find several theoretical approaches in modeling farm technology adoption decisions; depending on the specific objective of the study (see Feder *et al*, 1985 for a survey). Many of the existing approaches are constructed under the assumption of a perfectly competitive market structure and clearly defined property rights (perfectly working institutions). However, in many developing countries, decisions are made under an imperfect market structure, and incomplete or unclear property right regimes. Models that partially or fully incorporate market and institutional imperfections into their formulations include Feder and Onchan (1987) and Hayes *et al*. (1997) for insecured property right regimes, Pender and Kerr (1998) for missing labor and land markets, and Yesuf (2004) for imperfect institutional arrangements and imperfect factor markets (such as land, labor, and credit market imperfections). Our conceptual framework mainly draws from Feder and Onchan (1987) and Yesuf (2004).

In general, decisions of the farmer over a given period of time are assumed to be derived from the maximization of a discounted expected utility of farm profit subjected to credit and labor constraints and tenure insecurity perceptions of farm households. Farm profit is a function of the farmer's choice of a mix of technologies such as chemical fertilizer and soil conservation structures. This implies that for a discounted expected utility-maximizing decision maker, the two technology choices are joint decisions. Other factors that affect farm profit include yield uncertainties, subjective discount rates, and household and plot characteristics. The farm household adopts a given technology if the discounted expected utility obtained from adoption is larger than without adoption. We use the reduced form of this optimization problem for our empirical estimation of adoption decisions. More specifically, we assume that modern

fertilizer ( $fa_{hp}$ ) and soil conservation ( $sc_{hp}$ ) adoption[3] decisions by household *h* on plot *p* are conditioned on the adoption decision of the other technology, the household's perception of soil erosion and soil fertility problems ( $perc_{hp}$ ), the profitability index of the technologies adopted in plot *p* ( $prof_{hp}$ ), the household's perception of tenure security ( $tenu_h$ ), the household's access to the credit and labor markets ( $cmp_h$ ), the household's attitude towards risk and rates of time preferences (or in general behavioral measures) ( $beha_h$ ), and other random factors such as $\varepsilon_{hp}^{f}$ and $\varepsilon_{hp}^{c}$ for fertilizer and soil conservation adoption decisions, respectively.

A decision to adopt soil conserving and/or output enhancing technologies begins with the perception of soil erosion and soil fertility (Ervin and Ervin, 1982; Norris and Batie, 1987; Pender and Kerr, 1996; Shiferaw and Holden, 1999). This perception is a product of the observed factors that might determine the level of awareness of the household including soil and plot characteristics ( $PC_p$ ) such as plot size, slope, and soil quality, human capital of the household ($HC_h$) such as gender, age, education, and village level factors ($X_v$) such as agro-ecological factors including rainfall variability. Since we have not been able to measure perception of erosion at the plot level in our study, we substitute $PC_p$ , $HC_h$ , and $X_v$ into $perc_{hp}$ and get the following expression for fertilizer use and soil conservation adoption decisions respectively:

$$fa_{hp} = fert\ \left(sc_{hp}, PC_{hp}, HC_h, X_v, prof_{hp}, cmp_h, tenu_h, beha_h, \varepsilon_{hp}^{f}\right) \quad \textbf{(1)}$$

$$sc_{hp} = cons\ \left(fa_{hp}, PC_{hp}, HC_h, X_v, prof_{hp}, cmp_h, tenu_h, beha_h, \varepsilon_{hp}^{c}\right). \quad \textbf{(2)}$$

[3] Although measures of soil conservation vary in the literature, our definition of soil conservation is restricted to the construction of any physical structures in a plot to reduce run-off and soil loss. The most common structures in the Ethiopian highlands include stone bunds, soil bunds, cut-off drainage, and grass strips. Our definition of modern fertilizer is also restricted to any use of chemical fertilizers. The most common types in the Ethiopian highlands include Diammonium Phosphate (DAP) and Urea fertilizers. Both soil conservation and fertilizer adoption variables are defined as dummy variables as this study is mainly interested in probabilities of joint adoption decisions but not in intensities of adoptions.

By increasing the profitability of agricultural production, greater market access may promote adoption of both modern fertilizers and soil conservation technologies. Proximity to roads and markets also reduces transaction costs involved in accessing credit and labor markets. However, better access to markets and roads may also increase non-farming opportunities and hence takes labor away from agricultural activities and hence discourages investments in soil conserving and output enhancing activities. Therefore, the effect of access to markets and roads on farm technology adoption decisions is ambiguous.

It is often discussed in the literature that rural markets and institutions in developing countries are generally poorly developed and characterized by high transaction costs, arising from transportation costs, high search, recruitment and monitoring costs, and limited access to information, capital and credit (de Janvry et al., 1991; Sadoulet et al., 1996). As imperfect as they are, existing credit institutions in rural Ethiopia provide short-term credit for productive activities (mainly for the purchase of modern fertilizers and improved seeds), and consumption smoothing purposes, while there exists a serious credit failure for long term investments like soil conservation. Formal credit institutions in rural Ethiopia currently require that loans for agricultural inputs are repaid immediately after harvest, forcing farmers to sell their harvest when prices are low, rather than storing and selling when prices are higher and food is scarcer. According to a recent study, failure to repay this commodity-specific credit mainly due to crop failure has increased indebtedness among the peasantry (IDR, 2000). This is likely to prevent particularly risk averse households from taking credit, which subsequently affects their decision in adopting new farm technologies. Furthermore, availability of credit affects soil conservation decisions by reducing the subjective discount rate and the consumption risk of farm households. We, therefore, hypothesize that households with better access to credit or other sources of cash liquidity are more willing to adopt farm technologies than credit or liquidity-constrained households. On the other hand, as long as credit is available only for the short-term farm activities but not for long-term investments like soil conservation, greater provision of credit might take labor away from conservation activities. Hence, the impact of access to credit on soil conservation is ambiguous.

Another factor that is likely to affect the adoption decisions is tenure security. Insecurity of land rights is generally regarded as one important deterrent of long-term land investment decisions (see Alemu, 1999; Gebremedehin and Swinton, 2003).

Apart from its direct effect of providing incentives to undertake long-term investment ventures like soil conservation, properly secured tenure with tradable or transferable rights reinforces yield enhancing and soil conserving efforts by relaxing the credit market constraints through the provision of collateral in the credit market. In the empirical literature, people use various measures to capture tenure security such as duration of tenure (years of continuous land use), tenure arrangements (whether the plot is owner operated, shared cropped in or shared cropped out, and leased in or leased out), and the perceived degree of tenure security. Application of each measure depends on the type of land policy that a country pursues. In Ethiopia, all land is state property, and it may not be sold or mortgaged. Although the constitution guarantees the right of peasants and pastorialists to free access to land, it is not clear how this right is being assured in practice, given the scarcity of land and the ever exploding population pressure. Under the current land tenure arrangements, this right to free access of land is being implemented through redistribution and reallocation of plots. Although the basic criteria used in the redistribution are not clearly defined, farm size relative to family size, and the ability to manage existing plots are perceived to be the major ones (Alemu, 1999). Thus, tenure insecurity in this context is defined as the perceived probability or likelihood of losing ownership of a part or the whole of one's land without his/her consent (Sjaastad and Bromley, 1997; Alemu, 1999). Thus, given the land tenure structure in Ethiopia, we hypothesize that households with insecure tenure perceptions are less willing to invest in either soil conserving or yield enhancing technologies. Apart from deterring long-term investment decisions, the current land policy of the Ethiopian government that hinges on land redistribution has an adverse effect on farm technology adoption decisions through its impact on reducing and fragmenting individual plots following the overriding population pressure. There is an on-going debate in the literature on the impact of population pressure and deteriorating farm sizes on agricultural intensification or technology adoptions. One group (the Boserupians) argues that population pressure that leads to smaller plots will induce intensive use of the land through the adoption of new farm technologies, while the other group (the neo-Malthusians) argues that population pressure doesn't lead to intensive use of the land; instead it leads to cultivation of marginal lands and further land degradation. Thus, the impact of plot size on technology adoption decisions is an empirical issue.

The other group of factors that affect technology adoption decisions is behavioral factors such as farm household risk and time preferences. In the absence of good access to credit and poor cash liquidity, poor farm households are subjected to high

consumption smoothing problems and thereby high subjective discount rates which, in turn, discourage land investment decisions that entail short-term costs but long-run benefits (Pender, 1996; Holden *et al*., 1998; Godoy *et al*., 2001; Yesuf, 2003a). Therefore, households with high subjective discount rates are less likely to adopt soil conservation technologies. Incentives to invest in new agricultural technologies may also be reduced substantially when outcomes from the adoption of such technologies are conditioned by other stochastic factors such as rainfall variability. Hence the consideration of risk also plays an important role in the choice of production inputs and the adoption of technologies in a situation where insurance markets are poorly functioning or completely missing so that it is difficult to pass the risks to a third party (Just and Zilberman, 1988; Rozenzweig and Binswanger, 1993; Shively, 1997; 2001; Yesuf, 2003b). In a rain-fed agriculture (which is the main form in Ethiopia), returns from fertilizer use are highly conditional on many stochastic events, mainly on weather. Under such farming conditions, risk averse households are the least expected to adopt modern fertilizer due to the high risk of indebtedness.

## 3. The econometric model

The purpose of this study is to identify the determinants of soil conservation and fertilizer adoption decisions, in a situation where institutions and factor markets are imperfect. We assume that all non-technology variables that affect the adoption decisions are exogenous. In order to deal with the simultaneity of the technology adoption decisions we adopt the bivariate probit model of Maddala (1983, Model 6 in Section 8.8.). Consider a joint fertilizer and soil conservation adoption decision of a farm household given by the following bivariate simultaneous equation model:

$$fa_{hp}^{*} = \gamma_1 sc_{hp}^{*} + \beta_1^{'} X_1 + \varepsilon_f, \qquad fa_{hp} = 1(if \quad fa_{hp}^{*} > 0) \tag{3}$$

$$sc_{hp}^{*} = \gamma_2 fa_{hp}^{*} + \beta_2^{'} X_2 + \varepsilon_c, \qquad sc_{hp} = 1(if \quad sc_{hp}^{*} > 0) \tag{4}$$

$$\left[\varepsilon_f, \varepsilon_c\right] \sim BVN\left[(0,0),\ \sigma_f^2, \sigma_c^2, \rho\right],$$

Where, $\rho$ is the correlation, $\sigma_j$ is a standard deviation, and $fa_{hp}$ ( $fa_{hp}^{*}$ ) and $sc_{hp}$ ( $sc_{hp}^{*}$ ) are observed binary (latent) variables indicating the household's fertilizer and soil conservation adoption decisions. $X_1$ and $X_2$ are vectors of explanatory variables, and $\varepsilon_f$, and $\varepsilon_c$ are error terms for the respective equations. There are three interesting aspects of this model. First, the two dependent variables (decisions) are observed as binary variables. Second, the binary dependent variable of the first equation is entered as covariate in the second equation and *vice versa*. Third, the unobserved heterogeneities of the two decisions are correlated. Maddala (1983) proposes an estimable two-stage bivariate approach that produces consistent and efficient parameter estimates. The reduced form that is used to produce consistent and efficient parameter estimates of the structural model is given by Equation (5).

$$\left.\begin{aligned} fa_{hp} &= \pi_1' X + v_f, \\ sc_{hp} &= \pi_2' X + v_c, \\ \left[v_f, v_c\right] &\sim BVN\left[(0,0), \theta_f^2, \theta_c^2, \tau\right], \end{aligned}\right\} \qquad \textbf{(5)}$$

where $\tau$ is the correlation, $\theta_j$ is the standard deviation, and $X$ is the union of exogenous variables in the system. The predicted values of $fa_{hp}$ and $sc_{hp}$ from the reduced form are used to estimate the structural bivariate model. Maddala (1983) derives a way to recover consistent estimates of the structural form of coefficients from the reduced form coefficients that takes into account the cross equation relationships and is, therefore, asymptotically more efficient than a single equation estimation. Since the consistent parameter estimates, and not actual values of $fa_{hp}$ and $sc_{hp}$, are used in the estimation of the structural equations, the estimated asymptotic covariance matrix must be corrected.[4]

Like the standard simple probit model, an attempt to directly interpret the coefficients of a bivariate probit model is misleading since the absolute scale of the coefficients gives a distorted picture of the response of the dependent variable to a change in the

[4] See Maddala, 1983, p.246-247; LIMDEP, 2002, on the identification of consistent parameter estimates and derivation of the asymptotic covariance matrix.

stimuli (Greene, 1996). A general approach on how to calculate marginal effects in a bivariate probit model is illustrated in Greene (1996). In our model, $\rho$ is not statistically different from zero (i.e. the two equations are independent). In this case, the marginal effects are easier to calculate since the joint probability will be the simple product of marginal probabilities. The unconditional expected value of *sc* and *fa* are given by Equation (6) and (7) respectively.

$$E[sc|X_1,X_2]=E_{fa}E[sc|X_1,X_2,fa]=prob[fa=1]E[sc|X_1,X_2,fa=1]+prob[fa=0]E[sc|X_1,X_2,fa=0]$$
$$=\Phi(\beta_1'X_1+\gamma_1)\Phi(\beta_2'X_2+\gamma_2)+\Phi(-\beta_1'X_1)\Phi(\beta_2'X_2), \quad (6)$$

$$E[fa|X_1,X_2]=E_{sc}E[fa|X_1,X_2,sc]=\Phi(\beta_2'X_2+\gamma_2)\Phi(\beta_1'X_1+\gamma_1)+\Phi(-\beta_2'X_2)\Phi(\beta_1'X_1) \quad (7)$$

## 4. Results and discussion

The above models are estimated using survey data collected from 847 plots of 206 randomly selected households from seven villages of highland Ethiopia. The households are located in five *weredas* (such as Machakel, Gozamin, Enemay, Tehuldere and Kalu) of two different *zones* (Eastern Gojjam and South Wollo), one with high agricultural potential and the other with a history of recurrent drought and famine.[5] These households are part of a larger land use survey that was conducted in 2000 and 2002. A separate experiment was administered in 2002 aiming at estimating risk and time preferences among the farmers. In the risk experiment, households were confronted with six farming alternatives that differed both in their expected outcomes and spreads (risk levels) of good and bad outcomes. These six alternatives represented six levels of risk, where 1 for extreme risk aversion and 6 for risk loving behaviors, and the associated risk coefficients were calculated using a constant partial risk aversion utility function. On the other hand, in the rate of time preference experiment, households were confronted with choices of money that differed both in magnitude and time, from which the associated subjective discount

[5]*Wereda* and *zone* are the second and third lowest administrative hierarchies, respectively, in Ethiopia. *Kebele* is the lowest administrative hierarchy, a *wereda* is a collection of contiguous *kebeles,* and *zone* a collection of contiguous weredas.

rate (rate of time preference) was calculated for each farm household.[6] The basic descriptive statistics of the sampled households are provided in Table 1.

**Table 1: Basic descriptive statistics (n=847)**

| Variable | Description | Mean | Standard deviation |
|---|---|---|---|
| Technology adoption | | | |
| Conserve | A dummy whether the household has adopted any soil conservation structure in the plot | 0.26 | 0.44 |
| Fert | A dummy whether the household has used any modern fertilizer in the plot | 0.43 | 0.50 |
| Consfert1 | A dummy whether the household has adopted both soil conservation and fertilizer at the same time in the same plot | 0.09 | 0.28 |
| Consfert2 | A dummy whether the household has adopted both soil conservation and fertilizer at the same time in the same plot, given he/she adopts either of the technologies in the plot | 0.15 | 0.36 |
| Tenure security | | | |
| Tenure | A dummy for expecting a reduction in land size over the coming five years due to any perceived reason | 0.30 | 0.46 |
| Factor-market participation | | | |
| Formal Credit | A dummy for borrowing any amount greater than ETB 50 in the last two years from formal source | 0.45 | 0.50 |
| Plot and soil characteristics | | | |
| Steep slope | A dummy for steep slope plots | 0.28 | 0.45 |
| Poor soil | A dummy for poor soil quality | 0.24 | 0.43 |
| Plot size | Plot size in hectare | 0.27 | 0.20 |
| Human capital | | | |
| Gender | A dummy for male-headed households | 0.97 | 0.17 |
| Age | Age of head of the household | 46.49 | 14.51 |
| Literate | A dummy for literate household heads | 0.26 | 0.44 |
| Family labor | Family size of the household | 5.88 | 2.49 |
| Behavioral measures | | | |
| Risk aversion | Constant partial risk aversion coefficient, measured in a separate experimental study | 2.31 | 2.60 |
| Time preference | Subjective discount rate, measured in a separate experimental study | 0.42 | 0.34 |
| Village level factors | | | |
| Distown | Distance from homestead to nearest town in walking minutes | 60.81 | 36.61 |
| Machekel | *Wereda1* (a group of contiguous villages or kebeles ) dummy | 0.29 | 0.45 |
| Gozamin | *Wereda2* ( a group of contiguous villages ) dummy | 0.24 | 0.43 |
| Enemay | *Wereda3* ( a group of contiguous villages ) dummy | 0.19 | 0.40 |
| Tehuldere | *Wereda4* ( a group of contiguous villages ) dummy | 0.12 | 0.32 |
| Kalu | *Wereda5* ( a group of contiguous villages ) dummy | 0.16 | 0.36 |

[6] More detailed analyses on the measurement and determinants of risk and time preferences of the same sample of farm households are provided in Yesuf (2003a, 2003b).

The results of a two-stage bivariate probit model of Equation (3) and (4) that estimate soil conservation and fertilizer adoption decisions are provided in Table 2. For purposes of comparison, parameter estimates of the standard univariate probit model are also provided in Table 2. In all the models, the problem of multicollinearity is tested and found not to be serious (with variance inflation factors less than two in most cases). The resulting marginal effects of selected variables, which are decomposed into direct, indirect, and total effects, are separately provided in Table 3.[7] In all the cases, standard errors for marginal effects are calculated using the delta method (Greene, 2000).

[7] Direct effect accounts for the direct impact of a change in an explanatory variable (X) on the probability of adopting fertilizer in Equation (3) or soil conservation in Equation (4). The indirect effect accounts for the impact of a change in the same explanatory variable (X) on fertilizer adoption in Equation (3) via its effect on soil conservation, or soil conservation in Equation (4) via its effect on fertilizer adoption.

**Table 2: Determinants of soil conservation and fertilizer adoption decisions**

| Variable | Soil conservation adoption | | Fertilizer adoption | |
|---|---|---|---|---|
| | Univariate probit | Two-stage bivariate | Univariate Probit | Two-stage bivariate |
| ***Technology Adoption*** | | | | |
| Fertilizer Adoption | 0.196 | 0.009 | | |
| | (0.135) | (0.492) | | |
| Soil Conservation Adoption | | | 0.117 | -0.277* |
| | | | (0.129) | (0.165) |
| ***Tenure Insecurity*** | | | | |
| Tenure Perception | -0.143 | -0.147 | -0.065 | -0.095 |
| | (0.117) | (0.127) | (0.113) | (0.116) |
| ***Factor-Market Participation*** | | | | |
| Formal Credit | 0.040 | 0.082 | 0.651*** | 0.697*** |
| | (0.138) | (0.382) | (0.109) | (0.116) |
| ***Plot and Soil Characteristics*** | | | | |
| Steep Slope | 0.624*** | 0.614*** | | |
| | (0.113) | (0.123) | | |
| Poor Soil | | | 0.088 | 0.196 |
| | | | (0.111) | (0.139) |
| Plot Size | 0.616** | 0.686 | 1.264*** | 1.444*** |
| | (0.298) | (0.689) | (0.273) | (0.289) |
| ***Human Capital*** | | | | |
| Gender | 0.950** | 0.920 | -0.638** | -0.376 |
| | (0.480) | (0.584) | (0.283) | (0.350) |
| Age | -0.014*** | -0.014*** | -0.006 | -0.009** |
| | (0.004) | (0.005) | (0.004) | (0.004) |
| Literate | 0.170 | 0.165 | -0.133 | -0.072 |
| | (0.128) | (0.148) | (0.122) | (0.130) |
| Family Labor | 0.038 | 0.038 | | |
| | (0.025) | (0.026) | | |
| ***Behavioral Measures*** | | | | |
| Risk Aversion | | | -0.025 | -0.041* |
| | | | (0.021) | (0.024) |
| Time Preference | -0.421** | -0.428** | | |
| | (0.199) | (0.203) | | |
| Access to Market and Road | | | | |
| Distance to Town | 0.006*** | 0.006*** | -0.002 | -0.0001 |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| ***Village Dummies+*** | | | | |
| Machakel | -1.830*** | -1.760*** | 1.095*** | 0.493 |
| | (0.245) | (0.559) | (0.188) | (0.379) |
| Gozamin | -1.228*** | -1.196*** | 0.472*** | 0.025 |
| | (0.185) | (0.287) | (0.189) | (0.304) |
| Enemay | -0.228 | -0.229 | -0.052 | -0.193 |
| | (0.166) | (0.175) | (0.185) | (0.202) |
| Tehuldere | -0.186 | -0.177 | 0.151 | 0.061 |
| | (0.196) | (0.202) | (0.198) | (0.224) |
| Intercept | -1.128** | -1.055* | -0.226 | -0.408* |
| | (0.580) | (0.602) | (0.412) | (0.165) |
| Number of Observations | 847 | 847 | 847 | 847 |
| $R^2$ | 0.275 | | 0.210 | |
| Log-Likelihood function | -351.18 | -352.32 | -458.46 | -352.32 |
| Rho | 0.000 | 0.224 | 0.000 | 0.224 |

Figures in parentheses are standard errors.
***, **,* indicate significance levels at 1%, 5% and 10% levels, respectively.
+ Kalu is the reference village

**Table 3. Marginal effects of the two-stage bivariate probit model**

| Variable | Direct | Indirect | Total | (Type of variable, Mean) |
|---|---|---|---|---|
| ***Soil Conservation Adoption Decision*** | | | | |
| Tenure Insecurity | -0.020 | -0.014 | -0.034 | Binary, 0.30 |
| | (0.023) | (0.013) | (0.029) | |
| Formal Credit | -0.032 | 0.046** | 0.014 | Binary, 0.45 |
| | (0.072) | (0.019) | (0.065) | |
| Subjective Discount Rate | -0.104** | | -0.104** | Continuous, 0.42 |
| | (0.053) | | (0.053) | |
| Plot Size | 0.167 | 0.177* | 0.344*** | Continuous, 0.27 |
| | (0.137) | (0.094) | (0.089) | |
| Steep Slope | 0.124*** | | 0.124*** | Binary, 0.28 |
| | (0.033) | | (0.033) | |
| Distance to Town | 0.001** | -0.00001 | 0.001** | Continuous, 60.81 |
| | (0.001) | (0.0003) | (0.001) | |
| Literate | 0.036 | 0.006 | 0.042 | Binary, 0.2574 |
| | (0.033) | (0.013) | (0.041) | |
| Gender | 0.112*** | 0.031 | 0.142** | Binary, 0.97 |
| | (0.033) | (0.035) | (0.071) | |
| Age | -0.001 | -0.003** | -0.005*** | Continuous, 46.49 |
| | (0.001) | (0.002) | (0.002) | |
| Family Labor | 0.009 | | 0.009 | Continuous, 5.88 |
| | (0.007) | | (0.007) | |
| Fertilizer Adoption | 0.002 | | 0.002 | Endogenous, 0.43 |
| | (0.033) | | (0.033) | |
| ***Fertilizer Adoption Decision*** | | | | |
| Tenure Insecurity | -0.015 | -0.014 | -0.029 | Binary, 0.30 |
| | (0.035) | (0.013) | (0.040) | |
| Formal Credit | 0.195*** | 0.046** | 0.241*** | Binary, 0.45 |
| | (0.045) | (0.019) | (0.057) | |
| Risk Aversion Rate | -0.014* | | -0.014* | Continuous, 2.31 |
| | (0.008) | | (0.008) | |
| Plot Size | 0.502*** | 0.101 | 0.603*** | Continuous, 0.27 |
| | (0.111) | (0.082) | (0.112) | |
| Poor Soil Quality | 0.058 | | 0.058 | Binary, 0.24 |
| | (0.041) | | (0.041) | |
| Distance to town | -0.0001 | 0.001 | 0.001 | Continuous, 60.81 |
| | (0.001) | (0.001) | (0.001) | |
| Literate | -0.035 | 0.006 | -0.029 | Binary, 0.26 |
| | (0.039) | (0.013) | (0.044) | |
| Gender | -0.187 | 0.031 | -0.156 | Binary, 0.97 |
| | (0.142) | (0.035) | (0.139) | |
| Age | 0.0004 | -0.003** | -0.003 | Continuous, 46.49 |
| | (0.002) | (0.002) | (0.002) | |
| Soil Conservation Adoption | -0.163** | | -0.163** | Endogenous, 0.26 |
| | (0.081) | | (0.081) | |

Figures in parentheses are standard errors.

***, **,* indicate significance levels at 1%, 5% and 10% levels, respectively.

+ Kalu is the reference village

The p-value of 0.224 for the test of $\rho$ equals zero shows that the unobserved heterogeneities of both decisions are uncorrelated. This result, however, doesn't lead us to the conclusion that the two decisions are uncorrelated. Instead, a significant parameter estimate of the endogenous soil conservation variable in the fertilizer adoption equation shows that one of the important determinants (though negative) of whether a household adopts fertilizer is whether the same household has adopted soil conservation on that plot. The reverse causality, however, is insignificant. That is, household's decision to adopt soil conservation does not depend on whether the same household has adopted fertilizer. On the margin, controlling for other factors, households that adopt a soil conservation structure are 16 percentage units less likely to adopt modern fertilizers as well. Although soil conservation and fertilizer adoption are complementaries in agricultural production, they are substitutes in terms of decision making. Given the potential gains through complementarities of the two forms of technologies, this decision behavior of farm households in our sites looks perverse at a first glance. However, as in many other developing countries, the farm households in the Ethiopian highlands are working under severe cash liquidity and other resource constraints, which might force them to abandon one of the choices even if adopting both at the same time would give higher yields. This behavior is consistent with the prediction of decision theory in economics where factor markets are imperfect (Feder et al., 19985). In that case, policies that enhance the adoption of one component may retard the adoption of the other.

Among the exogenous variables included in our model, perception of tenure insecurity, family labor, educational level of farm households, and soil quality do not seem to explain variations in either of the two technology adoption decisions. Given other more binding constraints such as resource poverty, cash liquidity, and lack of appropriate incentives, perception of tenure insecurity does not seem to deter farm technology adoption decisions. The current land tenure policy that advocates for continuous redistribution, however, has a strong indirect effect on technology adoption decision through its effect on plot size and land fragmentation which, in our model, is captured by a separate variable called plot size. Farm households with bigger plot sizes are more likely to adopt new farm technologies than others. In the literature, this result is more often attributed to confounding factors such as poor soil quality, fixed costs of implementation or adoption, credit access, or risk preferences (Feder et al., 1985). In our case, controlling for soil quality, access to credit markets, risk preferences and other factors, plot size still has a positive and significant impact

on the decision to adopt either of the technologies. This result supports the neo-Malthusian argument that land redistribution and fragmentation resulting from the ever-increasing population pressure doesn't lead to more intensification of farming.

Market access to a formal credit market is found to be one of the strong and major determinants of fertilizer adoption decisions, though it does not have a direct strong impact on the soil conservation adoption decision. Households with access to formal credit are 24 percentage units more likely to adopt fertilizer than those without access. Access to the credit market gives opportunities to farm households to get the necessary resources for the adoption of technologies. Given the fact that credit institutions in rural Ethiopia provide short-term credit only for productive activities (mainly for the purchase of modern fertilizers and improved seeds), and consumption smoothing purposes, but not to long-term investments like soil conservation, our result that shows a positive and significant effect on fertilizer adoption but not on soil conservation adoption decision is not surprising. However, there are two other indirect channels through which better access to credit and cash liquidity affects both types of technology adoption decisions. First, better access to credit even for productive, consumption, and other purposes will reduce consumption smoothing problems and the subjective rates of time preference of farm households, which is a very significant factor explaining variations in farm technology adoption decisions in our study. This effect is captured by a separate variable called discount rate. Second, better access to credit and cash liquidity will enhance technology adoption decisions by encouraging farmers to take risks. This effect is also captured in our model by a separate variable called risk aversion. In countries where credit and insurance markets are poorly functioning or completely missing and households suffer from liquidity constraints and consumption smoothing problems, and are surrounded by a multitude of risks, people tend to have high subjective discount rates (higher than the market interest rate), and mimic risk aversion behavior (Pender, 1996; Yesuf, 2003a, 2003b). Under these circumstances, variations in such behavioral measures are often major determinants of household investment decisions. This assertion in the literature is consistent with our findings that variations in farm households' rates of time preferences and degree of risk aversion explain a significant portion of variations in soil conservation and fertilizer adoption decisions, respectively.

Among the soil characteristic indicators, only slope of the plot seems to explain significant variations in soil conservation adoption decisions. With regard to

household characteristics, male-headed households are more likely to adopt soil conservation technologies than female-headed households, and old-age household heads are less likely to adopt soil conservation technologies than younger heads.

Finally, proximity to town seems to affect the soil conservation adoption decision but not the fertilizer adoption decision. The direction of relationship, however, seems counter-intuitive in that the probability of adoption decreases with proximity to town. This is perhaps because households who live with closer proximity to town have higher opportunity costs of labor than distant households, which makes decisions to participate in labor-intensive soil conservation tasks more expensive to them. Significant parameter estimates for many of the village dummies also depict the role of village level factors such as variations in geographic, climatic, cultural and other factors as important determinants of variations in adoption decisions.

## 5. Conclusions and policy implications

Land degradation and deterioration of agricultural productivity are major threats to current and future livelihoods of farm households in developing counties. Following this concern, governments and development agencies have invested substantial resources to promote rapid dissemination of yield-enhancing and soil-conserving technologies. The results so far, however, are discouraging as the adoption rates are low and adoption is limited to certain villages and groups of farm households.

Although there is a growing literature that looks into technology adoption decisions of farm households in developing counties, both theoretical and empirical studies that deal with the institutional and factor market imperfections behind such low adoption rates are scarce. Even more disturbing is the absence of any empirical study that looks into the possible links and synergies between different forms of technology adoption decisions despite the fact that understanding the synergies across the different forms of technology adoption decisions could perhaps help policy makers and development agents to exert more effective and coordinated efforts to address the problem.

In this paper, we investigate the impacts of market and institutional imperfections on technology adoptions in a model that considers fertilizer and soil conservation adoptions as related decisions. In our case study, controlling for soil characteristics

and other factors, we find that a household's decision to adopt fertilizer does significantly and negatively depend on whether the same household adopts soil conservation. The reverse causality, however, is insignificant. On the margin, controlling for other factors, households that adopt soil conservation structures are 16% less likely to adopt modern fertilizer as well. For our sample households, these two technologies are found to be substitutes. This is consistent with decision theory in economics where factor markets are imperfect. The returns to fertilizer will be much higher if farmers adopt soil conservation as well since the structures help to conserve soil moisture and reduce losses of such inputs through run-off. However, if the decision maker faces a binding cash liquidity or credit constraints, the decision maker could neglect one in favor of the other and hence any incentive that promotes the adoption of one might retard the adoption of the other. Under such circumstances, efforts should be geared towards relieving some of the constraints or searching for the least cost technologies that suit the resource base of the farm households so as to enable them to adopt the technologies and reap benefits from potential complementarities of farm technologies.

Most of the other factors that significantly affect either of the technology adoption decisions are reflections of the prevailing factor market and institutional imperfections in the study villages. Households with relatively high subjective discount rates and higher degrees of risk aversion are less likely to adopt soil conservation structures and modern fertilizers, respectively. These results are consistent with the poverty induced environmental degradation argument in the literature that holds that in countries where poverty and environmental degradation are highly inter-twined, and credit and insurance markets are imperfect or completely absent, the critical factors affecting sustainability of resource use are the extent to which people discount the future and their willingness to undertake risky investment decisions (WECD, 1987; World Bank, 1996). In an imperfect credit and insurance market environment, variations across households in these two behavioral measures are mainly explained by differences in households' physical and financial endowments.

Limited access to the formal credit market is another outcome of factor market imperfection. This variable is found to strongly explain variation in fertilizer adoption decision, but not in soil conservation adoption decision. Households with better access to formal credit are 24% more likely to adopt modern fertilizers than those without access. Unlike the findings in other recent studies in Ethiopia (e.g. Alemu,

1999; Gebremedhin and Swinton, 2003), but consistent with the findings of Holden and Yohannese (2002) and Hagos and Holden (2003), we do not find tenure insecurity as one of the significant determinants of either of the technology adoption decisions. Instead, we find that plot size and land fragmentation, which are direct results of land redistribution in the current land policy in Ethiopia, significantly and positively explain variations in both of the technology adoption decisions. This result seems to support the neo-Malthusian argument on population pressure, land size and agricultural intensification.

This study generally shows the importance of investigating factor market imperfections in understanding farm household behavior in adopting yield- enhancing and soil-conserving technologies. In the short-run, any effort that reduces poverty and asset scarcity helps to reduce a farm household's subjective discount rate and degree of risk aversion, which subsequently leads to dissemination of new farm technologies. In the long-run, broad based economic development including the development of credit and insurance markets are needed to correct the existing market imperfections and reduce their negative impacts on different forms of farm investment decisions.

## References

Alemu, T. (1999). 'Land Tenure and Soil Conservation: Evidence from Ethiopia', *Ph.D. Thesis*, Dept. of Economics, Gothenburg University.

Bojö, J, and D. Cassells. (1995). 'Land Degradation and Rehabilitation in Ethiopia: A Reassessment', *AFTES Working Paper No. 17*, Washington D.C.: World Bank.

de Janvry, A., M. Fafchamps and E. Sadoulet. (1991). 'Peasant Household Behavior with Missing Markets: Some Paradoxes Explained', *The Economic Journal*, 101: 1400-17.

Ervin, C. and D. Ervin. (1982). 'Factors Affecting the Use of Soil Conservation Practices: Hypothesis, Evidence, and Policy Implications', *Land Economics*, 58(3): 277-92.

Feder, G., R. Just and D. Zilberman. (1985). 'Adoption of Agricultural Innovations in Developing Countries: A Survey', *Economic Development and Cultural Change*, 255-298.

Feder, G., and T. Onchan. (1987). 'Land Ownership Security and Farm Investment in Thailand', *American Journal of Agricultural Economics,* 69: 311-20.

Food and Agriculture Organization (FAO). (1998). '*Ethiopian Soil Fertility Initiative: Concept Paper'*, Investment Center Division, FAO/World Bank Cooperative Programme.

Gebremedhin B., and M. Swinton. (2003). Investment in Soil Conservation in Northern Ethiopia: The Role of Land Tenure Security and Public Programs, *Agricultural Economics*, 29: 69-84.

Godoy, R., K. Kirby and D. Wilkie. (2001). 'Tenure Security, Private Time Preference, and Use of Natural Resources Among Lowland Bolivian Amerindians', *Ecological Economics*, 38: 105-118.

Greene, W. (2000), '*Econometric Analysis'*, Fourth Edition, NJ: Prentice Hall.

_____. (1996). 'Marginal Effects in the bivariate Probit Model', *Working Paper number 96-11*, Department of Economics, Stern School of Business, New York University.

Hagos, F., and S. Holden. (2003). 'The Effect of Tenure Security, Poverty, Risk Aversion, and Public-Led Conservation on Farm Households' Plot Level Investment on Land Conservation in the Highlands of Northern Ethiopia', Department of Economics and Social Sciences, NLH, Norway, *mimeo*

Hayes, J., M. Roth, L. Zepeda. (1997). 'Tenure Security, Investment and Productivity in Gambian Agriculture: A Generalized Probit Analysis', *American Journal of Agricultural Economics*, 79:369-382.

Holden, S., B. Shiferaw and M. Wik. (1998). 'Poverty, Market Imperfections and Time Preferences: Of Relevance for Environmental Policy?', *Environment and Development Economics*, 3: 105-130.

Holden, S., and H. Yohannes. (2002). 'Land Redistribution, Tenure Insecurity, and Intensity of Production: A Study of Farm Households in Southern Ethiopia', *Land Economics*, 78(4): 573-590.

Hurni, H. (1993). 'Land Degradation, Famine and Resource Scenarios in Ethiopia', in Pimentel, D. (ed.), *World Erosion and Conservation*. Cambridge University Press.

Institute of Development Research (IDR). (2000). ' *Food Security and Resource Access: A Final Report on the Community Assessment in South Wollo and Oromiya Zones of Amhara Region, Ethiopia*', Addis Ababa University, Ethiopia.

International Food Policy Research Institute (IFPRI). (1999). '*Strategies for Sustainable Agricultural Development in the East African Highlands*', Washington, D.C.: IFPRI.

Just, R. and D. Zilberman. (1988). 'The Effect of Agricultural Development Policies on Income Distribution and Technological Change in Agriculture', *Journal of Development Economics*, 28: 193-216.

LIMDEP. (2002). Econometrics Software, Inc., Plainview, New York.

Maddala, G. (1983). '*Limited Dependent and Qualitative Variables in Econometrics*', Cambridge: Cambride University Press.

Mulat D., S. Ali, and T. Jayne. (1997). 'Promoting Fertilizer Use in Ethiopia: The Implications of Improving Grain Market Performance, Input Market Efficiency, and Farm Management', *Working Paper 5, Grain Market Research Project*, Ministry of Economic Development and Cooperation, Addis Ababa, Ethiopia.

Pender, J. (1996). 'Discount Rates and Credit Markets: Theory and Evidence from Rural India', *Journal of Development Economics*, 50:257-296

Pender, J. and J. Kerr. (1998). 'Determinants of Farmers' Indigenous Soil and Water Conservation Investments in Semi-Arid India', *Agricultural Economics*, 19: 113-125.

Rozenzweig, M., H. Binswanger. (1993). 'Wealth, Weather Risk, and the Composition and Profitability of Agricultural Investments', *The Economic Journal*, 103: 56-78.

Sadoulet, E., A. de Janvry and C. Benjamin. (1996). 'Household Behavior with Imperfect Labor Markets', *Working Paper Series*, Dept. of Agricultural and Resource Economics, University of California, Berkeley.

Scherr, S. and S. Yadav. (1996). '*Land Degradation in Developing World: Implications for Food, Agriculture, and the Environment to 2020'*, International Food Policy Research Institute, Washington, D.C.

Shiferaw B., and S. Holden. (1999). 'Soil Erosion and Small Holders' Conservation Decisions in the Highlands of Ethiopia', *World Development*, 27(4): 739-752.

Shively, G. (2001). 'Poverty, Consumption Risk, and Soil Conservation', *Journal of Development Economics*, 65: 267-290.

Shively, G. (1997).'Consumption Risk, Farm Characteristics, and Soil Conservation Adoption among Low-Income Farmers in the Philippines', *Agricultural Economics*, 17: 165-177.

Sjaastad, E., and D. Bromley. (1997). 'Indigenous Land Rights in Sub-Saharan Africa: Appropriation Security, and Investment Demand', *World Development*, 25(4): 549-562.

White, H. (1980). 'A Hetroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Hetroscedasticity', *Econometrica*, 48: 817-830.

World Bank. (1996). '*Towards Environmentally Sustainable Development in Sub-Saharan Africa: A World Bank agenda'*, The World Bank, Washington, DC.

World Commission on Environment and Development (WCED). (1987). '*Our Common Future*', Oxford University Press: New York.

Yesuf, M. (2004). 'A Dynamic Economic Model of Soil Conservation with Imperfect Markets and Institution', Department of Economics, Gothenburg University, *mimeo*.

_____. (2003b). 'Risk Preference of Farm Households in Ethiopia', Department of Economics, Gothenburg University, *mimeo*.

_____. (2003a). 'Time Preferences of Farm Households in Ethiopia', Department of Economics, Gothenburg University, *mimeo*.

# RECENT EXPERIENCES IN LAND RENTAL MARKETS IN ETHIOPIA: IMPACT ON EQUITY, EFFICIENCY AND POVERTY

Samuel Gebreselassie[1]

## *Abstract*

*Due to widespread poverty, improving tenure security is not a sufficient condition to induce investment, especially long-term investment in the peasant sector. Therefore, any land-reform should focus on measures that could induce investments on land, irrigation and other alternatives that could increase the productive capacity of farm land and its sustainable utilization.*

*Land market is generally considered as an important instrument to improve agricultural growth as it could help land transfer from less productive to high productive farmers. Available theoretical and empirical knowledge indicate that property rights to land that are secure and easily transferable are key elements for smooth and efficient operation of land rental markets. Yet, there is no sufficient knowledge on the factors that trigger the emergence of informal land markets, its competitiveness and role in local economy and the factors that govern the functioning of these markets. Knowledge of such factors will help Ethiopian policy makers to design policies that can optimize the positive outcomes of existing rental markets.*

*The research is based on a survey data collected in 2004 from 4585 households sampled from all regions of the country, except the Gambella National Regional State. Based on the review made on best practices in other countries, and results from descriptive and econometric analysis of the study, numerous policy recommendations are made to enhance the positive outcome of land rental markets. First, constraints put on the free operation of land markets in terms of limiting the contract period and size of land to be supplied to the rental market should be revised to enhance the competitiveness of the market and the long-term interest of the economy. Any restrictions on size of land farmers allowed to supply for rental market which is too small and highly fragmented will not help. If necessary, it would be better to limit the upper limit a tenant or leaseholder can farm. Once the market is started to be competitive, the government could set the minimum rental fee to protect the interest of the disadvantages like female-headed households and households headed by old (retired) persons who have weak bargaining power. In general, Ethiopia's land policy should be revisited to improve the economic value of rural land, the supply of which has been diminished due to the continued degradations of productive lands and population growth.*

[1] EEA/Ethiopian Economic Policy Research Institute

**Acknowledgment**
The author would like to thank the director of the EEA/EEPRI, Dr. Assefa Admassie, for his insightful review of the draft document. I would also like to thank Ato Daniel Aklilu for his support in computing statistics analyzed in the study.

## 1. Introduction

Agricultural land is the major source of income and livelihood in Ethiopia. It is also one of the most controversial issues that have been debated almost in any forum that discusses economic underdevelopment and agricultural stagnation in Ethiopia. The question of rural land first appeared in Ethiopia's development agenda some 40 years ago with the then students' slogan of "Land to the Tiller". The political agenda of this popular slogan – *Ending the feudal form of exploitation* - was accomplished 30 years ago by the *Derg*. The 1975 land reform nationalized all rural land and abolished tenant-landlord relationship. Land market in the form of sale, mortgaging or exchange was outlawed[2]. This radical measure was cheered at the time as it seemed that the land question had got adequate answer. But, rural land has continued to be one of the dominant political and development agenda items even today. It has remained as the most contentious topic in the national agenda for a very long period of time. The following three factors could explain this unusual phenomenon.

First, the level of poverty and food insecurity has worsened and failed to subside despite fundamental and minor policy changes on rural land. For instance, a national survey conducted by the EEA in 2004 shows that an average Ethiopian farm household generates only 59% of the minimum income required to lead a life out of poverty. Based on existing level of productivity and price structure, the average grain producer needs 2.8 hectares of land to lead a life above poverty[3]. Moreover, about 65% of farmers are food/grain deficit (or net buyers of food). This situation has forced development experts to revisit the role of the land policy.

Second, the issue of rural land has been exposed to very polarized policy debates that are not supported by empirical evidence. Researches carried out on the issue are limited both in scope and in number. Any genuine attempt to make research and dialogue on rural land has also been overshadowed by the enormous political weight and apprehension the issue of rural land has attracted from policy makers. Many people have the impression that rural land in Ethiopia is a political issue, rather than an economic issue that has political and social dimensions. On the other hand, high

[2] Despite discouraging the periodic land redistribution and allowing some form of regulated land renal market, the basic policy of the Derg's land policy has been maintained to date.
[3] Some rural experts also estimate the need of a similar size of land to provide full employment to the average rural household.

population pressure, severe land degradation and high poverty incidence have complicated the efforts to get a satisfactory answer to the land question.

Thirdly, knowledge on existing informal land rental market is very limited and the depth of discussion is narrow. Available information on the size of the market, its competitiveness, the role of the market in local economy and on market participants, or the kind of institutional support the market needs is very limited. This study tried to fill some of these gaps in information, and consequently, hoped to inspire an informed policy debate on this controversial issue by generating empirical supported information related to the issue of equity and efficiency of land rental markets.

Land rental markets could be considered to have a positive impact on equity if it has improved the welfare of both parties involved in the land rental market. This could be considered true if land transactions allow land transfer from land rich to land poor (including landless) farmers, from labor poor (that may include female headed households) to labor rich households or trigger land transfer from sick to healthy persons. It could also be considered to have a positive impact on equity if it helps for generation of employment and more income to both parties. On the other hand, the positive impact of land transactions on efficiency could be established if it helps land transfer from less productive to more productive farmers. This could be considered true if it helps for better factor reallocation, high use of purchased improved inputs, high labor mobility and participation in non-farm activities and improved participation in market (cash economy). All these positive impacts should be finally reflected through high land and labor productivities.

## 2. Land, agriculture and poverty in Ethiopia

Agricultural stagnation, increased poverty and food insecurity, on the one hand, and increased population pressure, on the other hand, has called for an efficient and sustainable utilization of productive land. As formal land sales are prohibited, land rental market could help to bring rural land to its most productive use by facilitating its transfer from less efficient to more efficient farmers. Existing realities in rural Ethiopia that include high population pressure, undeveloped non-farm sectors, and low-input low-output subsistence farming system have called for an enhanced role for land

rental market. However, there are also arguments against the role of land rental market to facilitate agricultural growth and the welfare of peasants.

Ethiopia is one of the poorest countries in the world. It is also a country where income inequality is very low. The national consumption Gini coefficient in 1999 was 0.28, and was lower in rural than urban areas. The government interprets this both as a negative indicator of widespread poverty, and as a positive outcome of land redistribution that brought an egalitarian land holding system (FDRE 2000: 6, cited by Stephen et al, 2005). However, many critics say that the land tenure system has gone too far to create a homogenous social structure that discourages competition and personal incentive required to fight poverty and underdevelopment in rural areas (Rahmato, 2005; Stephen 2005).

The combination of land redistributions and prohibitions against land accumulation, declining access to natural resources and community level assets (including grazing land and social capital), and asset sales for food in response to repeated shocks such as droughts, may have pushed hundreds of thousands of households in highland Ethiopia below the minimum threshold of key productive assets needed for a viable households. According to this view, equalization of assets in rural communities has contributed to agricultural stagnation, and is keeping the majority of Ethiopians trapped in poverty. Fear of future land redistributions – despite government assurances that none are planned – has inhibited investment in agriculture, while legal constraints against buying and selling have prevented the consolidation of small, 'sub-subsistence' plots (Stephen 2005). The rural economy has undergone a shift towards micro-agriculture in the last three decades that sunk the peasant population in grinding poverty (Rahmato, 2005).

One of the underlying causes of poverty and underdevelopment in Ethiopia is, therefore, the structural problem facing the economy. It is no more possible to rely on a traditional, rain dependant, small scale peasant economy to solve the chronic problems of poverty and economic stagnation. Until recently, the pathway for Ethiopian agriculture was intensification of smallholder agriculture. The government has tried to intensify smallholder production system using green-revolution like intervention (mainly inorganic fertilizer and improved seeds) in an environment where the supply of productive land and its sustainable use were constrained by increased population pressure and its intensive and optimum utilization by lack of sufficient soil

moisture. Recognizing the limits of this kind of intervention, the government has been experimenting other interventions such as livelihood diversifications (includes productive safety-net), commercialization of peasant agriculture (and/or specialization), and voluntary resettlement program. If a durable solution is to be sought for the country's deep-rooted economic problems, the government should go beyond these interventions to change both the structure of the agricultural sector and that of the whole economy.

However, the government discourages any major change in its land policy in general and the privatization of land in particular. Policy makers fear that providing full transferability rights to land, along with the institution of formal land markets, will lead to a massive eviction of poor rural households which rapidly aggravates the poverty situation all over the country. For instance, Prime Minster Meles argues that allowing land to become a tradable commodity would inevitably result in an 'urbanization of rural poverty'. When the next drought strikes hungry families with nothing to exchange for food will be forced to sell their land and, be displaced to cities like Addis Abeba, where they will survive in squalor in squatter camps, with little prospect of securing formal employment. This is related to "land as safety net" argument. Even if tiny farms are inadequate for self-sufficiency, the family plot does provide some proportion of subsistence needs, and this safety net would be removed if land can be sold. Ideologically, the EPRDF shares the Derg's opposition to large landowners, and they believe that commercializing land will inexorably concentrate ownership in the hands of a minority (Stephen, 2005). Since there has been no formal land market in Ethiopia, it would be difficult to empirically test the validity of this fear[4]. However, there are official statistics that put in doubt the validity of the premise that state-ownership of land, prohibition of land sales and government attempt to provide land titles to every peasant[5] to ensure access to the minimum productive resource (land) have contributed positively to rural welfare. The safety-net role of rural land has also been increasingly threatened and diminished by other factors like high population growth, natural resource degradation and agricultural stagnation.

[4] However, the EEA/EEPRI survey of 8540 households in 2002 has indicated that over 94% of the farmers will not sell their land and migrate to urban areas if government allows them to sell their land in a free market (EEA/EEPRI, 2002).

[5] Despite the recently discouraged land redistribution program, the Ethiopian constitution states that every peasant has the right to get farm land free.

Official statistics on peasants' vulnerability to drought and the level of food security could easily demonstrate the limitation of the land policy that has been enacted in1974. The drought of 2002/03 has shown that people in some parts of the country where drought or drought induced problems were manageable at local or household levels increasingly need food aid to prevent widespread famine. At the same time, people in areas where transitory or weather induced food insecurity has been the predominant problem increasingly suffer from chronic food insecurity[6], which is related more to poverty rather than to temporary shocks. This worsening trend is manifested by government statistics on the number of people affected by drought. For example, only about 1.5 million or not more than 5% of the total population of the country suffered from drought induced food insecurity problem during the imperial regime in the 1960's or early 1970's; by mid 1984, the figure increased to 7 million or 17.4% of the total population. In 2003, it increased to 14.5 million or 22% of the total population that was estimated at 69 million. About five million of these people have been suffering from chronic food insecurity (Samuel, 2004). Similar trend has been observed in terms of geographic coverage of drought. In Amhara region the number of *Woredas* affected by drought increased by over threefold in less than 20 years and reached 73 in 2003. The DPPC food security profile shows that the expansion of drought affected *Woredas* as a simple indicator of geographical coverage has been very drastic in Oromia and SNNP regions where a large proportion of the regional territories became susceptible to drought and famine. Taking the major regions of the country as a whole, vulnerability to drought and famine increased at an alarming rate in the short period of not more that one and half decades (EEA, 2004).

All these statistics indicate the need that guaranteeing peasants to have access to some plots of land is not sufficient to ensure food security or prevent desperate migration. In addition to actual or perceived tenure insecurity, low non-farm opportunities in urban areas and massive food aid program are major factors that prevent peasants from migrating to urban centers[7] or what is called the process of 'the urbanization of rural poverty'. The role of the land policy should be looked from the broader perspective that considers the dynamism of the Ethiopian economy and population. It should not be narrowly defined in terms of its impacts in poverty reduction. It is time to consider the role of the land policy in the transformation of the economy which highlights the need for land markets.

[6] Some Weredas in western Hararghie and Arsi became vulnerable to drought in 2002/03 for the first time, while about 35% of the Wollo population received food aid annually between 1997 and 2001.
[7] This should not imply that state ownership of land or prohibition of land sales does not prevent rural-urban migration especially during the early days of the land policy.

## 3. The land debate: Overview

Debates on the existing land policy and the future of land reform in Ethiopia are active but occasional, polarized and restricted to some elites in the government, academia and donors. The debates usually focused on privatization of rural land versus maintaining the status-quo, state ownership of land. The former option, the full privatization and titling model, however, is seen by many mainly by government officials as potentially highly problematic and based on assumptions which are unlikely to be proved true. The consequences of rapid consolidation of farm areas and an increase in landlessness among those selling most or all of their land is seen as potentially catastrophic in both humanitarian and political terms.

On the other hand, some policy commentators argue that the efficiency gains of land privatization and formal titling in Ethiopia are potentially highly significant. This would allow agricultural entrepreneurs to consolidate land holdings and manage economically viable land units on a commercial basis. This would encourage others to move out of agriculture and away from sub-economic 'starvation plots' and seek other forms of livelihood outside the rural areas, or within linked to new more commercial farming operations. With economic growth based on agriculture of this sort rural areas might have the chance of prospering with growth linkages fostered by a growth in the labour market, in agro-processing, in trading and other activities. External investment would then flow in as those with capital saw that agriculture was providing a return. The reduction in social safety net costs and government support of the state managed model currently advocated could be significant, releasing government and aid funds for more targeted investment elsewhere. Proponents of this policy said, if this policy, as claimed by the government, could lead to unproductive accumulation of land or translate immediately to the creation of a large landless class that could destabilize the social system, policy makers, as discussed earlier, could interfere in the operation of the market to prevent distress sales or ensure the basic principle of the market ('the interaction between a willing seller and a willing buyer at an agreed price') through secondary policy and institutional interventions (Samuel, 2006).

Still others argue that a good compromise between land privatization and titling and state ownership and redistribution already exists, but is constrained. As discussed below, rental markets exist in all areas of Ethiopia but have been constrained by

government's reluctance to see them flourish for similar reasons to the aversion to land privatization and titling. Limits to land rental have thus been set which govern the amount of land that can be transferred and the length of time the rental agreement lasts[8]. The degree to which such government regulations are enforced is not known, and most case study evidence points to an existing and vibrant land rental market in highland areas, mostly, however, the leaseholders are neighbours and relatives, who could not make the best from the rented land and/or could not offer the best rental fee to the landlord (Samuel, 2006).

- **Land rental market vis-à-vis state ownership of land**

Even though a well-functioning competitive land rental market is always useful in an economy where land has an enormous role, it has a unique role in a situation where the supply and demand of land is severely constrained by government ownership and administration of land. A competitive land rental market will facilitate farm investments and contribute for more efficient and sustainable utilization of agricultural lands. It will also encourage labor mobility which will have a positive impact on reducing problems that crop up from high rural population pressure and land fragmentation. A well-functioning competitive land rental market will also improve land consolidation and creates an enabling environment for a more specialized and intensified farming. Land market is generally considered as an important instrument to improve agricultural performance and economic growth as it could help land transfer from less productive to high productive farmers. Available theoretical and empirical knowledge indicates that property rights to land that are secure and easily transferable are key elements for smooth and efficient operation of land rental markets.

However, the free operation of land rental market has been constrained by various regulations (for detail, see section 6 below and Samuel, 2006). These regulations undermine the efficiency, the competitiveness and role of the markets mostly by confining the market among neighbours and relatives, who could not make the best from the rented land and/or could not offer the best rental fee to the landlord. The infancy of the market may partly be attributed to policy restrictions with the objective of controlling disguised land sales and maintain rural land's continued 'safety-net' role

[8] It could also be difficult for land renter (leaseholder) to engage into a long-term lease agreement with farmers with use right (the landlords) as the use right is not time bounded.

for vulnerable rural households[9]. Many critics say that such government interventions have failed to realize these social objectives because of high population growth, increased poverty and agricultural stagnation.

The policy challenge then is to provide a framework for encouraging and formalizing land rentals – and associated labour migration/exchanges and improvements of efficiency through scale advantages – while avoiding the downsides of rapid moves to consolidation and landlessness, perhaps as part of a phased approach that encourages a combination of off-farm diversification and migration (to farm and non-farm based livelihoods) (Samuel, 2006).

## 4. Purpose, data and methodology

- **Purpose of the study**

In a situation where land sales prohibited[10], scarcity of productive land has been increasing, population size has been growing but not labor productivity land rental markets assume a particular importance. Yet, there is no sufficient knowledge on the factors that trigger the emergence of informal land markets, the competitiveness of the market and its role in local economy as well as the factors that govern the functioning of these markets. Knowledge of such factors will help Ethiopian policy makers to design policies that can optimize positive outcomes of existing rental markets. This study, therefore, will try to shed some light on these issues by examining the operation of existing land rental markets and their implications on equity and efficiency.

Based on this review, the scope for government intervention and mechanisms to improve the functioning of land rental markets and their positive outcomes will be identified. The study will generate useful information that will help policy makers to design policies that will promote farmers' interest. This is very important as many

[9] Increasing population in the rural areas has been largely absorbed in agriculture through levelling down of holdings (both through inheritance among heirs of a family's land and through the recently discouraged but not outlawed state-led land redistributions) and distribution of communal grazing and woodland to new claimants (Mulat, 1999) rather than through alternative forms of employment.

[10] In his end-of-year report to Parliament in June 2004, the Prime Minister announced that the privatization of land in Ethiopia would take place only 'over EPRDF's dead body'.

critics say that excessive government interventions in rural areas have weakened personal incentives and destroy any form of rural social stratification that is required to encourage competition required for a sustainable rural development. A competitive, and freely operated land rental market will help to unlock personal incentives and encourage some levels of inequality in rural communities that have been destroyed by the radical land reform and increased vulnerability to drought that compels peasants to convert their assets to food.

- **Data and Methodology**

The study uses data collected recently (in 2004) by the Ethiopian Economic Association for its study on agricultural extension program in Ethiopia. The study adopted a stratified random sampling technique to select samples. Woredas were stratified by potential agricultural commodities to be produced. A total of 92 woredas were selected for the survey. They were drawn from 9 regional states (excluding Gambella) and distributed over 43 administrative zones. The majority of the zones (82%) are drawn from Oromia, Amhara, SNNPR and Tigray in that order of importance. Out of the total sample, 9 woredas (10%) are agro-pastoral and pastoral woredas selected from Afar, Somalie, Dire-Dawa and Oromia regions. The sample represents close to 20% of the total number of woredas in the country. Similarly, 21%, 19%, 12%, 20%, 9%, 20%, and 21% of the total woredas in Afar, Amhara, Benishangul-Gumuz, Oromia, Somalie, SNNPR, and Tigray were selected. Finally, 50 farm households were selected from each woreda. Although the expected total number of households is 4600, the final completed questionnaires are 4587.

The questionnaire for the survey of farm households covered data on household demographic issues, farm resources, farm management practices in crop and livestock production as well as natural resources management, input, output, post harvest activities and marketing, details of agricultural extension and technology packages, extension and gender issues, farm and household income and expenditure, farmers' assessment of the extension program and the challenges faced, and other issues. Information on the existing land rental markets – both on fixed fee rental and sharecropping arrangement – was also collected, which has been used to answer the questions raised by the study.

The survey data has been thoroughly edited and compiled. The database was created using Foxpro and made ready for analysis in Stata format. Both simple descriptive methods and regression analysis were used.

## 5. Land rental markets: Impact on equity

The current system of land tenure in rural Ethiopia emerged partly as a result of population pressure and land scarcity, and partly as a result of government interventions in land redistribution. Although the current constitution guarantees peasants and pastoralists free access to land, it is not clear how free access can be assured given mounting population pressure (Fafchamps, 2000). It is not only high population pressure, but also low migration and employment opportunity in non-farm sectors that create scarcity of farm land in rural Ethiopia. Even though the fundamental solution to this continued problem is to improve the productivity of farmland and labor, land rental market has a very critical role in catalyzing this process. It could also relax the problem of land scarcity which has been created partly by low farm productivity and existing truth in rural Ethiopia that has forced everybody to till land to sustain his/her life. There are two or three ways to realize these positive outcomes of land rental market. First, land rental market could lead to high land and labor productivities by allowing land transfer from less productive to more productive farmers. On the other hand, it could facilitate migration that will help for the expansion of non-farm employments. It could also help for the development of a cash economy in rural Ethiopia.

Results from this study indicate that the size of land rental markets (both fixed fee rental and sharecropping) in Ethiopia is high. Taken together fixed rental and sharecropping, 22% and 23% of households in Tigray and Amhara regions, respectively, cultivate someone else's land obtained through land rental market. At national level, the figure is 13.4%. Land rental market is limited in SNNPR region where population pressure and land scarcity is said to be high. Only 4% of the sampled households reported the use of someone's land in SNNPR. In terms of the size of the land supplied to land rental markets, 19% to 22% of total land owned by surveyed farmers was marketed in Tigray, Amhara, and Oromia regions. In comparison to the size of non-marketed land, land marketed through rental market constitutes 21.2%, 27.9% and 23.4% in Tigray, Amhara and Oromia regions, respectively (see Table 1). In general, survey data indicate that the size of the land market is high both in terms of the number of market participants and size of land supplied to the market[11].

[11] As land market is still not formally recognized or supported by institutions, the author expected the existence of some unreported transactions especially in regions where tenure insecurity is high.

**Table 1: Land Transactions in Ethiopia: Size of market**

| | | Tigray | Amhara | Oromia | SNNPR | Other regions (Excluding Gambella) | Ethiopia |
|---|---|---|---|---|---|---|---|
| Size of market | % of HHs engaged in land markets (HHs who cultivated someone's land) | 21.7 | 23.1 | 13.3 | 4.0 | 7.8 | 13.41 |
| | % of total marketed land as of total available farm land | 19.25 | 21.79 | 19.31 | 4.56 | 17.18 | 17.40 |
| | as of non-marketed land | 21.22 | 27.87 | 23.93 | 4.78 | 20.74 | 21.10 |
| Average size of land per transaction (ha/hh) | Rent-out | 0.38 | 0.65 | 0.65 | 0.25 | 2.00 | 0.69 |
| | Rent-in | 0.64 | 0.91 | 0.98 | 0.88 | 0.98 | 0.95 |
| | Share-out | 0.71 | 0.69 | 0.86 | 0.49 | 0.67 | 0.77 |
| | Share-in | 0.76 | 0.85 | 1.10 | 0.45 | 1.79 | 1.01 |
| Average payments | Fixed rent (Br/ha) | 640.2 | 383.7 | 415.8 | 653.3 | 421.2 | |
| | Sharing (% of total output) | 48.9 | 47.7 | 47.1 | 53.6 | 43.0 | |
| Number of years land rented-in or shared-in consecutively | Fixed rent | 2.7 | 2.7 | 3.08 | 4.0 | 2.1 | |
| | Sharing | 2.5 | 4.5 | 3.3 | 2.6 | 3.2 | |
| N | | 350 | 994 | 1889 | 852 | 500 | 4585 |

Annual fee for land cultivated through sharecropping is not fixed as it varies with the amount of harvest of the tenant. Survey data indicate that it varies between 47% in Oromia and 54% in Southern region. On the other hand, annual fee for fixed rental land varies between 384 Birr for a hectare of land in Amhara region and 653 Birr in SNNPR. Land is expensive in Tigray and Southern regions. These differences in rental fee could be explained in terms of variations in land productivities and the competitiveness of the land rental market (supply and demand factors) in the different regions.

In the four major regions, the average size of land per transactions varies between 0.25 and 0.65 ha for fixed rental land. However, the size of the land that is cultivated by a tenant is a little higher than this and varies between 0.64 and 0.98 hectare (Table 1). This variation on the size of land per transaction and the average size of land a tenant rented-in could be attributed to the following factors. A tenant could rent-in land from more than one landlord or those who rent-out their land may have underreported the size of land they actually supplied to the market which could be the case as in some regions farmers are not allowed to rent-out all of their land. On the other hand, the size of land per transaction for sharecropping varies between 0.50 and 0.86 hectares.

Average contract period for fixed-term land rental markets was three successive years in Tigray, Amhara and Oromia, while it was four years in SNNPR. Average sharecropping period was for about 2.6 consecutive years in Tigray and SNNPR, 4 or 5 years in Amhara; while in Oromia, the average contract period prevailed for 3.3 consecutive years.

- **Policy implications**

The information generated by the study and discussed above has important policy implications for resolving existing unsettled issues in land rental market like issues related to the length of contract period and size of land peasants are allowed to supply for land rental market which have important implications on the efficiency and equity impacts of rental markets.

The study had assessed the impact of land rental market on equity. The impact of rental markets on equity as mentioned earlier could be measured in terms of its power to allow land transfer from land rich to land poor (including landless) farmers, from labor poor (that may include female headed households) to labor rich or help land transfer from sick to healthy persons. It could be also considered to have a positive impact on equity if it helps for generation of employment. A close analysis of the questions, who participated in the land rental market? and why? provide information on the factors that trigger households to participate in the land rental market. It could also provide clue on the impact of rental market on equity (i.e. welfare implication on the two parties).

The survey data indicate that land rental market allows land transfer from labor poor to labor rich farmers. Especially having adult labor (aged between 10 and 49) is very important. For instance, the number of adult labor for households which share-in land exceeds almost by 30 percent when compared to households that share-out their land. Similarly, households that rent-in land have on average 20% more adult labor than households that rent-out their land. There is also a similar pattern for ox and livestock ownership. However, the reverse is true for land ownership. Despite the egalitarian nature of land ownership, households who cultivate someone's land have on average 15% less land than those households who rent-out or share-out their land. Land rental market, therefore, facilitates the transfer of land from households who owned less draft oxen and adult labor to households who owned more of these resources. In general, in a country where factor markets don't exist or operate in an imperfect environment, land rental market is playing a role to compensate the weakness of factor markets especially the negative impact of the absence of active rental market in oxen and imperfections in credit market. It also helps to harmonize the allocation of different factors of production among different farm households and, consequently, to improve allocative efficiency.

Existing land rental markets have also transferred land from old to younger people. The average person who rented-in land is on average 8 or 9 years younger than those rented-out. On the other hand, rental market has also allowed land transfer from sick persons to healthy persons. When compared to households that rent-in or share-in land, the percent of household heads who were sick in the past 12 months is on average 20% and 34% more in those households which share-out and rent-out their land, respectively markets to improve the welfare of both parties that were involved in land rental market. y. Beyond potential gains in efficiency, all these indicate the positive contribution of land rental

When looked in terms of gender composition, most land transactions have been carried-out from female-headed households to male-headed households. The number of female-headed households that rent-in or share-in land is on the average 4%, while on average 30% of female-headed households rent-out or share-out their land. This might have created gender disparity in the market but, under the existing market situation, is largely useful for the welfare of both parties involved in the market[12].

[12] This should not be interpreted as the market benefited female-headed households at the level that what a competitive market could offer. As we will see later, households who leased-out their land got less than

**Table 2: Characteristics of households who participated in land rental market**

| | | HHs not engaged in land transactions | HHs engaged in land transactions | | | |
|---|---|---|---|---|---|---|
| | | | Rented-in land | HHs Shared-in land | Rented-out land | HHs Shared-out land |
| | | Ownership per average household | | | | |
| Resource ownership | Land (including pasture land) (ha) | 1.05 | 0.99 | 0.90 | 1.17 | 1.07 |
| | Labor (ME) | 2.8 | 3.2 | 3.1 | 2.8 | 2.4 |
| | Ox (number) | 1.73 | 2.05 | 1.91 | 1.5 | 1.4 |
| | Livestock (TLU) | 3.62 | 5.38 | 4.86 | 3.66 | 3.35 |
| HHs characteristics | Sex (% of female headed HHs) | 14.1 | 3.6 | 4.7 | 22.9 | 36.7 |
| | Age | 43.4 | 42.7 | 43.8 | 50.9 | 50.7 |
| | Number of persons | 6.15 | 6.74 | 6.62 | 5.69 | 4.83 |
| | Number of persons between 10 and 49 | 3.75 | 3.93 | 3.75 | 3.19 | 2.73 |
| Health condition of head 12 months prior to the survey (% sick) | | 30 | 24 | 23 | 34 | 46 |
| Use of hired/exchanged labor (% of hhs hired labor) | | 19 | 47 | 31 | 13 | 19 |
| N | | 2122 | 439 | 404 | 70 | 90 |

Land rental market has also contributed for employment generation. Households that rent-in or share-in land employed twice non-family labor (hired labor) than the average households that did not engage in the market. This is expected to improve the social welfare of the community. In general, existing informal land transactions have contributed to the objective of equity by enhancing the welfare of both parties involved in the market and the community at large.

The study has also tried to assess the existence of any relationship between households' food security and income level and their participation in the land market. Survey data shows that most of the households who supplied land to the rental market are food deficit, while the reverse is found true for households' leased-in land. On average 73% of households who leased-out land are food deficit, while the

one third of what the most inefficient farmer gets from a hectare of land. Under a competitive market, the minimum rental fee should be the minimum net farm income level.

corresponding figure for households leased-in land is about 47%. The average households who rented-in land produced 600 kilogram of surplus grain, while the average household who rented-out its land had a deficit of about 320 kilogram of food. On the other hand, households who did not take part in the market are almost food secure. In general, survey data indicates that the need to become food self sufficient has a low probability to initiate participation in land rental market. However, being food insecure (for households leased-out) and/or the need to earn more income and fight poverty (for households leased-in) could trigger participation in land market.

**Table 3: Food security level and income of households who participated in the rental market**

| Basic characteristics of participants of land market | HHs not engaged in land transactions | HHs engaged in land transactions | | | |
|---|---|---|---|---|---|
| | | Rented-in land | HHs Shared-in land | Rented-out land | HHs Shared-out land |
| Percent of food secured households (from own production, exclude root crops) | 26% | 56% | 50% | 23% | 29% |
| Food grain balance (kg/average household) | -62 | 599 | 137 | -320 | -238 |
| Household income (Birr) | 2957 | 3382 | 3222 | 1741 | 1470 |
| Per capita hh income (Birr) | 506 | 519 | 523 | 314 | 238 |
| N | 2122 | 439 | 404 | 70 | 90 |

Despite the aforementioned statistics which could indirectly imply the impact of land rental market on equity, the level of variation between the forgone income by households' decision to rent-out their land (i.e. the minimum net farm income that could be generated if the land remains in the hand of its owner) and the rental fee is the ultimate indicator of the market on the welfare of market participants. Survey data indicates that rental fee for a hectare of land during the survey year varied between 384 and 653 Birr, while net-farm income that could be generated from a hectare of land was in the range of 1434 and 4669 Birr. This implies that the minimum rental fee should be Birr 1434 for a hectare of land. It could be, therefore, concluded that land rental market does not have a positive impact on equity, if it is defined in terms of

economic relationship between the two parties[13]. However, if households who leased-out their land had no opportunity to farm their land, the benefit was to both parties. Moreover, if we define equity in a more broader perspective that includes the welfare of all community members, land rental market improves the welfare of the community as it enhances productivity of resource that could otherwise be underutilized, and creates the opportunity to produce more food at community level.

- **Implication on existing land administration laws/directives**

Land administration laws of some regions like Oromia allow farmers to lease not more than half of their land, and only up to three years (Fafchamps, 2000). Even the present draft proclamation on rural land administration and use which is expected to be ratified by parliament stated in article 8, number 1 that *"peasant farmers who are given holding certificates can lease to other farmers or investors* ***land from their holding*** *of a size sufficient for the intended development in a manner that* ***shall not displace them****, for a period of time to be determined by rural land administration laws of regions based on their particular local conditions"*[14]*.*

The draft proclamation has indicated that the size of land peasants are allowed to lease out could either be determined by authorities or only a portion of their land as indicated by the phrase 'land from their holding'. However, experiences from existing land rental markets indicate that the average size of land per transactions is near to the average size of land owned by a peasant[15]. This implies that any attempt to restrict the size of land to be rented out may not be in the best interest of farmers. In general, the minimum size of land a given farmer is allowed to supply for rental market should not either be limited or be less than 1 hectare in Oromia or 0.85 ha in Amhara if one wants to allow current practices of average farmers to continue.

There is no cutoff point in the new draft proclamation for the size of land a given tenant or investor can rent-in. The proclamation may assume that existing realities in rural Ethiopia will not lead to land concentration. However, it would have been better

[13] This is contrary to what the statistics on socio-economic characteristics of market participants suggest.
[14] The document has been distributed by the outgoing parliament for public comment and the author has sent 3 pages of comments. The author has no information whether the law is ratified or not.
[15] As most of existing regional governments' law restricts the size of land a peasant farmer can rent-out, the data provided by peasants on the size of rented land may be on the lower-end.

if it limits the maximum size of land to be rented-in[16] rather than restricting the size of land a farmer is allowed to rent-out from his existing meager and largely less productive lands.

The draft proclamation delegates regional governments to decide on the number of years farmers' are allowed to lease out their farm lands and implement it based on what it says *"their particular local conditions"*. Theoretically, the length of the period should not be lower than peasants land use right period or the length of the period a farmer is allowed by the government to farm his/her land. However, the draft proclamation has put no time limit on peasants' land use right period. It also contained other articles that could trigger land redistribution any time[17]. These conditions could create uncertainties that undermine market competitiveness and make farmers to engage in time-bounded or long-term contract difficult which are vital to optimize the positive outcomes of land rental markets.

Some articles in the draft proclamation could also create some practical difficulties for regional governments to draft their own decree in terms of specifying the length of the time peasants are allowed to transfer their land use right to a third party through land rental markets. The proclamation also delegates regional governments to decide the upper limit of contract period based on their particular local condition. But it is unrealistic for some regions with large and diversified conditions to have one law for every farmer found in their region. The draft proclamation also declares that land rental market shall not displace landlords (peasant farmers having land use rights). This makes it difficult and insecure for farmers (landlords) to lease-out their land and migrate to other places in search of non-farm employment opportunities.

If experiences from existing informal land rental markets guide future actions, however, it would be better for policy makers to let farmers to decide on the number of years they are allowed to rent or share out their land themselves. However, to make this recommendation workable farmers should first know the minimum use right

[16] The maximum size of land a given farmer is allowed for renting or sharing could be decided by taking equity (employment) and efficiency factors into consideration.

[17] Article 9 of the draft proclamation put many conditions that could lead to deprivation of land use rights. It states that land use right could be dispossessed if holders are deceased and have no heirs or gone for resettlement or left the locality on own wish and stayed over a long-period of time. It also states that upon the wish and resolution of peasants and where land redistribution becomes the only alternative, land will be redistributed taking into consideration the minimum desired size of holding. It also says that land distribution will be undertaken on irrigable land in order to use irrigable land properly and equitably.

period. On the other hand, if policy makers have a reason to limit the maximum number of years land rental contracts to reign they should base their judgment on the following two factors. First, they should consider the motives that trigger or force farmers to engage in land transactions both as seller or buyer of land use rights. Second, as mentioned earlier, policy makers could consider the experiences of existing informal land rental markets as they reflect farmers' interest. For instance, data from this study indicate that a maximum of 5 years doesn't seem to contradict the present practices of farmers engaged in informal land rental markets. However, to create sufficient conditions for farmers to make short-term and long-term investments on their land, policy makers should provide long-term land use right a period not less than 15 years[18].

## 6. Land rental market and economic efficiency

Currently, close to 11.5 million farmers are said to be engaged in farming and other agricultural activities in Ethiopia. These farming units are quite heterogeneous. There are marked variations in agricultural resource endowments. A considerable portion of farm households do not own oxen for draft power. CSA indicates that the number of draft oxen per farm household is 1.02 (CSA, 2003). There are households with insufficient labor force (inadequate labor supply for lack of energy, health or small number of adult members). Capital in terms of seed, cash to purchase modern inputs and other services are also problems that constrain production.

Under such circumstances, there is no doubt that part of the country's agricultural land is underutilized because of lack of one or more of the essential inputs for production. Many cases of land rentals and sharecropping that take place currently arise from such conditions. Hence, land markets have important resource transfer and reallocation roles that would benefit the development of the agricultural sector and the economy at large (Berhanu, 2004).

A recent study by EEA/EEPRI and the World Bank researchers (Deininger et al, 2003) confirmed that improving security of land ownership and transferability of land in Ethiopia can have a significant impact on overall output and household welfare.

[18] This is what China has implemented.

Econometric analysis indicates that through its impact on investment in terraces for soil conservation alone, abolition of further administrative redistribution of land is estimated to increase annual output by about 1.5%. Adding transferability of land rights would increase output by an additional 4.4%.

The present study had examined some of the factors that the literatures point out as the positive roles of land rental markets on agricultural efficiency. These factors include improved investments on farms, better allocation of production factors to enhance allocative efficiency in resource use, contribution to labor mobility and development of a vibrant off-farm economy. Improved efficiency in the use of agricultural extension services could also be considered as one of the expected gains from land rental market which expected to allow land transfer from farmers who use the services of agricultural extension less intensively than those who use more regularly and exhaustively.

**Table 4: Land transactions and farm efficiency in Ethiopia**

| | | HHs not engaged in land transactions | HHs engaged in land transactions | | | |
|---|---|---|---|---|---|---|
| | | | Rented-in land | HHs Shared-in land | Rented-out land | HHs Shared-out land |
| Use of modern farm-inputs | % of HH utilizing improved seeds[19] | 33 | 50 | 45 | 34 | 22 |
| | Intensity of improved seeds use (Kg/ha) | 83 | 149 | 146 | 79 | 66 |
| | % of HH utilizing inorganic fertilizers | 57 | 79 | 78 | 51 | 53 |
| | Intensity of Fertilizer use (Kg/ha ) | 125 | 160 | 183 | 71 | 47 |
| Money spent on land (variable cost) (Br./ha) | | 258 | 487 | 379 | 227 | 189 |
| Intensity of primary factors' use | Labor-land ratio (amount of potential labor on 1 hectare of land) | 3.86 | 4.21 | 4.55 | 2.91 | 2.60 |
| | Ox-land ratio (amount of potential ox on 1 hectare of land) | 2.04 | 3.14 | 2.48 | 1.87 | 1.29 |
| Availability of labor and | Number of persons between 10 and 49 | 1.91 | 2.09 | 2.11 | 1.48 | 1.20 |
| Use of hired labor | Use of hired/exchanged labor (% of hhs) | 19 | 47 | 31 | 13 | 19 |
| N (for cases not specified) | | 2122 | 439 | 404 | 70 | 90 |

[19] Households reported for their use of improved seeds seems exaggerated. The reported figures could be better to be interpreted as households tested (or have experience with) improved seeds.

The result indicates that land rental markets have positive effects on agricultural efficiency in two ways: it helps farmers to intensify their use of purchased farm inputs and improves the reallocation of primary factors of production. There is a marked difference in fertilizer use among households that acquire farm lands through rental markets and households that lease out their lands. Among the surveyed 4585 households, on average 78% of farm households that rent-in or share-in land applied inorganic fertilizers which exceeds by 26% and 21% when compared to households which rent-out land and did not participate in land rental market, respectively. The intensity of fertilizer use is also high among farmers who rent-in or share-in farm lands. Fertilizer application on a hectare of land was about 160 kg and 183 kg for households that rent-in and share-in lands, respectively. However, it is only 71 and 47 kg for households that rent-out and share-out, respectively, their farm lands (Table 4).

There is also a similar trend in the use of improved seeds. On average about 48% of farmers that rent-in or share-in land use improved seeds, while only 28% of farmers that did not engage in land markets use this important technology. Moreover, the intensity of improved seeds use is high in the former case. The intensity of improved seeds use on a hectare of cultivated land is about 148 kg for farmers who rent-in or share-in land, which is higher than by 65 kg and 75 kg when compared to farmers that did not participate in land markets and rent-out/share-out their land, respectively. In general, land rental market encourages short-term investments on land. Survey data indicate that households' leased-in land doubled their investment on land. The result could imply the positive impact of land rental market on long-term investment that could be materialized if long-term land rental markets are allowed.

Land rental markets have also a positive impact on improving the reallocation of factors of production. The market seems to contribute for land consolidation and formation of economically viable farm units that help more efficient use of farm resources. Farm households that rent-in or share-in lands have not only applied more improved technologies, but also got the opportunity to use labor and ox that otherwise could be underutilized or unutilized. The ratio of labor to land or draft-oxen to land is high among households that have got land through rental market. For instance, labor-land ratio and oxen-land ratio among households that rent out their land through fixed rental or sharecropping arrangement is only 63% and 56%, respectively, of households that rent-in or share-in lands.

Participation in non-farm activities is slightly higher for households that marketed their land. Survey data indicate that about 36% of households that rented-out (or share-out) their land participated in non-farm activities, while the corresponding figure for those who rented-in or shared-in land is only 29% and 33% for those who didn't participate in land rental markets. However, in terms of income from non-farm activities, remittance or relief it is not households that spent their time more on non-farm activities that earn more. The average household that rent-in (or shared-in) land earned about 1106 Birr from these activities, while those who rent-out (or shared-out) got on average about 510 Birr per annum. In general, the data imply that households that rent-out (or share-out) their land have engaged in more diversified income generating activities but earn less while the reverse is true for households that rent-in (or share-in) land. This implies that households who got extra land from rental market are not only doing better in their farming activities but also in their non-farm activities probably through concentrating on few activities that help them to realize the benefit of specialization. The positive relationship between the amount of cash income from non-farm activities and high level participation in land rental markets may depict the fact that the level of non-farm activities in the study areas are too small to affect farming activities negatively.

**Table 5: Land Transactions and participation in off-farm employment and agricultural extension services in Ethiopia**

| Households' participation in non-farm activities and extension programs | | HHs not engaged in land transactions | HHs engaged in land transactions | | | |
|---|---|---|---|---|---|---|
| | | | Rented -in land | HHs Shared-in land | Rented-out land | HHs Shared-out land |
| Participation in non-farm activities | % of HH head participated | 33 | 28 | 30 | 39 | 32 |
| | % of other members participated | 41 | 37 | 39 | 41 | 46 |
| | Cash income from non-farm activities including remittance and relief (Birr/hh/annum) | 674 | 859 | 721 | 87 | 398 |
| | Value of non-farm earnings obtained in kind (Birr/hh/annum) | 331 | 183 | 448 | 308 | 227 |
| Agricultural extension and land transactions | HHs that had participated in extension package programs? % | 49 | 75 | 76 | 45 | 45 |
| | HH heads that have contacted village DAs: % | 73 | 88 | 84 | 52 | 69 |
| | HHs interest for more frequent contact with DA: % | 86 | 90 | 94 | 62 | 78 |
| | HHs participated in trainings: % | 40 | 61 | 56 | 32 | 34 |
| N (for cases not specified) | | 2122 | 439 | 404 | 70 | 90 |

Households that rented-in (or shared-in) land participated better in extension programs and had more contact with village development agents (DAs). Moreover, they have participated in extension trainings more frequently, listen more to agricultural programs from radio, and have high interest for close contact with DAs in the future[20]. The high use of agricultural extension services among households that rent-in lands may indicate that they opt for concentrating in their farming than those who rented-out opted to diversify their livelihood to non-farm activities.

**Table 6: Land market and productivity**

| Basic characteristics of participants of land market | | HHs not engaged in land transactions | HHs engaged in land transactions | | | |
|---|---|---|---|---|---|---|
| | | | Rented-in land | HHs Shared-in land | Rented-out land | HHs Shared-out land |
| Labor productivity | Birr per adult labor | 971 | 1085 | 1040 | 459 | 481 |
| | Birr per working hour | 2.01 | 3.1 | 1.0 | 1.3 | 1.2 |
| Land productivity | Gross margin (Br./ha) | 1471 | 1458 | 1309 | 1064 | 1165 |
| | Net farm income (Br./ha) | 1293 | 1230 | 1150 | 989 | 850 |
| N | | 2122 | 439 | 404 | 70 | 90 |

Survey data indicates the importance of land rental market in improving the return to key resources (land and labor). Households leased-in and cultivate someone's land have better land and labor productivity. HHs leased-in land makes 24% more from a hectare of land than those who leased-out (especially, among participants in land sharing market). Similarly, farm labor productivity among households who leased-in lands is 64% higher than households who leased-out their land. As the government claims that Ethiopia's development strategy is mainly targeted for efficient use of land and labor, land rental market should be considered by the authorities as one of the instruments to realize its strategy.

[20] This could be a two-way cause-effect relationship; however, the point is that households that rent-in (or share-in) use more of services provided by the agricultural extension system.

## 7. Econometric evidence

A regression model is estimated to verify some of the results obtained through the descriptive analysis and establish whether basic economic relationships assumed to initiate farmers to participate in land rental market is supported by empirical evidence.

Farmers' decision to participate in the land rental market (i.e. the decision to lease-in or lease-out land both in fixed rental and sharecropping markets) is estimated using the probit model which is expressed using the following equation:

$$I_i = \beta_1+\beta_2 X_i \qquad \textbf{(1)}$$

where $I_i$ is observed decision of a given household to take part in land rental market or not and it is defined as $I_i=1$ if $I^*>1$ and $I_i=0$ if $I^*<0$ where $I^*$ is the critical or threshold level of the index of personal and non-personal characteristics of a given farmer that taken as to separate farmers leased-in and leased-out farm land in the land rental market, and

$\beta_i$ represents various exogenous variables that affects farmers' decision to take part or not in the extension program.

The threshold $I^*$, like $I_i$ is not observable, but if we assume that it is normally distributed with the sane mean and variance, it is not only to estimate the parameters of the index given in (i) but also to get some information about the unobservable index itself. The calculation which is given by Gujarati is as follows:

Given the assumption of normality, the probability that $I^*$ is less than or equal to $I_i$ can be computed from the standardized normal cumulative distribution function (CDF) as

$$P_i = P(Y=1|X) = P(I^* \leq I_i) = P(Z_i<\beta_1+ \beta_2 X_i )=F(\beta_1+ \beta_2 X_i) \qquad \textbf{(2)}$$

Where $P(Y=1|X)$ means the probability that an event occurs given the values of the X, or explanatory variables and where $Z_i$ is the standard normal variable, i.e., $Z\sim N(0, \sigma^2)$. F is the standard normal CDF, which written explicitly in the present context is:

$$F(I_i) = 1/\sqrt{2\pi}\, {}^{h}\!\int_{-\infty} e_{-Z}^{2/2} \qquad \textbf{(3)}$$

$$= 1/\sqrt{2\pi}^{\beta 1+ \beta 2Xi} \int_{-\infty} e_{-Z}^{2/2}$$

Since P represents the probability that a household decides to participate in the land market, it is measured by the area of the standard normal curve from $-\infty$ to $I_{i.}$

Now to obtain information on $I_{i.,}$ the utility index as well as on $\beta_1$ and $\beta_{2,}$ we take the inverse of (2) to obtain:

$$I_i = F^{-1}(I_i) = F^{-1}(P_i) \quad \textbf{(4)}$$
$$= \beta_1 + \beta_2 X_i$$

where $F^{-1}$ is the inverse of the normal CDF. This equation was estimated using STATA.

Many variables ($X_i$) were hypothesized to influence farmers' decision to participate in the land rental market. The ability and willingness of farmers to participate in the land rental market is hypothesized to be influenced by household characteristics, resource endowments, productivity, and use of farm technologies, household food security and income level, income from non-farm activities. Details of the variables hypothesized to influence farmers' participation are listed below. The dependent variable is dummy variable where it is equal to one if farmers participate in the land-rental market (if leased-in or leased-out) and equal to zero, if not.

Despite high correlation between factors that lead households to participate in fixed rental market or land sharing (or crop-sharing) markets, they could not be affected by the same factors, and consequently two regressions were carried-out.

**Table 7: Variables considered in the regression model**

| HH characteristics | Hypothesis |
|---|---|
| - Age of hh head | Age could be considered as a proxy for experience and could affect decision to participate in either way. But being young could induce households to lease-in someone's land. |
| - Sex of household head (dummy) | As a male-dominated society, participation in land market is assumed to have a gender-divide. |
| - Literacy of household head (dummy) | Education could improve access to information on new ideas and inputs provided by extension workers. |
| - had spent 9 or more years in school (dummy) | Therefore, the more the household head is educated, the more likely s/he is to participate in land rental market (lease-in someone's land) and earn more. |
| **HH Resource Ownership** | |
| - Household labor availability (Man equivalent) | Participation in land rental market could lead to higher or intensive management of farm activities. Hence, higher size of labor is expected as a positive element for participation. |
| - Household size (Adult equivalent) | Household size is hypothesized to affect participation in some way depending on other household characteristics. |
| - Own oxen (dummy, none, or one or more) | Having no oxen (draft power) is hypothesized to trigger households to supply their land either in fixed or crop-sharing market. The reverse is true if households own more oxen. |
| - Own oxen (dummy, one or less, versus two or more) | |
| - Total cultivated land (hectare) | Size of land cultivated by peasants is hypothesized to affect participation in some way depending on other household characteristics. |
| - household total income (Birr/household) | Even though farm technologies were disseminated to farmers with credit, they have been demanded partial down payments. Hence, the level of household income could enhance the chance for farmers to participate in extension. |
| - household non-farm income (Birr/household) | Households' income from non-farm activities could enhance or hold back participation in land rental market depending on the level of its competition for labor for farm activities. |
| **Extension and resource productivity** | **Hypothesis** |
| - had participated in the extension program (dummy) | Participation in extension program and having high return to land and labor could initiate farmers to look for more land. On the other hand, farmers utilizing their land less efficiently could supply land to the rental market (if they have other alternative livelihood like non-farm activities). |
| - land productivity (return to farm land, net) (Birr/hectare of cultivated land) | |
| - labor productivity (return to labor) (Birr/man equivalent_ | |
| **Use of improved inputs** | |
| - Use of fertilizers (dummy) | Similarly, farmers applying improved technologies could look for more land to enhance the scale of economy in technology utilizations. |
| - Use of improved seeds (dummy) | |

## 8. Results of the econometric analysis

Table 8 provides summary statistics of household characteristics and some details on the use of modern farm inputs, participation in non-farm activities and extension package programs. The average household size varies between 4 and 7 persons. Households that share-in or rent-in land have a larger family size and more adult labor. They are also headed by younger and male people than households who rent-out or share-out their land.

As expected households who rent-in or share-in have a slightly smaller land size but own more draft-oxen, livestock and labor. The average household that rent-in land has 4.21 units of labor and 3.14 units of oxen per one unit of land, while those who rent-out their land have only 2.91 units of labor and 1.87 units of oxen on the same land. Similarly, those households who share-in someone's land have 4.5 and 2.5 units of labor and oxen, respectively, on a hectare of land, which unfavorably compare to 2.6 and 1.3 units of labor and oxen, respectively, for households which share-out their farm land. Similar differences are reflected in the use of modern farm inputs and participation in extension package programs and non-farm activities. For instance, 48% of households who share-in or rent-in reported that the average use of improved seeds was 148 kilogram on a hectare of land. The corresponding figures for households who rent-out or share-out their land is only 28% and 73kg/ha. Similar trend is observed in terms of participation in extension programs. About 75% and 86% of households who rent-in or share-in land reported that they had participated in the extension package program and have recently contacted extension agents, respectively whereas only 45% of households who rent-out or share-out their land had any experience of the package program. However, 61% of them reported that they have met extension agents once or more in the past 12 months.

All surveyed households have reported that they had participated in non-farm or off-farm activities. On average 1.5 persons were engaged in non-farm income generating activities on one or more occasions in the past 12 months. Unlike the marginal difference in participation in non-farm activities, average income from such activities varies significantly among households. In general households who rent-out or share-out their land earned less from non-farm activities.

**Table 8: Summary statistics of participants of land rental markets**

| | HHs who participated in fixed rental market | | HHS who participated in share-cropping arrangement | |
|---|---|---|---|---|
| | Rent-out | Rent-in | Share-out | Share-in |
| **Resources and basic characteristics of household head** | | | | |
| Own land (ha) | 1.17 | 0.99 | 1.07 | 0.90 |
| No. of people less than 10 | 1.55 | 2.11 | 1.06 | 2.07 |
| No. of people between 10 and 49 | 3.19 | 3.93 | 2.73 | 3.75 |
| No. of people above 50 | 0.68 | 0.34 | 0.79 | 0.44 |
| Has male household head | 74% | 96% | 58% | 95% |
| Age of household head | 50.8 | 40.9 | 51.8 | 42.9 |
| Has literate household head | 38% | 59% | 25% | 57% |
| Draft ox ownership (No./HH) | 1.5 | 2.05 | 1.4 | 1.91 |
| Livestock ownership (TLU/HH) | 3.66 | 5.38 | 3.35 | 4.86 |
| Labor land ratio | 2.91 | 4.21 | 2.6 | 4.55 |
| Oxen land ratio | 1.87 | 3.14 | 1.29 | 2.48 |
| Health status of household head (% sick in the past 12 months) | 34% | 24% | 46% | 23% |
| **Use of modern farm inputs** | | | | |
| Percent of households reported applying improved seeds | 34 | 50.2 | 22.4 | 45 |
| Amount of improved seeds used (kg/ha) | 79 | 149 | 65.9 | 145.9 |
| Percent of households applied fertilizers | 51.4 | 78.8 | 53.3 | 77.5 |
| Amount of inorganic fertilizer used (kg/ha) | 71.1 | 159.9 | 46.9 | 182.7 |
| **Participation in non-farm activities** | | | | |
| Number of persons who participated | 1.47 | 1.63 | 1.57 | 1.6 |
| Total income (Br./household) | 395 | 1042 | 625 | 1169 |
| Cash income (Br./household) | 308 | 183 | 398 | 448 |
| **Participation in extension package and programs** | | | | |
| Percent who participated in extension package | 45 | 75 | 45 | 76 |
| Percent who had contact with DA in the past 12 months | 52 | 88 | 69 | 84 |
| Future interest on extension program | 62 | 90 | 78 | 94 |
| Percent listened to radio | 21 | 34 | 10 | 29 |
| Percent of hh who participated in trainings | 32 | 61 | 34 | 32 |

**Table 9: Regression results – determinants of participation in market**

| | Participation in fixed rental market | | Participation in share cropping arrangement | |
|---|---|---|---|---|
| | **Rent-out** | **Rent-in** | **Share-out** | **Share-in** |
| Owned land (ha) | -0.024 | 0.199*** | -0.153 | 0.238*** |
| Labor (ME) | -0.113 | -0.038 | -0.041 | -0.074* |
| Sex (dummy) | -0.328** | 0.483*** | -0.432*** | 0.445*** |
| Logage (years) | 1.093*** | -0.351*** | 0.428** | -0.117 |
| Literacy (dummy) | -0.249* | 0.027 | -0.212 | 0.096 |
| Spent 9 or more years in school (dummy) | -0.096 | 0.061 | 0.317 | -0.139 |
| Oxen (dummy) | -0.333 | -0.029 | -0.709*** | 0.508* |
| Household size (AE) | 0.012 | -0.012 | -0.124* | -0.061* |
| Use of fertilizers | 0.215 | 0.302*** | 0.153 | 0.317*** |
| Participation in extension | -0.017 | 0.299*** | 0.175 | 0.285*** |
| Food security level (from own production) | -0.000 | 0.000 | -0.000 | -0.000*** |
| Household income | -0.000 | 0.000** | 0.000** | 0.000*** |
| Income from non-farm activities | 0.000 | 0.000 | -0.000 | 0.000 |
| Net-farm income (Br./ha) | -0.000 | 0.000 | -0.000*** | -0.000 |
| Gross farm income (Br./ha) | 0.000 | -0.000 | 0.000 | -0.000 |
| Labor productivity (Br./ha) | -0.001 | -0.001 | -0.003 | -0.0314*** |
| N | 3670 | 3670 | 3670 | 3670 |
| Log-likelihood | -238.43 | -1069.45 | -267.23 | -937.25 |

Econometric results from the probit model indicate that households headed by female and old persons have high probability to rent-out their land. The same is found true for households having illiterate heads. On the other hand, the likelihood to rent-in farm lands is high among households with relatively large farm sizes and headed by male and younger persons. Similarly, participation in the extension package program, use of fertilizers and the level of household income were found statistically significant to influence positively households' decision to rent-in and cultivate someone's land. However, there is significant variation among the different regions[21].

[21] Results from regional level regression analysis are not reported.

The factors that trigger participation in crop-sharing (land-sharing) market are largely different from those that prompt farmers to engage in fixed-fee rental market. Households' decision to lease-out their land in crop-sharing arrangements is significantly influenced by most social and economic factors. For instance, if the head of the household is female or old person, the likelihood of the household to share-out their land is high. On the other hand, households with no oxen, low family size and land productivity have high probability to engage in crop-sharing arrangement. Contrary to what is expected, households having high income here also high probability to share-out their land.

On the other hand, having more ox, more land, and less labor, participation in extension and fertilizer adoption, low food self-sufficiency level, low labor productivity, and high household income are found statistically significant to influence positively households' decision to lease-in land.

## 9. Conclusion and policy recommendations

Due to abject poverty, improving tenure security is not a sufficient condition to induce investment, especially long-term investment. Therefore, any land-reform should be accompanied by measures that could induce investments on land, irrigation and other alternatives that could increase the productive capacity of farmland and its sustainable utilization.

Recent literatures on the causes of long-term agricultural stagnation in Ethiopia have started to widen the thinking on Ethiopian agriculture by bringing the widespread homogeneity of peasants (or too little inequality) in rural Ethiopia into the picture (see Stephen, 2005; Rahmato, 2005). Critics say that the extent of rural homogeneity has gone too far to undermine the effort that has been made to bring about rural development through destroying personal incentives and motivations. It is the frequent land distribution through state-sponsored program and intra-household distribution and increased vulnerability to drought that compels peasants to convert their asset to food that has changed the rural social structure. This study has argued that a competitive land rental market has an important role in enhancing personal incentives and motivations and introduces entrepreneurship into rural Ethiopia. The following results illustrate the importance of land market:

- Land rental markets improve short-term investments on land. Peasants' leased-in land invests 52% more on land (short-term investment).
- Land rental markets also create better opportunity for citizens to fight poverty and create more wealth in their communities. Households who leased-in someone's land
  - have better labor productivity (64% more than those leased-out)
  - earn more income from the same unit of land (24% more).
- However, existing rental market is not competitive and leads to exploitative type of relationship between the two parties. The major disadvantaged groups are female-headed households and households headed by seniors (old persons). These groups have largely leased-out their land and earn less than one-fourth of what they could earn if they cultivate their land.

## Policy recommendations

- Policy makers should take further policy actions to enhance the performance of land rental market and its competitiveness by enhancing tenure security further. Policy makers could consider the Chinese experience in setting-out the time the next potential land reallocation could take place. Policy makers could also work to enlarge the size of rental market by encouraging participants beyond immediate neighbors. This will enhance the competitiveness of the market and help those households who leased-out their land to get fair payment (rental fee).
- Constraints put on land markets in terms of limiting the contract period and size of land to be supplied to the rental market should be revised to enhance the competitiveness of the market and the long-term interest of the economy.
  - Any restrictions on size of land farmers are allowed to supply for rental market which is too small or unproductive will not help. Rather, it would be better to limit the upper limit a tenant or leaseholder can farm, if the government has the intention to balance the equity and efficiency issues in its land policy.
- Once the market is started to be competitive, the government could set the minimum rental fee to protect the disadvantages (or the powerless) like female-headed households and households headed by old (retired) persons.
- Until non-farm economy and factor markets grow in rural areas, policy makers should consider land rental markets as one of the development tools available to fight
  - poverty (at community level) and low productivity of labor and land, and

  - problems caused by land scarcity, low non-farm employments, and imperfections in rural credit market
  - It also helps for a well-implementation of the new government development programs – the commercialization of peasant agriculture and livelihood diversification.
- Ethiopia's land policy should be revisited to improve the economic value of rural land. It is not fair to discourage land rental markets because of the fear of the land tenure system of the pre-revolution period. Based on research findings, policies should be formulated to enhance the positive outcome of land rental markets.

## References

Abebe Haile Gabriel. (2000). Thriving Informal Land Markets and Patterns of Entitlement Redistribution among Peasant Households. In Alemu Mekonnen and Djene Aredo (eds). pp.67-86.

Berhanu Nega. (2004). Land Markets in Ethiopia: Evidence and Policy Implications for Rural and Peri-urban areas. Issue Note. The Distance Learning Course on Land Policies for Growth and Poverty Reduction in Africa. World Bank Institute, 2005.

CSA. (2003). Ethiopian Agricultural Sample Enumeration: Statistical Report on Farm management practices, Livestock and Farm Implements. Addis Abeba (2003).

Damodar N.Gujarati. (No date). Basic Econometrics. Fourth Edition. United States Military Academy, West Point.

Dessalegn Rahmato. (2005). From Heterogeneity to Homogeneity: Agrarian Class Structure in Ethiopia since the 1950s. Forum for Social Studies, Addis Abeba.

_____. (1997). Manufacturing Poverty: Rural Policy and Micro-Agriculture. Paper presented at the workshop of the Land Tenure Project of the Institute of Development Research, November. Addis Ababa. Unpublished.

EEA. (2004). The Third Annual Report on the Ethiopian Economy. Addis Abeba, Ethiopia.

EEA/EEPRI. (2002). Land Tenure and Agricultural Development in Ethiopia. Addis Ababa, Ethiopia.

Ege, S. (1997). The Promised Land: The Amhara Land Redistribution of 1997. Working Papers on Ethiopian Development No.12. Norway: Reprocentrlen AVH, ANTU.

Jean-Marie Cour. (2003). "A demoeconomic analysis of long term structural changes in Ethiopia". In Berhanu Nega and Befekadu Degefe (eds.). "The role of urbanization in the socio-economic development process: EEA/EEPRI publications. Addis Ababa, Ethiopia.

Klaus Deininger, Songqing, Berhanu Adenew, Samuel G. Selassie, and Berhanu Nega. (2003). "Tenure Security and Land-Related Investments: Evidence from Ethiopia". World Bank, Working Paper No. 2991, 2003.

Klaus Deininger, Songqing, Berhanu Adenew, Samuel G. Selassie, and Mulat Demeke. (2003). "Land Tenure, Rural Land Transactions and Impacts on Farmers' Efficiency: Evidence from Ethiopia". World Bank Working Paper No. 2992, 2003.

Marcel Fafchamps. (2000). Land Rental Markets and Agricultural efficiency in Ethiopia. Department of Economics, Oxford University.

Samuel Gebreselassie. (2006). Land, Land Policy and Smallholder Agriculture in Ethiopia: Options and Scenarios. Paper Prepared for and Presented at the Future Agricultures Consortium Meeting at IDS, University of Sussex, 20-22 March 2006

Samuel Gebreselassie. (2004). Food Insecurity and Poverty in Ethiopia. Evidence and Lessons from Wollo. Working paper No. 3/2004. EEA/Ethiopian economic Policy Research Institute.

Stephen Devereux, Amdissa Teshome and Rachel Sabates – Wheele. (2005). Too Much Inequality or Too Little? Inequality and Stagnation in Ethiopian Agriculture IDS Bulletin Vol 36 No 2 June 2005. Institute of development Studies, UK.

# SOIL DEGRADATION, POVERTY, AND FARMERS' WILLINGNESS TO INVEST IN SOIL CONSERVATION: A CASE FROM A HIGHLAND IN SOUTHERN ETHIOPIA

Worku Tessema[1] and Stein Holden

*Abstract*

*This paper assesses farm households' perceptions of land degradation and presents empirical results of the determinants of farmers' willingness to invest in (or pay for) soil conservation practices in Gununo highland, Southern Ethiopia. Based on data collected from 140 farm households operating 556 plots, descriptive results indicate that majority of the farm households in Gununo perceive the severity of land degradation in their villages and especially on private farms, in terms of soil erosion and nutrient depletion. Contingent valuation (CV) results indicate that about 96 percent of the respondents are willing to contribute labour to conserve soil on their farms. When the payment is in cash, about 84 percent are willing to pay. Household random effects regression model is used to empirically investigate the determinants of the farm households' willingness to pay or contribute for soil conservation. The empirical results show that the willingness to pay (WTP) is affected by various factors such as perception of erosion, poverty in terms of resource endowment and cash, and plot characteristics. The results suggest that any soil conservation intervention in the area needs to consider plot characteristics, type of technology, family workforce, and farm income for successful conservation investment activities. It is also noted that the farm households are able to contribute more in terms of labour than money due to severe cash poverty. Using labour days as a payment vehicle for WTP studies in similar areas would provide a more sensible outcomes than using monetary payments.*

Key Words: soil degradation, poverty, willingness to invest, Ethiopia

[1] Department of Economics and Resource Management, Norwegian University of Life Sciences (UMB), P.O.Box 5003, 1432ÅS, Norway. Email: worku.tessema@umb.no
Permanent address: Department of Agricultural Resource Economics and Management, Awassa College of Agriculture, Debub University, P.O.Box 5, Awassa, Ethiopia. Email: wtessema@gmail.com
**Acknowledgements**
We have substantially benefited from valuable comments and suggestions from an anonymous reviewer. We also thank the participants of the 3rd International Conference on Ethiopian Economy, June 2-4, 2005, Addis Ababa, for their comments and questions on the first draft of this paper.

## 1. Introduction

Soil degradation is exhibited as one of the severe biophysical problems to sustainability of agriculture in rural Ethiopia, particularly in the densely populated highlands (Hurni, 1988; Tegene, 1992; Bewket and Sterk, 2003). The degradation, in terms of soil erosion and nutrient depletion, is said to have contributed to the low productivity of agriculture in these areas (Shiferaw and Holden, 1998; Gebremedhin and Swinton, 2003; Elias, 2002).

According to some estimates, Ethiopia loses about 1.5 billion tons of topsoil per year from the highlands by erosion caused by erosive rainfall on less protected soils (Tadesse, 2001). The country's average annual soil loss rates on cultivated land were estimated at 42 t/ha, and may reach up to 170 t/ha in the highlands while soil formation rates were only about 2 t/ha (Hurni, 1983b, 1988). A study in the highlands of Southern Ethiopia also indicated that increasing population pressure and land shortage have resulted in shortened fallow periods and cultivation of more marginal lands leading to further deterioration of the soil resource. Deforestation and overgrazing have also become contributing factors for the degradation of community lands (Ayele, 1998).

According to Tegene (1992), soil erosion is a serious problem on the Nitosols of Gununo highlands (our study area) taking away 75% of the deep, fertile, and productive topsoil from the severely eroded cultivated land. The average annual net soil loss rate on cultivated fields of Gununo was estimated at 75 tons/ha, which is much higher than the national average. Other qualitative studies in this area (Elias, 1998; Dea, 1998; Jonfa, et al 1997; Tessema, 1998) revealed that farmers in Gununo are also well aware of the severity of the soil degradation problem in their villages and especially its effect on their production. Our study also indicated that about 45% of the sample households perceived soil erosion as the most important agricultural problem followed by nutrient depletion (41%) on private lands. However, there are few conservation structures used by farmers in the area to date (Elias, 1998). Even out of those who operated plots where conservation structures were built through the Soil Conservation Research Project (SCRP) that operated in the area in the 1980s, a large number of them have partially or fully removed the structures (Tadesse and Belay, 2004). Similar results have been reported in other parts of the Ethiopian highlands (Shiferaw and Holden, 1998).

A number of studies have attempted to explain as to why farmers, while in agreement with scientific studies on the severity of soil degradation on their farms, are not adopting soil conservation structures or even partially or totally removing them (Shiferaw and Holden, 1998; Alemu, 1999; Holden and Shiferaw, 2002; Gebremedhin and Swinton, 2003; Tadesse and Belay, 2004). Some of the reasons include tenure insecurity, poverty, land and technology characteristics, weak perception of degradation problem, and household characteristics. This paper aims: (a) to assess farm households' perception of soil degradation on private farms and community land, and (b) to identify the determinants of farm households' willingness and ability to invest in soil conservation on their private land in a highland area of Southern Ethiopia. The paper attempts to add to the previous studies by analyzing the willingness to pay both in terms of labour and cash based on responses of the same sample to separately asked willingness to pay questions.

The rest of the paper is organized as follows. Section 2 presents the study area, data and collection methods. Section 3 provides a theoretical framework for the analysis and testable hypotheses. Econometric methods for estimation are presented in Section 4. Section 5 discusses the results followed by conclusions in Section 6.

## 2. The study area, data and collection methods

This study is based on cross section data collected from randomly selected farm households in Gununo highlands of Wolaita Zone, Southern Nations Nationalities and Peoples Region of Ethiopia, located at about 405 km South West of Addis Ababa. The area lies on an elevation extending from 1800 to 2100 m.a.s.l., and receives an average annual rainfall of 1330 mm (SCRP, 1996). Mixed farming, which involves crop-livestock production, is the common practice with a lion share of root crops. The soils are Eurotic Nitosols which are characterized by very deep weathering and leaching (Elias, 1998).

The data were collected in 1999 as part of a general farm household survey by EU project, Awassa College of Agriculture (ACA) in collaboration with the Norwegian University of Life Sciences (UMB), formerly the Agricultural University of Norway (NLH). The area is homogeneous in terms of weather, cropping patterns, and some socio-economic conditions of the households. The project has randomly selected 142

households for the survey, the number being limited by time and financial constraints. The data used for this study are drawn from 140 households, operating 556 plots at the time of the survey. Two of the sample households were dropped from this study due to incomplete plot level data.

The basic socio-economic characteristics of the farm households are presented in Table 1. Oxen ownership is one of the wealth indicators in this area. The majority of the sample households (57%) do not own ox, and out of those who own, (78%) of them have only one ox. The average land holding of the households without ox is very small (1.17 *timad*[2]) and they earn lower average farm and off-farm income than those owning ox. They receive also less amount of credit, on average, than those who own oxen. The average number of workforce (male and female) and livestock in TLU is also higher for those who own oxen. This may indicate that those households with no ox are operating under resource and cash poverty.

However, resource availability should be seen in terms of per unit of land operated if we aim to identify its effect on the willingness of a household to invest in soil conservation. About 56% of those who have shown willingness to invest in labour days as well as in cash do not have oxen. Their average willingness to pay is also higher than those with oxen. About 40 (29 %) out of the 140 farm households had adopted conservation structures and 93% of these were soil bunds constructed through Food-For-Work. The reason why the majority (60%) of the 40 households who adopted soil conservation structures do not have oxen could be due to the fact that Food-For-Work (FFW) programmes might have targeted the poor. Oxen ownership in this area is one indicator of wealth.

[2] 1 *timad* = 0.25ha

**Table 1: Basic socio-economic characteristics of sample households**

| Characteristics | No ox | own ox** | All samples |
|---|---|---|---|
| Number of households(HH) | 80 | 60 | 140 |
| Proportion of HHs in sample (%) | 57 | 43 | 100 |
| Percent of female-headed HHs | 16 | 3 | 11 |
| Number of HHs owning plots with conserv. Structure | 24 | 16 | 40 |
| Number of HHs with no conservation structure | 56 | 44 | 100 |
| Number of HHs willing to contribute labour | 75 | 60 | 135 |
| WTP in labour days per year | 74 | 48 | 63 |
| Number of HHs unwilling to contribute labour | 5 | 0 | 5 |
| Number of HHs willing to pay in cash | 66 | 52 | 118 |
| WTP in cash (birr /year) | 8 | 6 | 7 |
| Number of HHs unwilling to pay in cash | 14 | 8 | 22 |
| Family size (persons) | 6 | 9 | 7.5 |
| Female HH members (persons) | 3 | 4.4 | 3.8 |
| Male HH members (persons) | 3 | 4.7 | 3.7 |
| Female workforce (persons) | 1.7 | 2.1 | 1.9 |
| Male workforce (persons) | 1.4 | 2.2 | 1.7 |
| Consumer units | 3.5 | 4.8 | 4 |
| Dependency ratio (dependent members/workforce) | 1.2 | 1.1 | 1.2 |
| Farm size (*timad**) | 1.17 | 2.62 | 1.79 |
| Operational holding (*timad*) | 1.09 | 2.64 | 1.75 |
| Tropical Livestock Units (TLU) | 1.4 | 4.18 | 2.59 |
| Farm income (Birr/year) in 1998/99 | 236 | 621 | 401 |
| Non-farm income (Birr/year) in 1998/99 | 352 | 500 | 416 |
| Credit for previous year (Birr/year) | 56 | 106 | 78 |
| Oxen days per year (1 ox day = 1 yoke/day) | 11 | 27 | 18 |

Source: From the survey

*1 *timad is* about 0.25 hectares

** Only one household owns 3 oxen, 12 households own 2 oxen each, and the rest own one ox each.

## 3. Theoretical Framework

Adoption of any modern technique to conserve soil can be costly, either directly in investment requirements or indirectly in production foregone. The techniques might take productive land out of production without increasing overall productivity of land.

The decision to invest in conservation is, therefore, based on considerations of costs and benefits unless they have been imposed from an external agency, for example, through some food-for-work (FFW) projects. When we are not in a position to compare these costs and benefits directly from the market mechanism, we need to use other valuation methods to put value on the resource in question, in this case soil conservation.

Various methods are used for valuing non-marketable items such as soil conservation practice. The two widely used methods include: indirect revealed preferences ( for example, hedonic pricing and transaction cost methods which use current transactions to help estimate how much people value certain non-marketed things) and stated preferences (contingent valuation) where hypothetical questions on their willingness to pay for a particular effect are presented to people. Our study is based on the stated preferences that involve finding of a farm household's willingness to pay for soil conservation activity in order to maintain productivity of its farm. Holden and Shiferaw (2002) assert the relevance of contingent valuation method (CVM) for such a study in rural economies of developing countries where markets are often imperfect (or missing) and where preferences cannot be revealed through the market mechanism.

A number of theoretical and methodological issues and criticisms have been raised in the 1980s concerning the application of the CVM in developing countries. Posing hypothetical questions to low income, perhaps illiterate respondents were assumed to be overwhelming that one should not even try. However, it has been shown by a number of studies that CVM can actually be meaningfully applied in developing countries (Georgiou *et al*., 1997; Whittington, 1998). Some of the studies that used CVM in the Ethiopian context have been documented in Asrat *et al.* (2004) who also applied the CVM approach to study the willingness to pay for soil conservation practices in the southeastern part of the country. Tegene (1999) suggested for a wider use of the CVM in Ethiopia for environmental and other non-priced projects, based on his findings that the method was applicable even for people who are illiterate and without prior exposure to such valuation methods.

Unlike other environmental valuation methods, CVM answers to WTP questions go directly to the theoretically correct monetary measures of utility changes (Perman *et*

*al.,* 1999). The WTP to maintain current productivity can be shown as (Holden and Shiferaw, 2002):

$$WTP = e\left(P, EU_0, K_0, Z^h\right) - e\left(P, EU_0, K_1, Z^h\right) \quad \textbf{(1)}$$

where WTP is Hicksian compensating surplus, P is vector of prices, $EU_0$ is the current expected utility level, $K_0$ is the old technology, and $K_1$ is the new technology that helps to maintain productivity, and $Z^h$ represents plot and household characteristics as well as other exogenous variables that affect the WTP. The function e(.) is an expenditure function that represents the minimum expenditure level required to attain the initial level of utility ($EU_0$) before and after the change in the technology. The WTP is therefore the difference in the level of expenditure required to attain the initial level of utility after the change in the (soil conservation) technology.

The households will be willing to invest in soil conservation if they perceive that the use of technology $K_1$ (soil conservation structure) would help them to maintain the productivity of their land, which otherwise would deteriorate due to erosion and other land degradation factors. Inclusion of household characteristics is important here as we are dealing not with pure consumers but with farm households who are producers and consumers of their produce. These are entities that operate under imperfect market conditions, and their production and consumption decisions are non-separable.

## 4. Methodology

### 4.1. Administration of the WTP questions for CVM

Our questions on the willingness to invest in soil conservation were administered as part of a larger household survey. Although this might have helped to avoid project bias by the respondents in answering the questions, it had some entry limitations of not having a well-established format solely for contingent valuation method (CVM). In order to relax the limitations, we asked some questions related to soil degradation before the questions on willingness to invest[3]. Specifically, the respondents were

[3] In this paper, willingness to invest (WTI) and willingness to pay (WTP) are used alternatively.

asked about their perceptions of the most important degradation problems on their farms and in the community at large. Severity of each degradation type (See Table 3) was ranked at on-farm, communal land, and overall community levels. Subsequently, the willingness to pay (WTP) was solicited using open-ended questions. Open-ended questions are one of the three common valuation techniques used in CVM studies, the other two being dichotomous choice and iterative bidding. With open-ended questions, the respondents are asked for their maximum willingness to pay with no value being suggested to them. This has an advantage of avoiding a starting point bias although the respondents may find it relatively difficult to answer such questions, especially where they have no prior knowledge of trading with the commodity in question (Mitchell and Carson, 1989). The payment vehicle may also significantly influence the level of WTP and ease the decision on valuation of the non-marketed resource. The farm households ere asked to state the maximum amount of money (cash) they are willing to pay per year as well as the number of days (labour days) they are willing to contribute per year to conserve their farm in order to maintain productivity. Using the latter payment vehicle (labour days) is reasonable since farmers are more endowed with labour than cash. For some families labour could be abundant and cheap (Tegene 1999; Asrat, *et al*., 2004) so that they may express the true willingness to pay. Focusing on labour days instead of on cash payment, which they have no prior knowledge of trading for soil conservation investment, may help us to get a better understanding of the farm households' WTP for soil conservation.

## 4.2. Econometric methods and estimation

We aimed at estimating the determinants of household's willingness to invest in soil conservation in terms of labour days and cash (Birr[4]), i.e. the amount of contribution or payment[5]. We carried out a plot level analysis, as previous studies have shown that physical (plot) characteristics may play a significant role in determining the intensity of investment in soil conservation (Gebremedhin and Swinton, 2003). Because each household is repeated for different observations (plots) in this plot level analysis, we applied a panel data technique and used household random effects regression model for the estimation. We used a Breusch and Pagan Lagrange Multiplier test for random effects and the *p-value* of the test was found to be highly

[4] Birr is Ethiopian currency. The current exchange rate is 1USD = 8.868 Birr.
[5] Only 5 out of 140 households have shown zero WTP in labour-days in responding to the open ended questions.

significant (Table 4) suggesting that the random effects model is suitable for analyzing our data.

Based on our theoretical framework provided in section 3, the estimable form of the WTP for conservation investment in terms of money or labour to maintain productivity on own land can be shown as follows:

$$WTP = f\left(tensecu, income, wealth, hhcharct, plotcharct, erosion\right) + v_i \qquad \textbf{(2)}$$

where *WTP* is willingness to pay per year per *timad* for soil conservation investment in order to maintain productivity on private farms, measured in labour days and in Birr; *tensecu* is tenure security measured as dummy variable 1 if the household has expressed no fear of losing land from future land redistribution; *income* represents farm and off-farm income, which are used to test the poverty hypothesis; *wealth* refers to resource endowments such as farm size, total livestock units, male and female workforce, and oxen; *hhcharct* refers to household characteristics such as age, education and sex; *plotchact* refers to plot characteristics such as distance from house, slope, soil type, soil depth and conservation structure on the plot in meters; *erosion* is a dummy variable which is 1 if the household has expressed erosion as a problem at least in one of its plots; and $v_i$ refers to the unobserved error terms.

## 4.3. Hypotheses and variable specification

With market imperfections, the probability or the level of farm household's WTP for soil conservation depends on various factors, such as poverty and household characteristics, than only farm characteristics. If markets (for example, credit markets) were perfect, then farm households' WTP would depend only on farm characteristics as they could address cash liquidity problems through these credit markets. Generally, we hypothesize the following:

***H1:*** Perception of severity of soil degradation at least on one cultivable plot will increase the household's WTP for soil conservation.
***H2:*** Farm household's WTP increases with an increase in wealth and farm income implying that household's wealth and cash poverty will reduce the probability of willingness to pay.

***H3:*** Relaxing credit constraints may reduce the subjective rate of time preference of the poor and hence lead them to higher WTP.
***H4:*** WTP in soil conservation increases with degree of household's perception of tenure security.
***H5:*** The households may show higher WTP for distant plots that are grown with annual crops and are prone to erosion, since plots nearest to homestead are planted more with perennial crops.

Detailed information on the definition, expected signs and descriptive statistics of the specific variables used for the empirical analysis is provided in Table 2. It is expected that secure tenure will enhance the WTP of the household. This variable could be endogenous but we did not find good instruments. Income (farm income and off- farm income) and credit will relax cash constraints and increase WTP. Off-farm income can also negatively contribute to WTP if the household is too inclined to off-farm activities. Farm income, apart from relaxing cash constraints, may indicate household's dependency on land and will increase WTP for soil conservation. Resource endowments such as farm size, total livestock units, male and female workforce, and oxen will positively contribute to WTP. However, oxen ownership may reduce the WTP for soil conservation investment if the type of technology is felt not suitable for oxen plowing. Farm size may also have a negative effect if it relates to tenure insecurity (Alemu, 1999) or Boserup effect (Holden and Yohannes, 2000). Income variables can also capture wealth.

Household heads with better education are expected to understand the consequences of degradation and be willing to invest more in soil conservation. Older age may shorten planning time horizon and reduce the WTP; or it may relate to farm experience and increase willingness to improve the soil for better productivity.

The amount of payment for soil conservation could be lower on gentle slope (1-5%) plots compared to 5-10% slope plots while it could increase for plots of 10-30% slopes, as the latter could easily be affected by erosion. Perception of erosion as a problem will have a positive effect on the willingness of the household to invest in soil conservation.

**Table 2: Definition of variables, summary statistics and expected signs**

| Short form | Name and definition of variables | Expected signs | Mean | Standard deviation |
|---|---|---|---|---|
| wtpmha | Maximum willingness to pay per year in labour days per unit of land | Dep. var | 15.59 | 21.66 |
| wtpbha | Maximum willingness to pay per year in Birr per unit land | Dep. var | 1.70 | 3.46 |
| tensecu | Tenure security = 1 if no fear of land redistribution; 0 otherwise | + | 0.78 | 0.41 |
| ophcu | Operational holding in *timad* per consumer units | -/+ | 0.55 | 0.46 |
| perceros | Dummy = 1 if erosion is perceived on farm; 0 otherwise | + | 0.22 | 0.41 |
| dis | Distance of a plot from the house in meters | -/+ | 50.55 | 187.42 |
| slp1 | Cat. = 1 if the slope of the plot is 1-5%, | - | 0.58 | 0.49 |
| slp2 | Cat.= 2 if the slope of the plot is 5-10% | base | 0.37 | 0.48 |
| slp3 | Cat. = 3 if the slope of the plot is 10-30% | + | 0.49 | 0.22 |
| consrvha | Length of conservation structure in meters on a plot per unit of land | +/- | 18.03 | 88.57 |
| malewfha | Male workforce per unit of land | + | 1.60 | 2.15 |
| femalewfha | Female workforce per unit of land | + | 1.76 | 2.68 |
| cwratio | Dependency (consumer-worker) ratio | -/+ | 1.20 | 0.86 |
| age | Age of household head ( in years) | -/+ | 42 | 14 |
| edu1 | Cat. = 1 if household head is illiterate | | 0.60 | 0.49 |
| edu2 | Cat. = 2 if household head has attended grades 1- 6 | | 0.23 | 0.42 |
| edu3 | Cat. = 3 if household head has attended grades 7- 8 | | 0.09 | 0.29 |
| edu4 | Cat. = 4 if household head has attended grades 9 -12 | base | 0.08 | 0.27 |
| oxeha | Number of oxen owned by the household per unit of land | +/- | 0.37 | 0.83 |
| farincom | Predicted farm income (in Birr) | + | 472.41 | 614.27 |
| creha | Credit received during the year ( in Birr per unit of land) | + | 69.15 | 173.29 |
| ofiha | Non-farm income (in Birr per unit of land) | +/- | 396.94 | 1500.73 |

# 5. Results and Discussion

## 5.1. Descriptive results

Table 3 below displays farmers' perceptions of land degradation on their farms and communal land. Soil erosion and nutrient depletion are the most important land degradation problems on private farms in the study area. On communal land, gully formation is added to these two problems. Specifically, about 45% of the sample

households ranked soil erosion as the most serious problem on their farms followed by nutrient depletion which was perceived as the most serious problem by 12% of the households and as the second most serious problem by 41%. Soil erosion is ranked first (31%) even in communal lands followed by nutrient depletion and gully formation. These perceptions go in line with findings from previous studies in the area (Tegene, 1992; Elias, 2002). Overgrazing is not seen as a problem by the majority both on private farm (92%) and communal land (90%) and this could be due to the fact that a few animals are kept by the households and are fed being tied around homestead or fed through cut and carry system.

**Table 3: Farmers' perception of on-farm and communal land degradation problems in Gununo**

| Major land degradation problems | Percent of households perceiving the degradation problems (Ranking)* | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| **Private land (on-farm)** | | | | | | |
| Erosion | 44.6 | 3.6 | 0.7 | | | 52.5 |
| Nutrient depletion | 11.5 | 41.0 | 2.9 | | | 46.0 |
| Overgrazing | 2.2 | 5.0 | 2.2 | | | 92.1 |
| **Communal land** | | | | | | |
| Erosion | 30.9 | 0.7 | 3.6 | | | 66.9 |
| Nutrient depletion | 0.7 | 25.2 | 3.6 | 3.6 | 0.7 | 68.3 |
| Gully formation | 0.0 | 4.3 | 18.7 | 4.3 | 4.3 | 69.8 |
| Overgrazing | 2.2 | 2.2 | 2.2 | 3.6 | 1.4 | 89.9 |
| Deforestation | 1.4 | 1.4 | 2.9 | 2.9 | 2.9 | 88.5 |

*Ranks: 1=most important problem 6=not perceived as a problem

In order to generate information on farmers' own incentive, the households were asked on their willingness to invest in (or WTP for) soil conservation. The number of willing households slightly varied for labour and cash seen separately. Of all the respondents, 135 showed willingness to contribute in labour days, only 5 unwilling. But the number of unwilling households increased to 23 when they were asked to pay in cash (Birr), most of them indicating lack of financial sources to pay. Econometric analysis was carried out in order to identify determinants of the households' willingness to invest (WTP) to conserve soil on their farms. The results are presented in the following section.

## 5.2. Empirical results

Table 4 shows the results of econometric analysis for the WTP both in labour days and Birr. A random effects regression model was estimated on the data and most of the variables are significant for WTP in labour days.

Consistent with our hypotheses (H1), perceptions of erosion (*perceros*) positively and significantly affected farm households' willingness on how much labour to contribute for soil conservation activities. The significance and positive relation between distance (*dis*) from the house and the amount of labour contribution in labour days shows that the household is more willing to invest labour to conserve distant fields than homestead ones (H5). Our results contrast to those found by some previous studies on conservation investment decisions (Bekele and Drake, 2003), where they attributed the positive correlation between this variable and no conservation decisions to either land tenure insecurity or location factor that will increase labour costs for traveling to distant plots. In our context, the positive sign can be plausibly interpreted due to the fact that erosion prone fields are distant plots where cereal crops are continuously grown. The issue of tenure insecurity may not over weigh the erosion problem especially when we consider investing in terms of labour, which is relatively more abundant and cheap. Tenure security (*tensecu*) in our analysis is insignificant. The negative and significant relation of the number of oxen owned by the household (*oxeha*) also indicates that the households are thinking of distant fields where oxen plowing are critical. Previous adoption studies in the area indicated that farmers removed conservation structures due to difficulties for oxen plowing, among other reasons (Tadesse and Belay, 2004).

Other physical factors such as slope and length of conservation structure on the plot were also found significant. The amount of labour days that a farm household is willing to invest in conserving a plot with 1-5% slope (*slp1*) is lower than the amount for a plot with 5-10% slope (*slp2*). The length of conservation structure existing on a plot (*consrvha*) is negatively and significantly correlated with the WTP in labour days. One explanation for this could be that the farm household may not need any additional structure on the plot. We can also think that the existing structures might have not shown any additional benefits or even might have created problems such as inconvenience for oxen plowing or hosting rodents.

**Table 4: Determinants of willingness to invest in soil conservation**

| Explanatory Variables | Random effects regression results | |
|---|---|---|
| | **WTP in labour days** | **WTP in Birr** |
| tensec | 2.535(3.061)[a] | 0.398(0.572) |
| ophcu | 2.063(3.802) | -0.023(0.558) |
| perceros | 7.208(2.129)*** | 0.360(0.328) |
| dis | 0.024(0.004)*** | 0.001(0.001)** |
| Slp1 | -4.391(1.856)** | -0.610(0.288)** |
| Slp3 | 1.103(4.005) | -0.262(0.626) |
| Consrvha | -0.014(0.009)* | -0.000(0.001) |
| lnmalewfha | 7.193(3.716)* | - |
| lnfemalewfha | -1.911(3.323) | - |
| cwratio | - | -0.217(0.286) |
| age | -0.174(0.101)* | 0.004(0.019) |
| edu1 | 6.172(6.077) | 0.346(1.151) |
| edu2 | -0.040(6.046) | -0.171(1.152) |
| edu3 | 6.949(7.200) | -1.117(1.376) |
| oxenha | -3.087(1.526)** | 0.154(0.272) |
| lncreha | 0.346(0.580) | 0.132(0.109) |
| farincom | 0.015(0.003)*** | -0.000(0.000) |
| lnofiha | -0.083(0.479) | -0.147(0.090) |
| Constant | 6.126(9.512) | 2.102(1.562) |
| Regression diagnostics | | |
| *Wald chi-square* | *101.24* | *23.98* |
| *Prob>chi-square* | *0.0000* | *0.0900* |
| *Overall R-sq* | *0.2371* | *0.0667* |
| *Observations* | *556* | *556* |
| *No of HHs* | *140* | *140* |
| Test results for RE | *Sigma_u = 11.91036* | *Sigma_u = 2.43147* |
| (Test: var(u) =0 | *Sigma_e = 16. 08479* | *Sigma_e = 2.38154* |
| | *Rho = 0.35413077* | *Rho = 0.51037286* |
| | *Chi-square = 54.01* | *Chi-square = 201.74* |
| | *Prob>chi-square = 0.0000* | *Prob>chi-square = 0.0000* |

[a] standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Male workforce per *timad* (ln*malewfha*) and farm income (*farincom*) have positive and significant association with the households' willingness on how much to invest in labour days, supporting our hypothesis (H2) on poverty. However, credit per *timad*

(ln*creha*) was statistically insignificant although it had an expected positive sign (H3). Off-farm income (*lnofiha*) has also insignificant but negative relationship with the amount of labour contribution.

Among the household factors, age of the household head (*age*) seems significantly and negatively correlated with the WTP in labour days. This may be due to short term planning horizon of older household heads, as benefits from the conservation structures may not be realized in one or two production seasons.

Most of the variables are insignificant when we look at the results for the WTP in terms of money (Birr/year/*timad)*. The only significant variables are plot characteristic (physical) variables, namely distance from house and gentle slope (1-5%). Similar to that for WTP in labour days, distance showed positive and significant relationship with the WTP in Birr. The household is willing to invest less on plots with 1-5% slope compared to those with 5-10% slope. The insignificance of socio-economic variables may indicate that there is no much variation between the sample households in terms of monetary investment, which could be attributed to general cash constraints faced by the households in the area. Generally, the WTP analysis in terms of labour days gave better picture than that in monetary payments.

## 6. Conclusion

This paper has attempted to assess farm households' perceptions of land degradation and to elicit farmers' WTP for soil conservation practices in Gununo highland of Southern Ethiopia. Farmers perceived land degradation mainly in terms of soil erosion and nutrient depletion especially on private farms. Their perception of erosion increased the willingness on the amount of labour contribution in labour days per year. Plot characteristics such as distance from house and slope are found important in determining the number of labour days invested in soil conservation. A negative and significant correlation of conservation structure and oxen ownership with the labour days to be invested may indicate the need to select an appropriate technology for conservation.

The study also indicated that the endowment of male labour force is an important resource that increases households' WTP in labour days. The positive relation of farm

income also indicates that lack of it (cash poverty) may lead to a reduced willingness to pay for soil improvement.

The study generally suggests for considering plot characteristics, type of technology, family workforce, and farm income if an intervention is intended for soil conservation activities in the study area. This informs that any policy attempt to recommend a homogenous soil conservation technology for all the households and/or plots may lead to a failure. The fact that poverty (especially, cash poverty) shortens farmers' planning time horizon and lack of (male) labour force will be a disincentive for labour contribution should also be given due emphasis when planning conservation intervention. It is also important to note that in rural Ethiopian communities (such as those in Gununo) with relatively more labour available than cash, the WTP studies that employ labour days as payment vehicle can provide more sensible results than those which use cash as payment vehicle.

## References

Alemu, T. (1999). Land tenure and soil conservation: Evidence from Ethiopia. PhD dissertation, Department of Economics, University of Goteborg, Sweden.

Asrat, P., Belay, K. and Hamito, D. (2004). Determinants of Farmers' Willingness to Pay for Soil Conservation Practices it the Southeastern Highlands of Ethiopia. Land Degradation and Development, 15: 423-428.

Ayele, A. (1998). Characteristics and Classification of Soils of Wondo Genet Area, Northern Sidama, Ethiopia. MS.c Thesis, School of Graduate Studies, Addis Ababa University, Addis Ababa.

Bekele, W. and Drake, L. (2003). Soil and water conservation decision behaviour of subsistence farmers in the Eastern Highlands of Ethiopia: a case study of the Hunde-Lafto area. Ecological Economics, 46: 437-451.

Bewket, W. and Sterk, G. (2003). Assessment of soil erosion in cultivated fields using a survey methodology for rills in the Chemoga watershed, Ethiopia. Agriculture, Ecosystems and Environment, 97: 81-93.

Dea, D. (1998). Soil Fertility Management in its Social Context: A Study of Local Perceptions and Practices in Wolaita, Southeren Ethiopia. Managing Africa's Soils, No.1, London.

Elias, E. (1998). Is Soil Fertility Declining? Perspectives on Environmental Change in Southern Ethiopia. Managing Africa's Soils, No.2, London

_____. (2002). Farmers' Perceptions of Soil Fertility Change and Management. ISD and SOS Sahel (UK). Addis Ababa.

Gebremedhin, B. Swinton, S.M. (2003). Investment in soil conservation in northern Ethiopia: the role of land tenure security and public programs. Agricultural Economics, 29: 69-84.

Georgiou, S., Whittington, D., Pearce, D. and Moran, D. (1997). *Economic values and the environment in the developing world*. Cheltenham, UK, Edward Elgar.

Holden, S. and Shiferaw, B. (2002). Poverty and Land Degradation: Peasants' Willingness to Pay to Sustain Land Productivity. In: Barret, C.B., Place, F. and Aboud A.A. (eds.). Natural Resource Management in African Agriculture, CABI International.

Holden, S. and Yohannes, H. (2002). Land Redistribution, Tenure Insecurity, and Intensity of Production: A Study of Farm Households in Southern Ethiopia. Land Economics, 78(4):573-590.

Hurni, H. (1983b). Soil Erosion and Soil Formation in Agricultural Ecosystems: Ethiopia and Northern Thailand. Mountain Resource and Development, 2(2): 131-142.

_____. (1988). Degradation and conservation of the resources in the Ethiopian highlands. Mountain Research and Development, 8: 123-130.

Jonfa, E., Berhanu, T., Kano, K. and Follo, F. (1997). Participatory Soil Mapping and Characterization in Kindo Koysha, Southern Ethiopia. Technical pamphlet no.13, Farmers' Research Project (FRP), FARM Africa, Addis Ababa.

Mitchell, R. and Carson, R. (1989). Using Surveys to Value Public Goods: The Contingent Valuation Method. Resources For The future, Washington, D.C.

Perman, R., Ma, Y., McGilvray, J. and Common, M. (1999). *Natural Resource and Environmental Economics*. Pearson Education Limited, Essex, England.

SCRP, 1996. Data Base Report. (1982-1993). Series II: Gununo Research Unit. University of Berne, Switzerland and Ministry of Agriculture, Ethiopia.

Shiferaw, B. and Holden, S. (1998). Resource Degradation and Adoption of Land Conservation Technologies in the Ethiopian Highlands. A Case Study in Andit Tid, North Shewa. Agric. Econ. 18: 233-247.

Tadesse, G. (2001). Land Degradation: A Challenge to Ethiopia. Environmental Management, 27( 6): 815-824.

Tadesse M. and Belay, K. (2004). Factors Affecting Adoption of Soil Conservation Measures in Southern Ethiopia: The Case of Gununo Area. Journal of Agriculture and Rural Development in the Tropics and Subtropics, 105(1): 49-62.

Tegene, B. (1992). *Erosion:* Its Effects on Properties and Productivity of Euritic Nitsols in Gununo Area, Southern Ethiopia, and Some Techniques of its Control. African Studies Series, Berne, Switzerland.

Tegene, G.E. (1999). Willingness To Pay for Environmental Protection: An Application Of Contingent Valuation Method (CVM) In Sekota District, Northern Ethiopia. Ethiopian Journal of Agricultural Economics, 3(1): 123-145.

Tessema, W. (1998). Policies for Sustainable Soil Fertility Management in Wolaita, Southern Ethiopia. Farmers' Research Project (FRP) Technical Pamphlet No.18, FARM Africa, Ethiopia.

Whittington, D. (1998). Administering Contingent Valuation Surveys in Developing Countries. World Development, 26(1): 21-30.

# Part II

# Industry and Finance

# LINKAGES IN THE ETHIOPIAN MANUFACTURING INDUSTRY

## (Preliminary Assessment)

Kibre Moges[1] and Worku Gebeyehu[2]

*Abstract*

*The extent and nature of the interplay within and among sectors, citrus paribus, determines the base, pace and sustainability of economic development. This interplay is in turn determined largely by the composition and volume of manufacturing activities. Using an input-output framework, this study attempts to assess the magnitude of linkages among manufacturing industries and manufacturing sector with other sectors in the context of the Ethiopian economy. The study has demonstrated the existence of a very weak internal linkage. Agro-processing industries have had relatively high backward linkages; where as chemical and metallurgy industries are largely import dependent. A mixed result has been observed with regards to forward linkages. While some industries have relatively large multipliers, the majority have little or no forward linkages both from agro-processing and chemical and metallurgical industrial groups. Industries with high per unit output multipliers do not actually play a tangible role in the economy because of their tiny size. Although natural it could be to observe very weak internal linkages in the early stages of industrialization, sustaining this pattern may not ensure rapid and sustainable pace of industrialization. Thus, a deliberate change of direction should be sought towards internalizing the linkage effects of import intensive industries, minimizing external dependency, maximizing and deepening the overall linkage effects through the expansion of industries having high unit output multipliers and building domestic technological capabilities.*

[1] Kibre Moges, Senior Researcher, Trade and Industry Division, EEA/EEPRI,
[2] Worku Gebeyehu, Researcher, Trade and Industry Division, EEA/EEPRI

## 1. Introduction

The manufacturing sector is central in creating wide ranges of linkages. The linkages take place through input-output transactions among the manufacturing industries and between manufacturing and the rest of the economy. The interaction could take either or both of the two forms: backward (demand side) and forward (supply-side) linkages. An industry creates "*backward linkages*" with sectors or industries through its input demand. In the same way, if an industry output is supplied to be used as inputs to other industries or sectors, it creates a "*forward linkage*". An increase in the production of goods by industries having high backward linkages could also induce increased output in upstream industries producing such inputs. Similarly, increases in the production of goods that are in short supply by industries having high forward linkages encourage industries using such goods as inputs to expand their level of production.

The extent of the interplay between the different industries or sectors in the demand and supply chain determines the volume and nature of economic activities and the pace of economic development. Thus, the difference in the level of industrialization between developing and developed countries can be partly explained by the type and strength of internal linkages between the different sectors of their respective economies. In industrialized countries, manufacturing industries have strong linkages among themselves; so are sectoral linkages. Manufacturing industries acquire much of their inputs from within the economy, and do not depend much on imports. They satisfy the demand for machinery & equipment for themselves and other sectors of the economy. In most developing countries, the situation is quite different: manufacturing relies heavily on imports both for its machinery and equipment and regular use of inputs. It supplies only a small portion of intermediate inputs' demand to the rest of the economy. It is not either successful in generating export earnings even to cover costs of imported inputs for their own use.

The Ethiopian manufacturing sector has very weak internal linkages. Its external linkage is quite unbalanced: highly import intensive and inward oriented for output markets. This exercise attempts to assess the extent and nature of interdependence among manufacturing industries and between manufacturing and other sectors of the economy, particularly, agriculture and mining using an input–output framework. It seeks to measure the magnitude of input-output linkages among manufacturing industries and between sectors. The importance of the whole exercise is to identify

industries that have strong backward and forward linkages in the economy. This enables to draw investment coordination policies and also streamline incentive structures for an industrialization program.

## 2. Methodology

Input – output table provides information about the interaction between economic sectors. The table is usually developed on an annual comprehensive data base and usually adjusted with changes in the resource mix requirements of the various sectors. At least there are three different tables that could be developed in the process. First, there is an input-output transaction table [Fig.1], which shows the flow of the total value of inputs-outputs among the various sectors of the economy.

**Figure 1: Input-output transaction**

| | Sectors (j) | | | Final demand | | | Total Final demand | Total Value of Output |
|---|---|---|---|---|---|---|---|---|
| | 1 …. N | | | Exports | Investment | Other consumpt -ion | $F_i = E_i + C_i + I_i$ | |
| Sector (i) | | $X_{11}$ | $X_{1n}$ | $E_1$ | $I_1$ | $C_1$ | $F_1$ | $X_1$ |
| | 1 | . . . | . | . | . | . | . | . |
| | . | . . . | . | . | . | . | . | . |
| | . | . . . | . | . | . | . | . | . |
| | . | . . . | . | . | . | . | . | . |
| | n | $X_{n1}$ | $X_{nn}$ | $E_n$ | $I_n$ | $C_n$ | $F_n$ | $X_n$ |
| Imports | | $M_1$ | $M_n$ | | | | | |
| Value added | | | | | | | | |
| Labor in wages | | $L_1$ | $L_n$ | | | | | |
| Profits | | $\Pi_1$ | $\Pi_n$ | | | | | |
| Capital consumption | | $K_1$ | $K_n$ | | | | | |
| Rents | | $R_1$ | $R_N$ | | | | | |
| Taxes | | $T_1$ | $T_n$ | | | | | |
| Total value of output | | $X_1$ | $X_n$ | | | | | |

$X_{ij}$ The value of output of industry 'i' sold to industry 'j' as intermediate input, $i, j = 1,...n.$

$X_i$ Total supply of sector 'i', $i = 1,...,n.$

$C_i$ Other consumption 'i', $i = 1,...,n.$

$E_i$ Export of sector 'i', $i = 1,...,n.$

$I_i$ Investment outlay in sector 'i', $i = 1,...,n.$

$F_i$ Final demand for sector 'i's output, $i = 1,...,n.$

$X_j$ Total demand of sector

$L_i$ Amount of labor used in sector $j, j = 1,...n.$

$\Pi_j$ Profit in sector, $j, j = 1,...n.$

$K_i$ Capital consumption $j, j = 1,...n.$

$R_N$ Rents paid for machinery, equipment and working premise.

Sectors "i" or "j" in Figure 1 show different industries within manufacturing, agriculture, and mining. Each is represented by a specific sector code. Rows contain revenues collected by sector (i) from sector (j) for the sale of products intended for intermediate and/or final demand use. For instance, an industry (say industry 1 in the first row), may retain part of its output ($X_{11}$) and/or sell some part of the output for another industry for intermediate use (say industry 5), ($X_{15}$). The remaining output of this industry may be exported ($E_1$), retained as an investment ($I_1$) and other domestic consumptions ($C_1$), which together constitute final demand ($F_1$). Thus, the sales of industry 1 for intermediate use ($\sum_{j=1}^{N} X_{1j}$) and for final demand ($F_1$) constitute total value of output for the sector ($X_1$).

Columns indicate the values of intermediate inputs purchased by sector "j" from itself or other industries, imports, $M_j$, labor ($L_j$), consumption of fixed assets ($K_j$),

profits ($\Pi_j$), rents paid for machinery, equipment and working premise ($R_N$) and taxes ($T_j$). These different cost elements constitute the value of production of a particular industry or sector ($X_j$). The supply of output or revenue collected by an industry (along the row of the table) ($X_i$) equals the demand for inputs or the cost paid for inputs and other purposes necessary for the production of goods by the same industry (along the column given that $i = j$.)

*Part of the transaction table (the shaded part) is transformed into a table of direct requirements matrix*[3]*.* This is calculated as:

$$a_{ij} = X_{ij} \Big/ X_j \qquad \textbf{(1)}^{4},$$

Where, $a_{ij}$ are direct requirement coefficients. The complete coefficient matrix is given by Figure 2.

[3] The conventional input-output model assumes technology to be constant and firms operate in constant returns to scale. Under this framework, inputs are combined in a given fixed proportion. This may not sound a plausible assumption and it is considered as one of the shortcomings of the model. However, it is a very simple tool of estimating the value of inputs, (excluding labor and capital) required from the different sectors (i) to produce a one birr worth of output in another sector (j) at a particular period of time.

[4] In the conventional model, effects of price variations are assumed to be constant in determining the transaction of goods among different sectors of the economy. The main focus is rather on the technical relationships between inputs acquired and outputs produced in a given physical form. In practice, one could not easily establish physical relationships between inputs and outputs simply because of the fact that there are various types of inputs that are used in a certain industry, in the production of different types of outputs. Use of money and of prices as a unit of measurement and aggregation becomes vital such that subsequent calculations (ratios and indices) could become possible. Taking the risk of assuming a change in price in a given year does not have a meaningful impact on the technical relationships between inputs and outputs, the linkage among the various industries is estimated for the period 2001/02. In the long run, however, the effects of price variations should be taken care of and equations such as (1) could be restated as:

$\frac{P_i a_{ij}}{P_j} = \frac{P_i X_{ij}}{P_i X_j}$ *so that possibly we will have a different type of nominal input-output coefficient as time changes* $a_{ij} * (\frac{P_i}{P_j})$ *although the real input – output coefficient remains the same.*

**Figure 2: Direct requirement matrix**

| | | | |
|---|---|---|---|
| $a_{11}$ | . | . | $a_{1n}$ |
| . | . | . | . |
| . | . | . | . |
| $a_{n1}$ | . | . | $a_{nn}$ |

$a_{ij}$ measures the value of inputs directly required from industry (i) for the production of a one birr worth of output of industry (j). The range of input-output transactions among the different sectors or industries could be represented in a compact linear equation form as:

$$X = AX + F \qquad \textbf{(2)}$$

where, $X = \left[ X_{1,} \ldots\ldots\ldots X_n \right]^T$ is the vector of gross output, *n* denotes the number of industries, $A = \left[ a_{ij} \right]$ is the matrix of direct requirement technical coefficient shown in Figure 2 and $F = \left[ F_1, \ldots, F_n \right]^T$ is the vector of final demand. Thus, the identity (2) indicates that gross value of production is the sum of that portion of the output used as an intermediate input to the various industries (*AX)* and the remaining used for satisfying final demand*, (F).*

The output industry i can be represented as:

$$X_i = \sum_{j=1}^{N} a_{ij} X_j + F_i \qquad \textbf{(3)}$$

Matrix A shows the direct effect and it does not show the dynamic (or chain of) effects that a change in output demand in a given industry could create in all other industries of the economy.

Rearranging equation (2) gives,

$$(I - A)X = F \quad \textbf{(4),}$$

and

$$X = [I - A]^{-1}F \quad \textbf{(5),}$$

Where, I is an identity matrix. $[I - A]^{-1}$ is the inverted Leontief Matrix or total requirement matrix. It shows how much output is produced by all industries (the economy) in order to produce a unit of output for final use by a given industry.[5] If each element of the $[I - A]^{-1}$ is denoted by $b_{ij}$, then the total requirement matrix takes the following shape. [Figure 3]

**Figure 3: Total Requirement Matrix**

| | | | |
|---|---|---|---|
| $b_{11}$ | . | . | $b_{1n}$ |
| . | . | . | . |
| . | . | . | . |
| $b_{n1}$ | . | . | $b_{nn}$ |

Therefore, $[I - A]^{-1}$ = B = [$b_{ij}$ ]

Each coefficient in the matrix, $b_{ij}$, indicates additional output by industry i for a unit of output produced by industry j for final use. Hence it shows the linkage between industry i and industry j. Unlike $a_{ij}$, which reflects only the direct (or immediate)

[5] The total requirement matrix has two elements: direct and indirect requirements. "The first round purchases, which represent the inputs purchased directly by the impacted industry from other firms, are simply given by the direct coefficient matrix **A**. The second-round effects occur as firms supplying inputs to the impacted industry in turn purchase inputs from others, and can be calculated by multiplying the **A** matrix by itself to get $\mathbf{A^2}$**.** The process continues with third-round effects being $\mathbf{A^3}$ and so on" [Dervis, et al (1982)]. Adding the initial effect, which is represented by the identity matrix with direct and indirect requirements constitute the total requirement matrix: $[I - A]^{-1} = I + A + A^3 + \ldots$.

relationship between two industries, the coefficients in the total requirement matrix $b_{ij}$ takes into account both the direct and indirect effects.

The demand effect of an industry may not stop at its immediate input supplier industry. For instance, a garment industry may need cotton fabrics from the textile sector for the production of wearing apparel. This specific requirement could be captured by the direct coefficient matrix. In order to satisfy the need for additional cotton fabrics, the textile industry has in turn to seek for more raw cotton from agriculture. Further, agriculture needs to have additional inputs such seeds from itself and other industries to meet the additional cotton demand. Such a chain of direct and indirect effects on the overall economy of a change in demand for a given product are captured by the total requirement coefficients, commonly known as Leontief inverse, ($B = [b_{ij}] = [1 - A]^{-1}$).

Hence, additional production in one such industry will invoke further production increase in all other industries with which it has linkages, both forward and backward linkages. Accordingly, the total output induced as a result of additional unit of output by an industry (say j) for final use through backward linkages would be equal to the sum of additional outputs of all industries (i) supplying inputs directly and other industries which are indirectly related to industry j.

Therefore,
$$b_{sj} = \sum_{i=1}^{N} b_{ij} \qquad \textbf{(6)}$$

Where, $b_{sj}$ is the sum of additional output of all industries linked to industry j. In other words, $b_{sj}$ is the total additional output of the economy for every unit of output of industry j for final use. As such, $b_{sj}$ is the output multiplier. $b_{sj}$ depict the relative importance of industries in terms of their multiplier effects. .

An industry may have high or low values of $b_{ij}$ , but its contribution to the economy at large, i.e., in terms of, for instance, gross value of production may be small or high.

To show an additional output creating capacity of an industry vis-a-vis the others, one may need to use weighting indices such as degree of importance of each industry in the economy. Different variables could be used as weights depending on the objective of the exercise. In this exercise, the relative contribution of each from the gross value of production of all considered industries or sectors is considered. Weighting the total requirement matrix by gross value of production gives [Claus, 2002] [6]:

$$b^{w}_{sj} = \sum_{i=1}^{n} b_{ij} * \{ \frac{Q_i}{\sum_{i=1}^{N} Q_i} \} \quad \textbf{(7),}$$

Where, $Q_i$ is gross value of production of industry 'i'.

Equation (7) shows the total output requirements for a unit value increase for final demand in sector *j's* output given each industry's share in the gross value of production of all industries considered in the system.

**Forward linkage coefficients**: A similar approach to that of the backward linkage coefficients can be used to calculate the forward linkages. But unlike the backward linkages, where the basis for estimating the inverse matrix is the input-output ratio, the corresponding ratio in estimating forward linkages is output supplied by an industry for input use in other industries to the total output of the same industry. Accordingly, the forward linkage multiplier is given by,

$$b_{si} = \sum_{j=1}^{N} b_{ji} \quad \textbf{(8).}$$

And the corresponding weighted multiplier can be designated by [7]

[6] Subscripts $S_j$ and $S_i$ denote column and row sums respectively.

[7] Industries/sectors do not have equal importance in the structure of demand. A small sector *j* could use inputs from sector *i* disproportionably large as a percentage of its output. This might blow-up artificially the forward linkage index. Thus, besides, the procedures followed below, an attempt will be made to examine

$$b_{is}^{w} = \sum_{j=1}^{n} b_{ij} * \left\{ \frac{Q_i}{\sum_{j=1}^{N} Q_i} \right\} \quad \textbf{(9)}$$

This indicates the increase in output of sector "i" that is required to be supplied as an input in the production of an additional unit of output for final demand in other sectors, given each sector's share in the total value of production of sectors considered in the system.

## 3. Data Source and aggregation procedures

The analysis involves agriculture, mining and manufacturing industries, but focusing more on the latter. Data sources include surveys of the Central Statistical Authority (specifically the 2002 Large and Medium Scale Survey, the Agricultural Sample Survey and Report on Land Utilization 2001/02)' EEA/EEPRI manufacturing industries survey 2002 Annual Report of the National Bank of Ethiopia (2002) and Ministry of Finance and Economic Development unpublished materials. The base year for the analysis is 2001/02. Agriculture and mining are taken as separate industries (sectors) while manufacturing, the focus of the analysis, is further categorized into 46 industries. The classification is very much in line with that of the Central Statistical Authority's categorization system with minor modifications. Thus, the model will consider forty eight industries in total.

Tracing the type of inputs and their corresponding values for the different industries is not straight forward at least for some industries. Agricultural inputs are mainly seeds, fertilizer, and pesticides. Seeds are largely retained from own production and an estimate of their values is taken from Agricultural Sample Survey [2001/02]. Fertilizers are almost entirely imported, while pesticides are largely imported. The

---

the situation from the supply side as well. In the supply side model, we will have $a_{ij}^{*} = X_{ij} \big/ X_i$ and the whole process continues as above.

values of imported inputs for agriculture are taken from the National Bank of Ethiopia. [NBE, QB, 2004/05] Except gold extraction, the mining sector uses rudimentary technology with little raw material or intermediate inputs from other industries. As such there is little documented information on the types and values of inputs in this sector.

With respect to manufacturing industries, however, there is little problem in disaggregating inputs into local and foreign sources (imports). The challenging task, however, is to identify the sources (supplying domestic industries) for some inputs. First, the types (or names) and values of the various local inputs used in the different industries are identified and judgment is made as to which industry (or industries) could possibly supply each specific input. Accordingly, the sources of most of the inputs of the various industries are identified and classified. However, not all firms exhaustively indicate their inputs by type or name. In most of the cases, industries identify only their major inputs while aggregate cost figures are given for all the rest of the inputs[8].

Based on these procedures, a transaction table is designed and used to generate consistent values for drawing direct and total requirement matrices, which reflect the nature of forward and backward linkages of industries.[9]

## 4. Empirical results

### 4.1 General

On the basis of the available data for 2001/02, only about 10 percent of the gross value of output of agriculture, manufacturing industry and mining is used as inputs[10].

[8] An attempt is made to disaggregate inputs given under "other items" category based on the rate of usage of other similar firms.

[9] It should be noted that as the focus of this exercise is the manufacturing sector, particularly of large and medium scale, it excludes other sectors, including small scale and cottage industries, construction industry, water and electricity, transport and communication and other services.

[10] The share of intermediate inputs used by the mining sector held about 16% of its total value of production. However, we are unable to get information, as to what the figure constitutes and what kind of inputs the sector uses. Thus, the 10 percent refers the inputs used in the industry and agricultural sectors only.

**Table 1: Outputs used as inputs in the economy and export in percent**

| | % share of inputs from GVP | | | Export as % of GVP |
|---|---|---|---|---|
| | **Total** | **For own use** | **Used in others** | |
| Agriculture | 9.7 | 5.9 | 3.9 | 9.8 |
| Manufacturing | 10.2 | 10.1 | 0.08 | 8.3 |
| Mining | 16.0 | 16.0 | 0 | 55.9 |
| Total | 9.9 | | | 10.2 |

A little more than 10 percent was exported, largely for further processing and the remaining 80 percent went into local final demand (definitely a larger percentage was meant for direct consumption). A close look at these industries reveals that input shares in agriculture, manufacturing and mining are about 9.7 percent, 10.2 percent and 16 percent respectively. Thus, the bulk of the total production of these industries is meant for satisfying final demand. For instance, in New Zealand about 47 percent of the total gross output went into the various industries in the form of inputs [Claus, 2002]. A closer look at the flow of inputs revealed that about 60% agricultural inputs was retained within agriculture and only 40% was sold for reprocessing. This is an indication of the existence of low level of processing in the economy. Another manifestation of weak interaction/linkages among the various industries of the economy is a very weak role played by the manufacturing industry in the production process of agriculture.

On the other hand, the economy is highly dependent on imports for intermediate inputs. For instance, in 2001/02, agriculture acquired about 30 percent of its inputs (94 percent of its intermediate input demand), from imports. The role of the manufacturing sector in addressing the demand for modern intermediate inputs such as fertilizers, pesticides and insecticides is, to say the least, very low [EEA, 2005]. Similarly, the manufacturing sector imported about 45 percent of its inputs, constituting about two-thirds of its intermediate inputs. The remaining 55 percent is acquired form local sources, i.e., 29 percent from agriculture, 27 percent from manufacturing itself and 3 percent from mining. Most of the local industries require imported inputs either as principal or auxiliary use. For instance in 2001/02, about 63 percent of all large and medium scale industries imported inputs from abroad either in a small or large magnitude.

As noted above, only a small proportion of the total agricultural commodities, not used for final use, goes for further processing locally. The bulk, about 68 percent, including coffee, oil seeds, pulses, raw meat and live animals, are exported in raw form for further processing abroad. [EEA, Vol. III, 2003/04]. These facts reveal that manufacturing is neither capable of satisfying its intermediate inputs demand from within, nor has developed the capacity for further processing commodities supplied by agriculture. This general picture is discussed in detail using backward and forward linkages of manufacturing industries in the next sections.

## 4.2 Backward linkage effects

As noted in the previous section, some industries have strong internal backward linkages while others heavily depend on imports. Some industries bring considerable direct effects in certain branches of the economy as the demand for their products increases. This effect may transcend into a chain of indirect effects in the case of some industries (such as, for instance, shoe, wearing apparel, etc) or it may end up with affecting only industries having direct linkage (for instance, structural clay). As a result, the direct and indirect effects of industries induced as a result of changes in the demand for their outputs vary considerably.

The import intensity and total effects in the manufacturing industries, indicating the status of industrial linkages, are shown in Table 2. Column 2 shows the share of the local inputs from the total cost of inputs used in each industry. Largely agro-processing industries relatively depend more on local inputs and thus they have relatively high direct backward linkage effects with the agriculture sector. It is natural for these types of industries, to remain dominant in terms of having high backward linkages with primary sectors in an economy where the level of industrialization is at a rudimentary stage. While these industries are relatively less import dependent, as they are natural-resource-based industries, they have limited or no role in inducing dynamic effects as a source of speedy and sustained industrial development. They play a very restrictive role in advancing technological progress and sub-subsequently induce dynamic effect on industrial development.

On the other hand, the remaining thirty three industries (69 percent) have very low input shares. Many of these industries depend more heavily on imports (all types of metallic and chemical industries, including the agriculture sector) with little share of local inputs.

**Table 2: Backward linkage multipliers: Summation of Direct and Total Requirement Coefficients**

| Sectors | Local input/Total input | Import/ Total input | Sum of total requirement coefficients |
|---|---|---|---|
| 1. Macaroni & spaghetti | 1 | 0 | 2.032 |
| 2. Wearing apparel (leather) | 0.87 | 0.13 | 1.806 |
| 3. Grain Mill | 0.98 | 0.02 | 1.805 |
| 4. Tannery | 0.83 | 0.17 | 1.745 |
| 5. Wearing apparel (cloths) | 0.89 | 0.11 | 1.725 |
| 6. Animal feeds | 1 | 0 | 1.707 |
| 7. Spice & salt | 1 | 0 | 1.652 |
| 8. Meat and vegetable processing | 0.87 | 0.13 | 1.632 |
| 9. Animal oil & fats | 1 | 0 | 1.628 |
| 10. Malt | 1 | 0 | 1.615 |
| 11. Bakery & pastry | 0.88 | 0.12 | 1.562 |
| 12. Textiles | 0.78 | 0.22 | 1.526 |
| 13. Footwear | 0.51 | 0.49 | 1.522 |
| 14. Dairy products | 0.83 | 0.17 | 1.428 |
| 15. Concrete & plaster | 0.99 | 0.1 | 1.420 |
| 16. Coffee & tea | 0.97 | 0.99 | 1.341 |
| 17. Furniture | 0.58 | 0.42 | 1.330 |
| 18. Marble & ceramics | 0.94 | 0.06 | 1.285 |
| 19. Paints, varnish | 0.39 | 0.61 | 1.268 |
| 20. Candle & related | 0.31 | 0.69 | 1.198 |
| 21. Printing | 0.42 | 0.58 | 1.185 |
| 22. Cement & lime | 0.95 | 0.05 | 1.183 |
| 23. Basic Chemicals | 0.71 | 0.29 | 1.168 |
| 24. Brewery | 0.54 | 0.46 | 1.168 |
| 25. Wood | 0.43 | 0.57 | 1.165 |
| 26. Sugar | 0.74 | 0.26 | 1.164 |
| 27. Wine | 0.51 | 0.49 | 1.162 |
| 28. Spirits | 0.88 | 0.12 | 1.161 |
| 29. Soft Drinks & mineral | 0.37 | 0.63 | 1.145 |
| 30. Foam & plastic | 0.20 | 0.80 | 1.138 |
| 31. Soap, cosmetics & detergents | 0.14 | 0.86 | 1.128 |
| 32. Food & beverage machinery | 0.34 | 0.66 | 1.112 |
| 33. Glass & glass products | 0.94 | 0.06 | 1.110 |
| 34. Fiber products | 0.64 | 0.34 | 1.103 |
| 35. Structural metal | 0.25 | 0.75 | 1.098 |
| 36. Truck assembly | 0.11 | 0.89 | 1.093 |
| 37. Agriculture | 0.73 | 0.27 | 1.064 |
| 38. Cutlery & hand tools | 0.09 | 0.91 | 1.057 |
| 39. Tobacco | 0.20 | 0.80 | 1.054 |
| 40. Rubber | 0.38 | 0.62 | 1.043 |
| 41. Other fabric. Metal | 0.07 | 0.93 | 1.037 |
| 42. Paper | 0.04 | 0.96 | 1.025 |
| 43. Structural clay | 0.84 | 0.16 | 1.016 |
| 44. Basic iron & steel | 0.01 | 0.99 | 1.006 |
| 45. Ovens & furnaces | 0.01 | 0.99 | 1.004 |
| 46. Pharmaceuticals | 0 | 0 | 1.002 |
| 47. Mining | NA | NA | 1 |
| 48. Battery | 0 | 1 | 1 |

Source: Calculated based on CSA, EEA, NBE and MoFED Data for 2001/02.

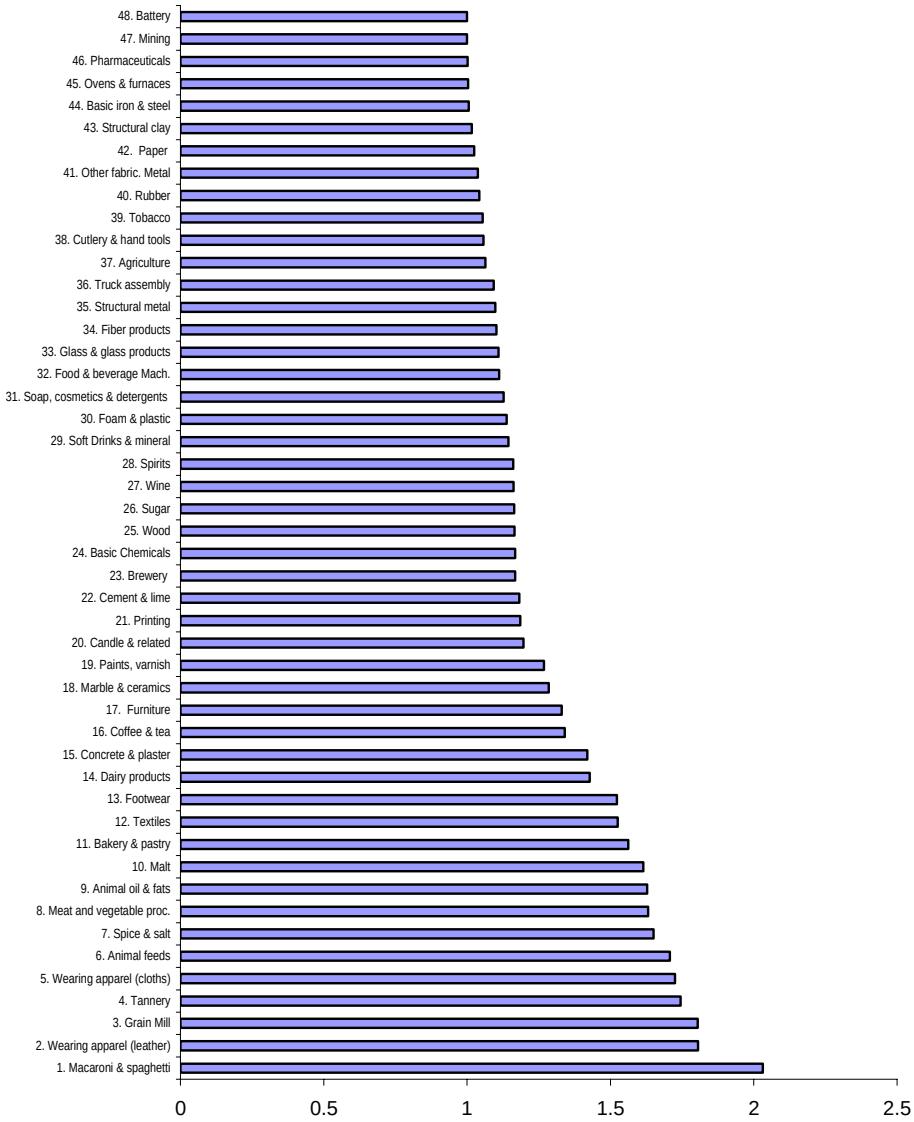
The industry with the highest multiplier effect is macaroni & spaghetti. For every birr worth of additional output for final use produced in this industry, additional output worth birr 1.032 would be produced, due to backward linkages, by other upstream industries. This implies that the induced production effect on other industries is greater than 100 percent. Two other industries, leather apparel and grain mill each induced additional production effects amounting to 0.8 birr (80 percent) in other industries due to a one birr worth of final demand change for their products. Around 13 industries have total requirement coefficients greater than 1.5. Most of these industries are agro-processing. Note that these coefficients do not include additional production that could be induced as a result of the forward linkages. This is discussed in the next section. Note also that industries with high multiplier effects are nevertheless the same industries having relatively significant direct effect.

On the other extreme, those industries producing intermediate and capital goods have little or no backward linkage effects. In other words, metallic and chemical industries import a significant portion of their inputs from abroad. For instance, currently, a car battery manufacturer imports entirely all its inputs and thus, an increase in the demand of this product does not have a mechanism to induce backward effect on other industries of the economy. This clearly reflects how basic engineering industries, which are central for creating strong dynamism for a rapid and sustainable industrial development, have very weak foundation.

The above paragraphs discussed the multiplier effect in manufacturing industries, specifically in terms of a unit change in the demand for a given commodity in an industry, other things remaining constant. The whole exercise was made on the basis of a unit level of output, hence inherently assumes that each sector is equally important in the economy. But due to their relatively large size, some industries may have considerable absolute backward linkage effects. In practice, however, not all sectors have equal importance (at least at a point in time) in terms of, for instance, gross value of production, employment or for foreign exchange earning.. The basis for evaluating their importance depends on the objective of the exercise. Thus, there may arise the need for weighting these multipliers.

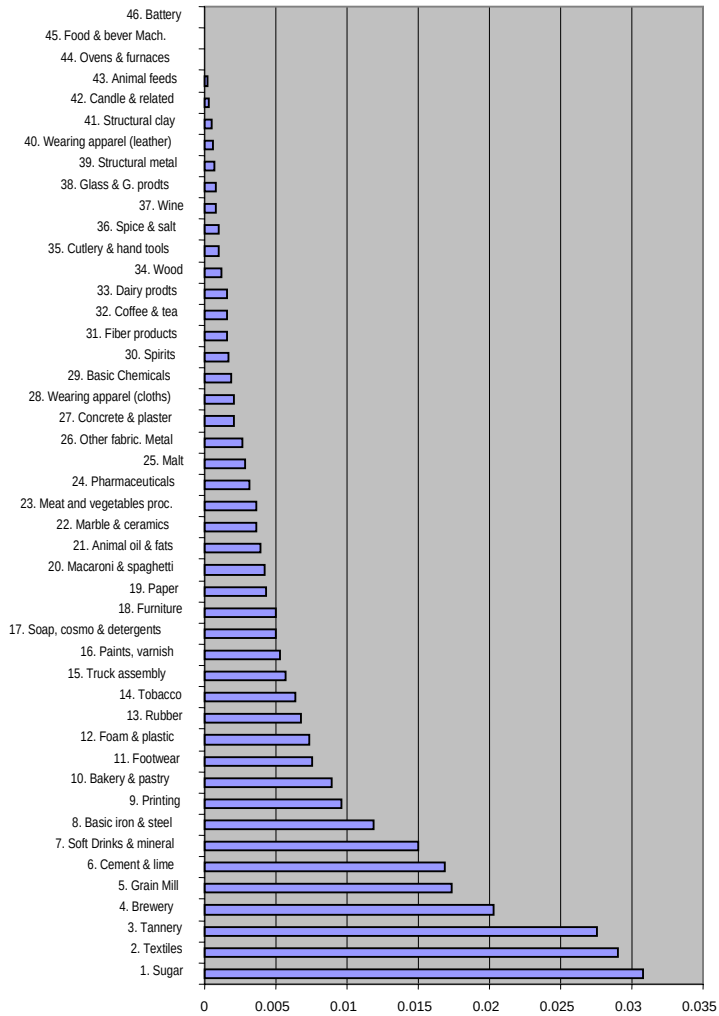
The importance of sectors in creating backward linkages considerably changes as the multipliers are weighted. Figure 4 and 5 map out the orders of industries according to their multiplier effects and multipliers weighted by the share of the gross value of production of the respective industries, respectively.

**Figure 4: Backward linkages per unit of output change**




Source: Calculated Based on Table 1 Above.

**Figure 5: Backward linkage weighted by GVP (excluding agriculture and mining)**




Source: Calculated based on weighted backward linkage indices[11]

[11] Agriculture and mining are two giant sectors, not disaggregated as it is the case for manufacturing, with a relatively high share of gross value of production. Despite their low multiplier effect, they could tend to bias the weighted multiplier effect and thus deliberately slashed off from Figure 5.

There is a change in position of industries as their multipliers are weighted. We have already seen that macaroni and spaghetti, wearing apparel for leather and grain mill were the three most important industries in creating relatively high multiplier effect. However, they are replaced by sugar, textile and tannery when the multipliers are weighted by their relative contribution in the gross value of production. As one could clearly see from their nature, such industries as macaroni and spaghetti and wearing apparel are found, so to say, on the second echelon in terms of degree of processing. They use intermediate inputs that passed through some other industries such as grain mills and tannery and because of this they create a relatively high multiplier effect per unit of output. Although few in number as they were even in Figure 4, the second echelon industries are fully replaced by industries that use predominantly primary inputs from the agricultural sector. In terms of creating backward linkages, the latter ones could only go one step for their major input demand. Nonetheless, because of their size they actually created relatively higher level of backward linkages in the economy, and predominantly with agriculture.

In general, there seems to emerge a consistent result with respect to backward linkage multipliers of manufacturing industries. Under the current industrial structure of the country, agro-processing industries are at the forefront with relatively high backward linkage effects. These industries play relatively significant roles in the economy in terms of creating demand for agricultural products. In this respect, however, two important issues should be looked into. Although, agro-processing industries have appeared to have relatively higher level of backward linkage effects in terms of both per unit output multiplier and weighted multiplier, this does not imply that they do have the same role in terms of ensuring the country's long term industrial development, Critical industries for creating technological progress, such as engineering: metallic and chemical industries, electrical and electronics, etc. have rather very weak backward linkage effects. These industries have been the sources of rapid technological progress and sustainable industrial development in a number of countries. However, in the Ethiopian case, they are not only few in number, but are also non-existent. The existing few industries heavily depend on imports with very limited backward linkages in the economy. Secondly, even second layer agro-processing industries such as macaroni and spaghetti, and wearing apparel for clothing and other industries with a relatively higher per unit output multiplier effect play a somewhat inadequate role in the economy due to their limited size. If they

were given more emphasis in the policy drive and hence expanded, they would have created substantial linkage effects with the rest of the economy.

## 4.3 Forward linkages

To show the complete picture of the linkages of an industry, there is a need to trace the extent of forward linkages too, for the simple reason that an industry influences production not only through its inputs but also via its outputs. The latter reflects the forward linkages.

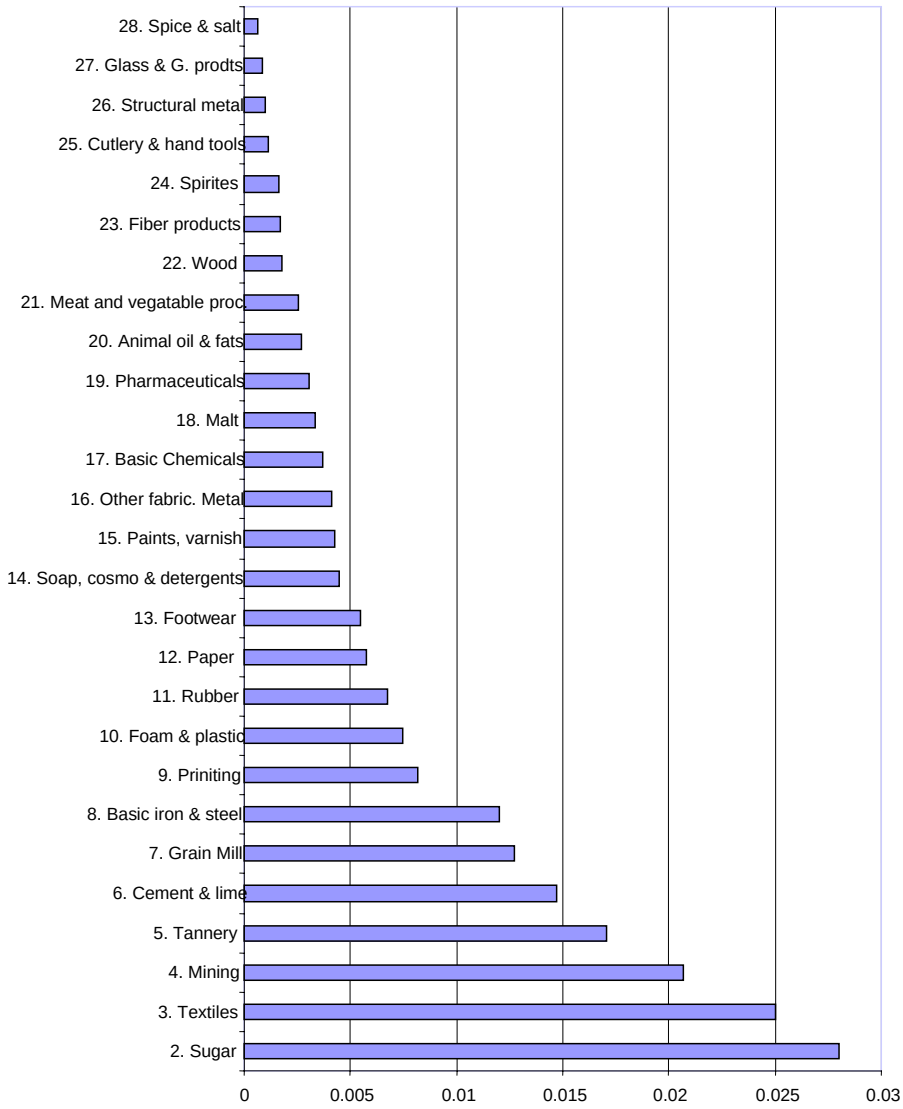
Table 3 tabulates the summation of supply side total requirement coefficients or multipliers for each industry. In the case of forward linkages, industries that have forward linkages of any sort are only twenty eight out of the total of forty eight industries. In the case of forward linkages, the dominance of agro-processing (or natural-resource-based industries) is significantly reduced and instead other industries including engineering industries appear to have better multiplier effects. As shown under column 2 of Table 2, basic chemical industries have the largest multiplier effect in the economy. This is so because most industries use chemicals, one way or another. Despite the fact that basic chemical industries have the capacity of creating the largest forward multiplier effects in manufacturing, there are only few chemical industries in the country. Because of this, both manufacturing and agriculture import substantial amount of chemicals. Also engineering industries such as structural metal, other fabricated metals, cutlery & hand tools, truck assembly, etc, appear to have relatively larger forward than backward multipliers. Malt, wood, structural metal and other fabricated metal, paper, grain mill, textiles, fiber products and cutlery & hand tools are other nine industries with relatively high per unit forward linkage effects. Five out of the ten industries are agro-processing and four out of the ten are metallic industries.

**Table 3: Forward linkage multipliers: Summation of total requirement coefficients (from supply side)**

| Industry/sector | Sum of total requirement coefficients |
|---|---|
| 1. Basic Chemicals | 2.33 |
| 2. Malt | 1.92 |
| 3. Wood | 1.74 |
| 4. Structural metal | 1.70 |
| 5. Other fabric. Metal | 1.62 |
| 6. Paper | 1.39 |
| 7. Grain Mill | 1.32 |
| 8. Textiles | 1.31 |
| 9. Fiber products | 1.20 |
| 10. Cutlery & hand tools | 1.19 |
| 11. Agriculture | 1.18 |
| 12. Glass & G. products | 1.16 |
| 13. Meat and vegetable processing | 1.16 |
| 14. Foam & plastic | 1.15 |
| 15. Spirits | 1.13 |
| 16. Truck assembly | 1.11 |
| 17. Animal oil & fats | 1.11 |
| 18. Footwear | 1.11 |
| 19. Tannery | 1.08 |
| 20. Sugar | 1.06 |
| 21. Spice & salt | 1.05 |
| 22. Rubber | 1.04 |
| 23. Cement & lime | 1.03 |
| 24. Basic iron & steel | 1.01 |
| 25. Paints, varnish | 1.01 |
| 26. Printing | 1.01 |
| 27. Soap, cosmetics & detergents | 1.005 |
| 28. Pharmaceuticals | 1.0002 |

Again, similar to the exercise undertaken for backward linkages calculation, weighing the total requirement matrix brings about a change in the relative importance of industries in creating forward linkages. The weighted multipliers result in a situation displayed in Figure 6.

**Figure 6: Forward linkage weighted by GVP (excluding agriculture)**




Source: Own Source

Agriculture dominates the actual forward linkage with relatively huge weighted multiplier coefficients and to show more apparently the relative role of other sectors, agriculture is deliberately excluded from Figure 6 above. As it has been observed in the figure, those industries having higher unit output multiplier slipped away from their positions due to their limited size in terms of output contributions in the system. On the other hand, sugar, textiles, mining, tannery and cement appeared at the forefront. As it has been the case in backward linkages, industries that have comparably high unit output multiplier effects actually play a very restricted role in the economy. It is partly due to the fact that the level of processing in the Ethiopian manufacturing sector is limited only to lower stages and as a result only those industries processing raw materials emanating from the primary sectors happen to have forward linkages. Secondly, some industries have relatively high per unit output forward linkages and yet their size is very limited and it is a testimony of a policy constraint.

## 5. Conclusion and recommendations

The significance of having strong linkages among sectors in determining the nature and pace of economic growth has not been a source of doubt. Countries with strong linkages among the different sectors of their economy are relatively less affected by external shocks and the interplay among economic actors will remain vibrant. The existence of this dynamism among industries expedites the pace of growth and development of the economy. As it has been observed above, the situation is different in countries such as Ethiopia, where there is a very loose linkage and integration among the different industries. The above exercise has resulted in the following main findings.

- Agro-processing industries appear at the forefront in creating relatively high backward linkages. Within this group of industries, those which have had relatively high per unit output backward linkage do not actually create tangible absolute linkage effects due to their tiny size. Chemical and engineering industries, which could have played a more dynamic role in boosting the pace of industrialization as it is universally the case, do not have any meaningful backward linkage in the Ethiopian case. Metallic and chemical industries are few in number and the existing ones themselves heavily rely on imports. This is primarily because of the underdeveloped nature of the mining sector and

absence of basic metal foundries in the country. Albeit natural to expect this kind of industrial linkage structure at the early stage of industrialization, it may not be possible to hasten the pace of industrialization and make structural transformation in the economy unless a deliberate change of direction is put in place.

- In the case of forward linkages, the result is mixed. Industries with a relatively high multiplier effects are observed from both agro-processing and other intermediate goods producing industrial groups. Most metallurgy and chemical industries are established with the prime motive of replacing imported final goods without involving major processing (for instance, assembly of cars, corrugated iron sheets, etc,). Under this condition, the forward linkage that has already been created by these industries is a signpost of the potential of those industries that would be established with the motive of addressing intermediate input demands of manufacturing and other sectors of the economy. A closer look at the nature of imported inputs clearly reveals that there is a very large market for these types of industries to replace.

To sum up, this study may not provide comprehensive policy recommendations. An attempt will be made in the future to widen the scope and deepen the analysis through disaggregating the agriculture and mining sectors, and including other sectors such as electricity and construction. Short of this, besides its importance to be used as an input for further study, the paper could provide the following policy implications.

For the country to embark upon a sustainable and more dynamic pace of industrialization, it has to devise a policy direction that gives more focus on those industries that create a relatively high per unit output multiplier effects in the economy. Metallurgy and chemical industries by their very nature provide high backward and forward linkages and it has been the case in countries that underwent through a successful industrialization process. These industries are by and large missing in Ethiopia. Policy makers should seriously look into this gap and take measures to nurture and expand them. Secondly, measures should also be taken to facilitate the establishment and growth of industries that have a relatively high per unit output multiplier effects even within the agro-processing industries. Industries that use semi-processed local inputs and pass through a longer value chain such as macaroni and spaghetti, wearing apparel for clothing, wearing apparel for leather etc

should be promoted. In this way, low stream industries and the agricultural sector itself would have the chance to flourish with the motive to exploit an increase in demand for their outputs to be reprocessed. In this way, value added generation capacity of the industrial sector in particular and the economy in general will be enlarged and the level of industrialization will deepen. All these could require designing an industrial program having a vision in the medium and long term perspectives to strengthen inter-sectoral linkages and hasten the pace of industrialization. One of the policy instruments in this respect is to streamline the incentive structure in line with the vision meanwhile capitalizing short-term gains that might be achieved under the given industrial structure.

## References

Central Statistical Authority. (2002). Agricultural Sample Survey, Report on Farm Management Practices (Private Peasant Holdings, Meher Season), Addis Ababa.

Central Statistical Authority. (2002). Report on Large and Medium Scale Manufacturing and Electricity Industries Survey, Addis Ababa.

Central Statistical Authority. (2004).: Large and Medium Scale Manufacturing and Electricity Industries Survey, Unpublished; Addis Ababa.

Claus (2002),"Inter Industry Linkages in New Zealand", New Zealand Treasury Working Paper 02/09.

Dervis, K., J.D. Melo and S. Robinson. (1982): General Equilibrium Models for Development Policy, A World Bank Research Publication, Cambridge University Press, Washington.

EEA/EEPRI. (2002). Survey of Large and Medium Scale Industries, Unpublished.

EEA/EEPRI. (2005). Industrialization and Industrial Policy in Ethiopia, Addis Ababa.

Ministry of Finance and Economic Development. (2005). Sectoral Gross Value of Production, Unpublished.

National Bank of Ethiopia. (2003). Annual Report 2001/02, Addis Ababa.

_____. (2005), Quarterly Bulletin, First Quarter (2004/2005), Volume 20, No.1.

Pesaran, Hashem M. & Peter Schmidt. (1999). (eds.). "Handbook of Applied Econometrics", Volume II: Micro Economics.

# Annexes

## Annex 1: List of industrial groups

| | |
|---|---|
| 1. Meat and vegetable proc. | 25. Printing |
| 2. Animal oil & fats | 26. Basic Chemicals |
| 3. Dairy products | 27. Paints, varnish |
| 4. Grain Mill | 28. Pharmaceuticals |
| 5. Animal feeds | 29. Soap, cosmetics & detergents |
| 6. Bakery & pastry | 30. Candle & related |
| 7. Sugar | 31. Rubber |
| 8. Macaroni & spaghetti | 32. Foam & plastic |
| 9. Coffee & tea | 33. Glass & G. products |
| 10. Spice & salt | 34. Structural clay |
| 11. Spirits | 35. Cement & lime |
| 12. Wine | 36. Concrete & plaster |
| 13. Malt | 37. Marble & ceramics |
| 14. Brewery | 38. Basic iron & steel |
| 15. Soft Drinks & mineral | 39. Structural metal |
| 16. Tobacco | 40. Cutlery & hand tools |
| 17. Textiles | 41. Other fabric. Metal |
| 18. Fiber products | 42. Ovens & furnaces |
| 19. Wearing apparel (cloths) | 43. Food & beverage Machinery |
| 20. Wearing apparel (leather) | 44. Battery |
| 21. Tannery | 45. Furniture |
| 22. Footwear | 46. Truck assembly |
| 23. Wood | 47. Agriculture |
| 24. Paper | 48. Mining |

**Annex 2: Total Requirement Matrix for backward linkages (Columns 1-13)**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0.171 | 0.014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0.101 | 1 | 0 | 0 | 0.044 | 0.0014 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 1.0183 | 0.0672 | 0.2953 | 0 | 0.5825 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0.005 | 1.001 | 0 | 0 | 0 | 0.0158 | 0.064 | 0 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0.005 | 0 | 0 | 0 | 1.004 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.1261 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2 contd. (Columns 1-13)**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0 | 0 | 0 | 0.0003 | S | s | 0 | 0.0002 | 0 | 0 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 | 0.0122 | 0.0008 | 0.0037 | 0 | 0.007 | 0 | 0.031 | 0 | 0 | 0.018 |
| 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0.0002 | 0 | 0 | 0.033 | 0.032 | 0.0006 | 5E-04 | 0 |
| 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0034 | 0.003 | 0 |
| 26 | 0.036 | 0.0007 | 5E-04 | 0.0085 | 0.007 | 0.003 | 0.0034 | 0.0049 | 4E-04 | s | 0.0037 | 0.015 | 0.0007 |
| 27 | 0 | 0 | 0 | s | S | s | 0 | s | 0 | s | 0 | 0 | s |
| 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 0 | 0 | 0 | 0.0135 | 0.0009 | 0.0039 | 0 | 0.0077 | 0 | 0 | 0 | 0 | 0 |

**Annex 2 contd. (Columns 1-13)**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0034 | 0.004 | 0 |
| 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 38 | S | s | 0 | 0 | S | 0 | 0 | 0 | 0 | 0 | S | s | s |
| 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41 | 0.001 | 0.002 | 0 | 0.0021 | 0.0004 | 0.0026 | 0.001 | 0.0012 | 0.002 | s | 0.0023 | s | 0.009 |
| 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 47 | 0.491 | 0.6249 | 0.427 | 0.7492 | 0.4149 | 0.2278 | 0.1586 | 0.4285 | 0.306 | 0.584 | 0.005 | 0.073 | 0.5872 |
| 48 | 0.002 | 0.0001 | s | 0.0006 | 0.0005 | 0.0003 | 0.0003 | 0.0004 | s | s | 0.0007 | 0.001 | 0.0003 |
| $\sum_{i=1}^{n=48} b_{ij}$ | 1.632 | 1.6277 | 1.428 | 1.8048 | 1.707 | 1.5624 | 1.1642 | 2.0323 | 1.341 | 1.652 | 1.1609 | 1.162 | 1.6154 |

**Annex 2: continued (Columns 14-27)**

| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0.011 | 0.09 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0.092 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2: continued (Columns 14-27)**

| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | S | s | 0 | 1.2611 | 0 | 0.5902 | 0.009 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | 0.0017 | s | 0 | 0.0025 | 1 | 0.0012 | S | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0.003 | 0.456 | 1 | 0.228 | 0 | 0 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.106 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.0142 | 0 | 0 | 0 | 0 |
| 24 | 0.0002 | 0 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.024 | 0.175 | 0 | 0 |
| 25 | 0.001 | 0 | 0.006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 26 | 0.0001 | 0.031 | s | 0.0057 | 0.0067 | 0.0081 | 0.021 | 0.047 | 0.021 | 0.0019 | 0.001 | 0.0077 | 1.07 | 0.2449 |
| 27 | S | s | 0 | s | 0.005 | s | S | 0 | 0 | 0.0071 | 0 | 0 | 0 | 1 |
| 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 0.0011 | 0.001 | 0 | 0.0014 | 0 | 0.0007 | S | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 0.003 | 0.004 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2: continued (Columns 14-27)**

| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 38 | S | s | s | s | S | s | S | s | s | s | S | s | s | s |
| 39 | 0.001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41 | 0.0009 | 0.001 | s | 0.0101 | S | 0.0048 | 0.001 | 0.002 | 0.007 | 0.0183 | S | 0.002 | 0.001 | 0.0002 |
| 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 47 | 0.0558 | 0.015 | 0.047 | 0.2443 | 0.0905 | 0.1165 | 0.318 | 0.693 | 0.158 | 0.1229 | S | 0.0002 | 0.025 | 0.0057 |
| 48 | 0.0004 | 0.003 | s | 0.0007 | 0.0005 | 0.0007 | 0.001 | 0.003 | 0.002 | 0.0007 | S | 0.0006 | 0.073 | 0.0167 |
| $\sum_{i=1}^{n=48} b_{ij}$ | 1.1682 | 1.145 | 1.054 | 1.5258 | 1.1026 | 1.7251 | 1.806 | 1.745 | 1.522 | 1.1651 | 1.025 | 1.1855 | 1.168 | 1.2676 |

**Annex 2: continued (Columns 28-41)**

| | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0.056 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0.006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2: continued (Columns 28-41)**

| | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0.0013 | 0 | 0.006 | 0 | 0.0251 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | S | 0 | s | 0 | S | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 0 | 0.004 | 0.04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 | S | 0.027 | s | 0 | 0.0025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 | S | 0 | s | 0 | S | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 0 | 1.005 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 1.043 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | S | 0 | s | 0 | 1.105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 33 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2: continued (Columns 28-41)**

| | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0.004 | 1 | 0.24 | 0.041 | 0 | 0 | 0 | 0 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 38 | S | s | s | 0 | S | s | s | s | s | s | 1 | 0.097 | 0.035 | 0.001 |
| 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 41 | S | s | s | 0 | 0.0002 | 0.002 | 0.0003 | 0.069 | 0.024 | 0.009 | 0 | 0 | 0.0211 | 1.005 |
| 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 47 | 0.0002 | 0.028 | 0.001 | 0 | 0.0049 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 48 | S | 0.002 | 0.15 | 0 | 0.0002 | 0.108 | 0.0115 | 0.113 | 0.156 | 0.235 | 0.006 | 0.0006 | 0.0009 | 0.031 |
| $\sum_{i=1}^{n=48} b_{ij}$ | 1.0015 | 1.128 | 1.198 | 1.043 | 1.1379 | 1.11 | 1.0157 | 1.183 | 1.42 | 1.285 | 1.006 | 1.0976 | 1.057 | 1.037 |

**Annex 2 continued (Columns 42-48)**

| | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2 continued (Columns 42-48)**

| | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|---|
| 17 | 0 | 0 | 0 | 0.0355 | 0 | 0 | 0 |
| 18 | 0 | 0 | 0 | S | 0 | 0 | 0 |
| 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0.1998 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 | 0 | 0 | 0 | 0.0023 | 0 | 0.001 | 0 |
| 27 | 0 | 0 | 0 | 0.0084 | 0 | 0 | 0 |
| 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 32 | 0 | 0 | 0 | 0.01 | 0 | 0 | 0 |
| 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Annex 2 continued (Columns 42-48)**

| | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|---|
| 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 38 | 0.004 | 0.02 | 0 | 0.001 | 0.0096 | s | 0 |
| 39 | 0 | 0 | 0 | 0 | 0.078 | 0 | 0 |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41 | 0 | 0 | 0 | 0.0119 | 0.005 | s | 0 |
| 42 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 43 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 44 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 45 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 46 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 47 | 0 | 0 | 0 | 0.0609 | 0 | 1.063 | 0 |
| 48 | s | 0.092 | 0 | 0.0005 | 0.0002 | s | 1 |
| $\sum_{i=1}^{n=48} b_{ij}$ | 1.004 | 1.112 | 1 | 1.3305 | 1.0928 | 1.064 | 1 |

**Annex 3: Weighted backward linkage coefficients (In order of Importance)**

| Industries/sectors | $\sum_{i=1}^{48} b_{ij}$ | Share of GVP (GVPS) | $\sum_{i=1}^{48} b_{ij}$ * GVPS |
|---|---|---|---|
| 1. Agriculture | 1.064 | 0.76319 | 0.81190 |
| 2. Sugar | 1.164 | 0.02647 | 0.03081 |
| 3. Textiles | 1.526 | 0.01904 | 0.02906 |
| 4. Tannery | 1.745 | 0.01578 | 0.02753 |
| 5. Brewery | 1.168 | 0.01741 | 0.02033 |
| 6. Mining | 1 | 0.01750 | 0.01750 |
| 7. Grain Mill | 1.805 | 0.00964 | 0.01740 |
| 8. Cement & lime | 1.182 | 0.01426 | 0.01686 |
| 9. Soft Drinks & mineral | 1.145 | 0.01311 | 0.01502 |
| 10. Basic iron & steel | 1.006 | 0.01184 | 0.01191 |
| 11. Printing | 1.185 | 0.00809 | 0.00959 |
| 12. Bakery & pastry | 1.562 | 0.00574 | 0.00897 |
| 13. Footwear | 1.522 | 0.00495 | 0.00753 |
| 14. Foam & plastic | 1.138 | 0.00647 | 0.00736 |
| 15. Rubber | 1.043 | 0.00648 | 0.00675 |
| 16. Tobacco | 1.054 | 0.00603 | 0.00635 |
| 17. Truck assembly | 1.093 | 0.00517 | 0.00565 |
| 18. Paints, varnish | 1.268 | 0.00419 | 0.00531 |
| 19. Soap, cosmetics & detergents | 1.128 | 0.00445 | 0.00502 |
| 20. Furniture | 1.330 | 0.00375 | 0.00499 |
| 21. Paper | 1.025 | 0.00417 | 0.00428 |
| 22. Macaroni & spaghetti | 2.032 | 0.00206 | 0.00418 |
| 23. Animal oil & fats | 1.628 | 0.00244 | 0.00397 |
| 24. Marble & ceramics | 1.285 | 0.00286 | 0.00367 |
| 25. Meat and vegetable proc. | 1.632 | 0.00224 | 0.00365 |
| 26. Pharmaceuticals | 1.002 | 0.00309 | 0.00310 |
| 27. Malt | 1.615 | 0.00175 | 0.00283 |
| 28. Other fabric. Metal | 1.037 | 0.00255 | 0.00265 |
| 29. Concrete & plaster | 1.420 | 0.00148 | 0.00210 |
| 30. Wearing apparel (cloths) | 1.725 | 0.00118 | 0.00204 |
| 31. Basic Chemicals | 1.168 | 0.00158 | 0.00185 |
| 32. Spirits | 1.161 | 0.00145 | 0.00167 |
| 33. Fiber products | 1.103 | 0.00144 | 0.00159 |
| 34. Coffee & tea | 1.341 | 0.00117 | 0.00157 |

**Annex 3 contd.**

| Industries/sectors | $\sum_{i=1}^{48} b_{ij}$ | Share of GVP (GVPS) | $\sum_{i=1}^{48} b_{ij}$ * GVPS |
|---|---|---|---|
| 35. Dairy products | 1.428 | 0.00108 | 0.00155 |
| 36. Wood | 1.165 | 0.00103 | 0.00121 |
| 37. Cutlery & hand tools | 1.057 | 0.00097 | 0.00103 |
| 38. Spice & salt | 1.651 | 0.00058 | 0.00096 |
| 39. Wine | 1.162 | 0.00071 | 0.00082 |
| 40. Glass & glass products | 1.110 | 0.00072 | 0.00079 |
| 41. Structural metal | 1.098 | 0.00059 | 0.00065 |
| 42. Wearing apparel (leather) | 1.806 | 0.00034 | 0.00062 |
| 43. Structural clay | 1.016 | 0.00047 | 0.00048 |
| 44. Candle & related | 1.197 | 0.00024 | 0.00029 |
| 45. Animal feeds | 1.707 | 0.00011 | 0.00020 |
| 46. Ovens & furnaces | 1.004 | 0.00009 | 0.00008 |
| 47. Food & beverage Mach. | 1.112 | 0.00004 | 0.00044 |
| 48. Battery | 1 | 0.00004 | 0.00039 |

# ENTERPRISE MANAGEMENT OF STATE-OWNED COTTON/TEXTILE/GARMENT ENTERPRISES IN ETHIOPIA

Endalkachew Sime[1]

*Abstract*

*Textile and apparel are some of the few strategic commodities that the Ethiopian industrial development strategy expects a leading role from. The state-owned cotton/textile/garment enterprises, which hold about 33.8% (in the year 2001/02) of the gross fixed capital of the Ethiopian manufacturing sector, are inefficient and facing a deep financial crisis majorly because of the very nature of their enterprise management system that lacks a sense of belongingness among workers, with many other subsequent technical and financial limitations. In addition, the sluggish and ineffective privatization programme that was put in places with the intention of dealing with this problem is bringing about the collapse of the existing small practices as workers fear for their jobs and speculate about what is going to happen to them. With all these dynamics that have hindered the privatization trials, a pre-designed worker-owner privatization system that considers the financial capacity of the existing workers thoroughly is believed to present a better solution for this vital problem.*

[1] Market Research and Sales Administration Head, Adei Abeba Textile, Garment and Yarn S.C.

## Abbreviations

| | |
|---|---|
| ADLI | Agricultural Development-Led Industrialization |
| AGOA | African Growth Opportunity Act |
| BDU | Bahir Dar University |
| BTA | Bilateral Trade Agreements |
| COMEESA | Common Market for Eastern and Southern Africa |
| CTPIC | China Textile Planning Institute of Construction |
| EBA | Everything But Arms |
| ETB | Ethiopian Birr |
| FTA | Free Trade Area |
| GDP | Gross Domestic Product |
| GSP | Generalized System of Preference |
| LDBC | Lesser Developed Beneficiary Countries |
| NITRA | Northern India Textile Research Association |
| PAF | Pearl Academy of Fashion |
| R&D | Research and Development |
| SDPRP | Sustainable Development and Poverty Reduction Program |
| SOE | State-owned Enterprises |
| TGE | Transitional Government of Ethiopia |
| TGISI | Textile and Garment Industry Support Institute |
| PPESA | Privatisations and Public Enterprise Supervising Authority |

## 1. Introduction

The term textile industry, for the purpose of this study will be representing the three major sectors of the industry i.e. cotton production, fabric formation and garmenting which basically focuses on finishing processes like dying, cutting, sewing and the like.

State-owned cotton/textile/garment enterprises hold about 33.8% of the gross fixed capital of the Ethiopian manufacturing sector (CTPIC, 2001/02). With three planting structures (public farms, private farms and household farms) and having six times higher output per unit of land than that of grain farming, the cotton planting sub-sector supplies 90% of the raw material for the textile sub-sector. As the public cotton farming practice employs 2-3 times more labour force than that of grain farming, 17-24% in acreage and 29-39% in yield among the total national cotton farming in the year 2000/01 has resulted from public farms.

Regarding the textile sub-sector, it is the third largest industry next to food & drink processing and leather and has contributed 1.35% of the national GDP and 8.31% to the total output value of the manufacturing industry with the total output value of 699.91 million Birr in the year 2000/01. (Chemonics International, 1996)

With a long history of traditional manufacturing, the garment sub-sector also has a profound national culture up to this date. Currently, there are well above 35 garment factories in Ethiopia.

## 2. Statement of the problem

In general, it is well known that the developmental process of a textile market moves from a product-oriented stage where all goods produced are sold, to a consumer-oriented stage where the desired goods are only those which will satisfy the consumer's demand comprising of his wants and purchasing power. (UNIDO, 1992)

And the ongoing market liberalization has increased the unavoidable impact of globalization, which is characterized by the demand of fast and flexible decision

making through greater communication with customers of different cultures, personalities and characters with the sense of belongingness to the deal.

According to J. Zheng X. Liu1 and A. Bigsten, (2000), centrally administrated SOEs in China were among the least efficient assuming everything else is fixed. The key problems that are deeply rooted in the SOE sector are low efficiency, productivity, and profitability as well as inability to separate management from state interference.

If we take public cotton farms, after they have broken away from government direct interference, the management board, representing Privatization and Public Enterprise Supervising Authority (PPESA) supervises the production, management and personnel matters of the farm, thus causing lack of self-inspiration, self-development, self-build up and self-discipline. The assessment goals of the managers are usually influenced by multi layers of authorities rather than by the pursuit of interest maximization. The management efficiency of the farms is not closely related to personal remuneration. Still due to affiliation to the government to some extent, the public firms have not assumed a leading role in the market. (CTPIC, 2004).

Different sources depict that public cotton/textile/garment enterprises are generally suffering from loss in Ethiopia and some enterprises specifically are in a critical loss; even unable to pay wages. We can see the profit and loss statements of some representative companies whose data are available, in the tables bellow.

**Table 1: Profit and loss figures for five factories in ETB**

| Net Profit/Loss I ETB (After Tax) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Factory** | **1985/86** | **1986/87** | **1987/88** | **1988/89** | **1989/90** | **1990/91** | **1991/92** | **1992/93** | **1993/94** | **1994/9** |
| Adei Abeba Yarn Factory | -2,262,000 | -385,000 | -5,226,000 | -7,295,000 | -3,461,000 | -6,707,000 | -11,527,000 | -8,193,000 | -5,269,000 | -4,427,0 |
| Combolcha Textile Mill | NA | -1,910,185 | -25,884,367 | -2,328,895 | -14,527,463 | -14,666,547 | -19,667,474 | -12,255,488 | -11,204,000 | 11,282,0 |
| Arba Minch Textile Factory | NA | NA | NA | NA | NA | NA | NA | -7,532,404 | -8,792,526 | -9,915,0 |
| Akaki Textile Factory | 1,920,659 | 3,372,491 | 2,560,970 | -411,288 | 810,102 | -6,244,057 | -11,533,325 | -6,028,878 | 462,206 | -8,479,3 |
| Dire Dawa Textile Factory | 4,260,656 | 5,671,513 | 3,490,469 | -3,579,504 | -680,985 | -15,863,625 | 5,388,015 | -14,251,917 | 2,953,498 | -8,858,4 |

*Source: - Textile Sector Study, SPESA; Volume II-K, II-F, II-E, II-M and II-I; 1996*

The above table shows that between the forty-two (42) annual financial records of five factories whose data are available, 32 (thirty-two) of them show a net loss; mostly, in millions of birr. This deep loss accounts for 76% of the records mentioned above.

On the other hand, the General Manager of these enterprises lacks the swiftness and flexibility that is vital to make the necessary decisions because of the Management Committee, which is a decision-making body and the Board, which gives approval. Even in the rare cases of relatively fast and flexible reactions of these bodies, lack of self motivation and commitment among the executive officers and technical staff in the enterprises makes their course of action unfit for the dynamic decision-making demand of the global textile industry. This lack of speed and flexibility in decision-making also affects the relatively weak public enterprises that do not engage in export and operate in local market, as the local market condition is under the influence of the global trend.

According to the report of Chemonics International (1996), these enterprises are in deep financial crisis, with negative net worth and little liquidity. They rely primarily on overdrafts to fund their current operation. All in all, the industry is losing a considerable amount of money. (Refer to table 1)

This problem is also being aggravated by the sluggish process of the privatization of these enterprises. This problem is manifested in a form of operational paralysis upon its workers in such a way that they lose their work motivation due to speculation of the fate of the enterprise and fear of job loss.

This situation calls for an urgent solution which considers the realistic and current conditions of the enterprises and the corresponding workers, which the theme of this report basically revolves around.

## 3. Textile industry

### 3.1 The global trend

Since the industry often requires only simple technology and is intensive in unskilled labour, many developing countries have a strong comparative advantage in this industry. (IMF and World Bank, 2002.)

The textile industry is regarded as a typical labour intensive industry developed on the basis of abundant labour supply and has a tendency to expand to overseas markets once the domestic demand is satisfied, as it is shown by established textile industries of many countries. (UNIDO, 1992).

Countries with a developed textile industry are gradually moving their manufacturing base to developing countries with lower labour cost so as to compete with the declining international textile price as a result of supply that is exceeding the demand; and to get their resources released to be engaged in highly technology-oriented value adding and capital intensive ventures. For instance Japan and Germany have already transferred part of their textile production ventures to India, Pakistan, Indonesia, Turkey, etc. The primary processing of fabrics is done in these developing countries where the fibre resource is rich and the price is cheap. And then the semi-processed product is transported back for finishing to cut down the production cost and to get added profit. And now, Asian countries and regions which have already achieved rapid development in the textile industry have began seeking opportunities for overseas relocations in an attempt to mitigate impacts of quotas and tariff barriers in the export market as well as the labour cost rise in their domestic market. (CTPIC, 2004)

The following opportunities and facts are pulling the ever ready-to-migrate textile industry being pushed by the high production cost and the ever-squeezing trend of their local environmental commitments to some preferentially treated countries including Ethiopia.

- AGOA (African Growth opportunity Act), the U.S. time-framed duty-free and quota-free market entry preferential treatment granted for sub-Saharan developing countries including Ethiopia;
- EBA (Everything But Arms) - the E.U. duty-free and quota-free market entry preferential treatment granted to Lesser Developed Beneficiary Countries (LDBC) including Ethiopia;
- GSP (Generalized System of Preference) - where Ethiopia enjoys a preferential tariff treatment in the United States, Canada, Switzerland, Norway, Sweden, Finland, Austria, Japan, majority of EU members and lately China;
- BTA (Bilateral Trade Agreements) - signed with 16 nations including Russia, Turkey, Yemen, etc;

- COMEESA (Common Market for Eastern and Southern Africa) - The launch of the first free trade area (FTA) of a common market for Eastern and southern African member nations in the year 2000.

## 3.2 Textile industry in Ethiopia

According to different sources, after the unrecorded and aged household practices, the history of the industrialization of the textile industry in Ethiopia dates back to the 1930's, when the country's cotton planting was still in a stage of traditional planting pattern only. After the 1960's, with the advent of mass production of cotton, the figure of the industry came into picture.

In 2002, the Ethiopian Government drafted the Sustainable Development and Poverty Reduction Program (SDPRP) in which it identified development and poverty reduction as a primary target of the government and Agricultural-Led Industrialization (ADLI) as its principal strategy.

The industry was contributing approximately 1 percent of the Gross Domestic product (GDP), or about 18 percent of the gross value of production from manufacturing. It employs approximately 30,000 people. (Chemonics Int'l, 1996).

Keeping in view the different opportunities available and assuming the necessary supporting practices, the government of Ethiopia is projecting an annual export target of 500 million USD by the end of the year 2010 from the current 20 million USD (NITRA, 2004).

The industrial demand that often fits the country's resource, as well as the current ever-expanding special market privilege opportunities makes the industry a sound role player in the directive our government is pursuing.

## 3.3 State-owned cotton/textile/garment enterprises in Ethiopia

The establishment of Ethiopia's public cotton, textile and garment enterprises goes back to the year 1939. The oldest commercial textile manufacturing enterprise is the

Dire Dawa Textile Factory established in the year mentioned. All other cotton, textile and garment manufacturing enterprises were established during the years of 1950's, 1960's, 1980's and 1990's. (NITRA, 2004)

Next to Dire Dawa Textile Factory, Edget yarn factory was established in 1953, Akaki Textile factory in 1956, Addis Garment factory in 1958, Adei Abeba Yarn Factory in 1961, Bahir Dar textile Factory in 1961, Abobo Agricultural Development Enterprise in 1961, North Omo Agricultural Development Enterprise in 1961, Debre Birhan Blanket Factory in 1963, Akaki garment Factory in 1963, Nifas Silk sewing thread factory in 1966, Middle Awash Agricultural Development enterprise in 1967, Gulele Garment Factory in 1983, Tendaho Agricultural Development Enterprise in 1985, Kombolcha Textile Factory in 1986, Awasa Textile Factory in 1989, Arba Minch Textile Factory in 1991, and finally , Nazareth Garment Factory in 1992, in the period of the transitional government of Ethiopia (TGE).

Before 1974, foreign interests were involved and targeted at the privately owned commercial textile sector. After nationalization in 1974, the sector was transferred to a centralized political bureaucracy with no appearance of autonomy.

In 1992, the transitional government of Ethiopia (TGE) changed the legal status of the public enterprise with proclamation no. 25/1992 which changed the government bodies with the responsibility to operate in a manner that is consistent with open market competition, until the enterprises are privatized.

The commercial cotton, textile and garment sectors of these enterprises remain almost entirely in the public sector; none of the pre-existing public sector enterprises have been privatized successfully on a permanent basis.

## 3.4 Current enterprise management of SOE

The official legal status of all public sector enterprises is set forth in the public enterprise proclamation no. 25/1992, published on August 27, 1992 in the *Negarit gazeta* of the transitional government of Ethiopia.

In the preamble to this proclamation, the following two fundamental statements are made.

*WHEREAS, as long as public enterprises have to stay under government control, it is necessary to create an organizational structure whereby they can enjoy management autonomy and thus enable them to be efficient, productive, and profitable as well as to strengthen their capability to operate by comparing with private enterprises;*
*WHEREAS, there has to be a legal framework under which public enterprises, other than those which have to stay under government control, are operated be it with the participation or under the full ownership of private investors pursuant to the new economic policy.*

The proclamation sets clear points regarding the following:

- The intent is to structure the controlling mechanisms of the enterprise so that they are managed autonomously; i.e., without political interference.
- The intent is that the enterprises have the primary goal of achieving efficiency, productivity and profitability; i.e., that they become competitive in open and unprotected markets.
- It is assumed that some of the enterprises will stay under government control; i.e., that they will not be privatized.

The official chain of command runs from the Privatization and Supervising Authority, to a Management Board assigned by the authority, to a General Manager that is to be appointed and dismissed by the board of the respective enterprises.

According to the study report of Chemonics International, (1996) the result of the forgoing powers and duties of this chain of command is to create a public sector rooted in the top hierarchy of national politics, which will in turn threaten the objective to have the enterprises managed autonomously. No structure is in place to insulate management decisions made for the purpose of profit form the political pressure to serve social welfare objectives. For example,

- The appointed boards are subject to intense political pressures. They do not bring in-depth expertise relevant to the needs of the newly liberalized enterprises. With one third of the board members made up of workers' representatives, over three-fourths of the remaining board members must be willing to override the labour vote.
- Finally, the general Manager is clearly not empowered to take unilateral action on labour issues. Unless the board has approved beforehand, a proposal by the

general manager for significant action regarding workers would endanger his position in the enterprise.

According to the study, the position of the general manager is structurally very weak. Unless the general manager has a universally recognized expertise or extraordinary political power, he will not survive repeated controversial decisions. Unfortunately, most decisions aimed at transforming an inefficient state enterprise into an efficient competitor, are somewhat controversial. Because a general manager has no economic incentive to undertake such changes, he will try to balance bureaucratic and political interests. Neither efficiency nor productivity and profitability could be the top priority in this situation.

This is a basic problem that emanates from the nature of the enterprise management system. This clearly shows how the performance of entities within an economy follows the conduct of the people within them, which in turn are determined by the enterprise management system within which the entities are required to operate. People's altered conduct will inevitably lead to altered performance within the economic entities they influence through their unrestricted effort; and eventually the effects will spread throughout the entire economy. And people's altered conduct majorly depends on the feeling of ownership.

Since the days of enlightenment, economists have agreed that good economic institutions must secure property rights, enabling people to keep the returns on their investment of all the resources that they have. Such security encourages people to invest more, exerting their utmost effort, thereby fostering economic growth. (World Bank 2003).

Through all these facts and the experiences of other countries that underlines the injection of the feeling of ownership which is the motor of any successful enterprise globally, tells us that the role of transfer of ownership through privatization to actualize realities of the natural death of unfit enterprises and/or activate efficiency, productivity and profitability in the sound enterprises is the option-less way we have in order to solve the existing basic structural and technical inefficiencies of state-owned cotton, textile and garment enterprises.

## 3.5 Privatization

Privatization is the transfer of ownership or control from government or state hands to private hands. This transfer should be enough to give private operators or owners substantive independent power, i.e., the government can no longer call the shots. (A. Danio, 1998)

The basic benefits of privatization include the following:

- Improved enterprise efficiency and performance;
- Improvements in the competitive environment resulting in consumers and customers getting better and often cheaper products and services;
- It can be a good source of foreign investment in a country;
- By making the private owners' focus on the economic aspects of the enterprises, it improves corporate governance;
- It generates revenue for governments.

On a survey conducted on the privatization program of 1000 small enterprises in Russia one year after they had been privatized, the following points were observed with many more constructive findings:

- Improved enterprise efficiency and performance in around 70% of the cases;
- Two thirds carried out repairs to their businesses;
- In 90% of the cases, employees were working more efficiently;
- 86% said that they plan to grow their businesses. (A. Danio, 1998)

Since 1992, the government of Ethiopia has committed itself to the privatization program. From 1995/96 up to the present time altogether 16 textile and garment enterprises have been listed for privatization; so far nine years have passed, and no marked result has come out on a permanent basis.

According to the study report of the development strategy of the Ethiopian cotton/textile/garment sectors conducted by CTPIC, the undue scale of textile enterprises, the lack of private capital to purchase the assets, the resettlement of the

old workers, the out-dated equipment and the high cost of technological upgrading and related issues have affected the progress negatively in a severe manner.
Another general rule is that the longer an enterprise has been up for sale, the worse its financial and commercial condition becomes. A form of paralysis often sets in when there is uncertainty and when the management of a SOE becomes aware that it is up for sale, motivation to run the business may disappear as workers start to fear for their jobs and speculate about what is going to happen to them.

## 4. Recommendation

A worker-owner privatization system accompanied by a low cost-share system that basically considers the realistic situations of the workers is pointed out as a realistic remedy for the existing technical, structural and operational weaknesses of Ethiopian cotton/textile/garment state-owned enterprises.

The principle of “using the locals”, which most multinational giants have used as a rule of the day for their successful businesses with regard to exploiting resources and market opportunities of different localities and set-ups is the point that is given a great emphasis here.

No outsider can perform better in these enterprises than the ones who know the details of the existing specific set-up in detail.

Let’s see the existing problems associated with the sluggish process of privatization.

- Undue scale of enterprises;
- Lack of private capital to purchase the assets;
- Resettlement of the old workers;
- The out-dated equipment;
- High cost of technological update; and the like.

Implementing a studied mechanism that makes the current energetic worker, the owner of their corresponding enterprises in a low cost-share system which takes into account the financial conditions of the workers, presents a solution to this entire

problem; and at the same time establishes a way to exploit idle resources of trained manpower through the following major points.

- The existing staff thoroughly understands the specific and detailed characteristics and behaviour of the input market of the corresponding companies and can handle it in an efficient way;
- The existing staff knows in detail about the customer trend, special characteristics and related issues about the product market that fits the corresponding enterprise;
- The existing workforce also has technical operational knowledge that fits the existing obsolete machineries that need high capital for update. The ever expanding problem of spare part supply which is characterized by difficulties to get a continuous technical support of foreign machine suppliers because of the absence of local service centre branches, expensive spare part prices, the far reaching and expensive transport of the suppliers, the old model and out-of-shelf series of the machineries and other related problems are making the local knowledge ever in demand. The existing machine operators of the aged state-owned enterprises have accumulated a conditional management skill with the support of local modified machinery part producers, until the deterioration becomes too severe to handle.

What would turn this into a good opportunity to exploit this local knowledge is to inject the feeling of ownership into the currently existing inefficient performance of the enterprises in discussion.

Of course we see a sense of right upon the possessions of factories and the related benefits among workers. This is a sentiment developed in the communist regime through unlimited and improper rights of labour forces as well as because of illiteracy. But this sense lacks the sense of belongingness with responsibility that makes them willing to work strongly for profitability caring for the factories as they care for their own private business. And the existing workers' sense of "national right" upon the factories that we see is not the type of feeling of ownership that the researcher is recommending now.

*Similar experiences:*

A similar experience with the recommendation of this paper (worker-owner privatization system) in Ethiopia is that of the safety-net programs, which were implemented in different sectors in different forms including the transport sector EDDC. In the cases mentioned, the safety-net programs are designed to establish socio-economic security for extra workers of public enterprises and civil service institutions that went through restructure and/or liquidation. The extra staff to be laid off in the process of creating financial feasibility and service efficiency for old business and civil service enterprises are organized into associations engaged in business that can at least subsidize their income through the profit of the group business.

Though this experience is observed in the transport sector, which has its own specialties that are different from the textile sector, there is something that we can learn from the safety-net program as a whole, as there is no such experience in the textile sector yet.

In most cases, the researcher of this paper faced difficulties in getting documented and organized information and data on the planning, implementation and monitoring practices of safety-net programs in different sectors. Reliable information from informal sources found through personal contacts from Noh transport, one of the five older products of safety-net programs in the country, is compiled as follows, in a way that could show the principles and practices of safety-net in line with the recommended worker-owner privatisation system.

Together with other four transport companies, Noh Transport Company was established by the safety-net program initiated by the government ten years ago. The other four transport companies are Abyssinia Transport, Nib Transport, Tarik Transport and Addis Fana Transport. These five companies include extra workers laid off from 8 state-owned business companies and government service institutions. Ministry of Agriculture, ETHOF, Educational materials production Company and RRC were among the institutions from which the laid off workers were collected. A number of heavy trucks and buses which were in different government institutions and being used at different times by the government, are given to these workers on a long term loan basis.

Among the five transport companies established then by the program, only two have survived until now. These are Noh transport and Nib Transport. Fifteen (15) laid off workers were given one truck or bus. And Noh transport has managed to get around 105 trucks for its 1,575 laid off workers from different institutions. The 1,575 members of Noh transport have been getting a monthly payment of birr 100 up to 414 for the past ten years. This is money that the company is paying its members who are not contributing to its efficiency or growth. Although the company has a huge debt which accounts for the 105 trucks bought by the then market price from the government, Noh transport is paying the necessary monthly members' payment and every administrative expense. On the other hand, Noh transport is expanding its operation and has recently bought six new heavy trucks and five new buses together with field work pick-up cars. And they have also bought expansion places for fuel stations and parking areas in two places in the country (Awash Meile and Nazareth). The sources suggest that the failures of the rest of the companies lie in two places.

- *The regular members' payment*

Compared to the other similar transport companies that are competing in the same market, these companies have a huge unproductive expense. For example. Noh transport is paying birr 350,000 each month for its healthy and fit members, which are making nothing for the company, and are doing their own private work or hired someplace else and making their own living. This is one of the facts that has kicked out most of the companies from the market and is threatening the rest.

- *Management and leadership problem*

The board, which is chosen from the members by their own vote, is the supreme body that hires and fires the general manager. Members face two problems in choosing competent board members. These are the problem of not knowing each other well and the problem of literacy. Most of the members do not know each other well enough to asses who has the skills to do management work and who hasn't, as they all come from different places. The other thing is that, most of the members are illiterate and cannot think professionally of how to bring about effective management. They prefer to choose board members by personal relationship rather than professional competency. And the same thing applies in their choice of a general manager. Because of these and related problems, the companies lack competent management and leadership in the prevailing dynamic market.

Unlike the experience observed in the above safety-net program, the worker-owner privatization system makes an exhaustive use of the existing manpower in the factories with their customized knowledge that they have accumulated for a long time. And besides, there is no unproductive expense that threatens the financial performance of the companies.

The management and leadership roles and practices shall also not be occupied by some strangers without the knowledge of the workers in the company. The leadership that the workers assign would be someone that they believe is competent for the job since they have been working together for long.

*For implementation: Textile and Garment Industry Support Institute (TGISI)*

The Ethiopian Government through the Ministry of Trade and Industry has established the Textile and Garment Industry Support Institute (TGISI), by hiring the services of consultants from Northern India Textile Research Association (NITRA) and Pearl Academy of Fashion (PAF) of India who could guide Bahir Dar University (BDU) on the future course of action for the development of the textile industry and provide guidance in the establishment of the institute.

It is indicated on the report of NITRA & PAF (Development of business plan, start up and implementation of TGISI of Bahir Dar University) that restructuring the existing factories will have to be done by TGISI by entering into strategic alliances with reputed international consultants. And it is indicated in the strategy report that TGISI will conduct different researches through its R&D activities.

Some of the priority areas for R&D to be undertaken by TGISI indicated in the strategy report include areas of product development, eco-friendly process, import substitution and software development for textile and apparel application. These initiatives should include the basic and timely problem of the institutional management system of state-owned enterprises in line with developing an applicable system of worker-owner privatization system that takes the financial position of current workers in to consideration in a detailed study.

In this regard, the point that the government should consider and be committed to is that as the price of a unit share gets lowered in order to meet the worker's poor financial capacity, the full transfer of ownership could obviously take a prolonged period of time. So, there should be a continuous financial and technical support until it reaches total transfer. And in addition, there might be resettlement of aged and to-be-retired workers which is going to be identified clearly by further detailed study works of TGISI.

## References

Andrew Danio. (1998). Privatization and its effect on Domestic Entrepreneurial capacity. Economic Focus Vol. 1 No. 6, Dec. 1998.

Chemonics International. (1996). Ethiopian Textile sector study.

CTPIC. (2004). study report on development strategy of Ethiopian cotton/textile/garment Sub sectors: China Textile Planning Institute of Construction (CTPIC). China.

IMF and World Bank. (2002). Market Access for Developing Country Exports.

J. Zheng X. Liu and A. Bigsten. (2000). Efficiency, Technical Progress, and Best Practice in Chinese State Enterprises (1980-1994). Göteborg University.

NITRA & PAF. (2004). Survey of Textile and Garment in Ethiopia. Addis Ababa. Secretariat of Public Enterprise Supervising Authority (SPESA); Textile Sector Study; Volume II-K, II-F, II-E, II-M and II-I; 1996.

UNIDO. (1992). Textile Industry. Malaysia, Indonesia: The Energy Conservation Centre (ECC), Japan.

World Bank. (2003). The New Comparative Economics. World Bank Policy research Paper, 3054, May 2003.

# LINKAGE BETWEEN AGRO-INDUSTRIAL FIRMS AND OUT-GROWERS

Solomon Retta[1]

## 1. Introduction

The Ethiopian economy remains heavily dependent on the earnings of fragmented smallholder agricultural activities. The sector contributes about 50% of the total Gross Domestic Product (GDP), 85% of total employment and 90% of export. The country's export is highly dependent on a single crop. Coffee generates nearly 60% of the total foreign exchange earnings.

On the other hand, the industrial sector contributes 12% of the country's GDP, 9.5% of employment opportunities and 20% of foreign currency earnings.

The development strategy of the Ethiopian Government gives due attention to rural development activities and focuses on mobilizing and utilizing the capacity of the farming communities in the implementation process of the market-driven agricultural development strategy. It is intended to enhance activities to enable farmers and private investors as well as the agricultural and the industrial sectors to supplement each other's efforts and develop together in a coordinated manner. At present in Ethiopia, the linkage between manufacturing and the agricultural sectors is very weak. Only one third of the total outflow from agriculture goes to manufacturing. To date the country depends on the export of raw agricultural products to meet foreign exchange demand rather than encouraging export of manufactured or even semi-processed commodities. Most of the agricultural exports including coffee could have been further processed at home if agro-processing industries were expanded.

[1] fassdiscovery@ethionet.et

Therefore, there is a need to process raw materials into forms suitable for export because the processed product adds economic value to the produce and generates more foreign exchange. For example, beef carcasses are processed into portion cuts or canned products; coffee beans are transformed into instant coffee, etc. Such incremental industrialization not only increases value added but also creates products that are further differentiated and have higher income elasticity. These are more insulated from the price fluctuations of less processed commodities. It is one way of preventing the manufacturing sector from external shocks and creating enabling environment for dynamic growth of the economy. Agro-industries also help the country to save foreign exchange by substituting domestic goods for imports. This kind of production increases the country's level of self sufficiency *and* food security. By broadening its agro-industrial export portfolio, a country may be able to obtain some countercyclical protection because the trend is toward higher value products. There is a need to give special emphasis to the creation of a strong agricultural and industrial sectors linkage as a prerequisite to achieving viable industrialization because the initial stage of industrialization draws on natural agricultural endowment. Firms using such a competitive strategy will need to be as cost efficient as possible by operating at the lowest average cost, if they are to succeed in marketing products to these customized market segments. This competitive strategy requires firms to focus on particular market niches and provide from of vertical coordination.

On the other hand, procurement system links industrial and agricultural sectors by transmitting market stimuli to farmers and enhances rural development. One method of ensuring the supply of raw material is to extend purchase contracts to raw material producers. Agro-processing firms might accompany contract pricing with benefits to suppliers and processors. This kind of partnership increases economic certainty, facilitates financial planning, and avoids the risks of variability under spot pricing.

## Objective of the study

The objective of this paper is to give an insight into vertical coordination of firms particularly the linkage between agro-industrial enterprises and out-growers. It could contribute to initiate an in-depth research on vertical coordination integration of agro-industrial firms to out -growers.

### Method of the study

The method of study mainly utilizes secondary sources to elicit information from relevant documents. The presenter of this paper has visited some agro-industrial firms in Ethiopia and held discussions with concerned people.

### Limitation of the study

Despite efforts made by the presenter to get relevant data on the issue under study, he failed to obtain adequate information on the Ethiopian agro-processing firms.

## 2. The Role of agro-industries in development

Agro-industries are enterprises that process materials of plant or animal origin. Processing in agro-industries involves transformation and preservation through physical or chemical alteration, storage, packaging and distribution. For example, raw food *and* fiber are transformed to create an edible or usable product, to increase storability, to obtain a more easily or economically transportable form, and to enhance palatability, nutritional value or consumer convenience.

Agro-industries are important to the development of the agricultural sector because they are the primary method of transforming raw agricultural products into finished products for consumption. The country can be competitive in the world market by exporting processed commodities rather than exporting raw agricultural products. For example coffee beans can be transformed into instant coffee, beef carcasses can be processed into portion cuts or canned products, etc. The linkage between agricultural and industrial sectors can be prerequisite to achieve viable industrialization that utilizes the country's natural agricultural resources. Moreover, agro-industrial enterprises can open new market opportunities to out-growers

Agro-industries can improve storage, transportation, and handling of agricultural products. This may enable to lower the costs of food to consumers by reducing post - harvest losses and making the entire food marketing chain more productive and efficient. Such reductions in food prices have a disproportionately positive impact on

the nutritionally vulnerable non-farm groups, who spend almost all their income on food. Food processors may also provide nutritional benefits to the population by improving the sanitary conditions and health safety of the food supply.

Agro-industries can also help in using human resources effectively in all the seasons of the year by shifting from the agricultural sector to industrial sector.

## 2.1 Nature of agro-industrial raw materials

Agro-industrial projects are unique because of three characteristics of their raw materials.

### Seasonality

Because raw material for agro-industries is biological, its supply is seasonal, available at the end of the crop or livestock-reproduction cycle. Although supplies of raw material are usually available only during one or two brief periods in the year, the demand for the finished products is relatively constant throughout the year. Unlike the nonagro-industrial manufacturer, the food-or fiber-processing factory must contend with a supply-and-demand imbalance and problems of inventory management, production scheduling and coordination among the production, processing, and marketing segments of the farm-to-consumer chain. Seasonality can also lead to a shortage in the working capital available to handle the bulge in expenses and the heavy financial cost of carrying the inventory; such financial shortages can lead to shortfalls in raw material procurement, causing severe underutilization of .the processing plant's capacity.

### Perishability

Unlike the raw materials used in nonagro-industries biological raw materials are perishable and often quite fragile. Agro-industrial inputs must be handled and stored with speed and care to preserve their physical traits and, in the case of food products, their nutritional quality. The perishability of raw food and fiber materials, and related characteristics such as fragility (eggs. for example) and bulkiness (of livestock, for example), often require special and sometimes more costly transportation methods.

### Variability

The final distinctive characteristic of agro-industries is the variability in the quantity and quality of raw materials. Changes in weather and damage to crops or livestock from disease or pests make quantity uncertain. Even with good rains and field growth the harvest could be greatly reduced at the last minute by a pest infestation. Even without these adverse vagaries of nature, quality varies because standardization of biological raw materials remains elusive, despite advances in animal and plant genetics. This variability contrasts sharply with the extensive specifications for and high uncertainty of standard materials used in other manufacturing industries. Variability exerts additional pressure on an agro-industrial plant's production scheduling and quality control operations.

## 2.2 Vertical coordination

Firms using a competitive strategy need to be as cost efficient as possible by operating at the lowest average cost if they are to succeed in marketing segments. This competitive strategy requires firms to focus in particular market niches and provide form of vertical coordination. Vertical coordination is an important part of a competitive strategy and is defined broadly as various methods used to manage vertical stages in a marketing channel.

Vertical coordination is the purposive organization of activities and information flows between independent firms. The activity patterns and information flows possess two related features. First, they are not enforced through legal ordering. Second, profits from these patterns and flows are split up through ongoing adjustment and bargaining rather than contractually specified.

One of the linkages is the linkage between an agro-industry and out-growers. The processing plant can open new crop opportunities to out-growers and, by so doing, create additional farm revenue. The plant can play an important role in disseminating agricultural production techniques that increase farmer productivity. As a result, small or subsistence farmers have sometimes been able to boost their income by selling more in the commercial market. The new production techniques can enable farmers to cultivate new lands for crops. Agro-industries can also provide support in building

rural infrastructure for farmers such as roads that provide access to raw materials, electrical installations, irrigation facilities, etc.
Producers' cooperatives may lack adequate professional management and have limited capital. This may lead to serious operating problems. In order to solve these problems, cooperatives can get training, receive technical assistance, or obtain contracted external management.

Producers' organizations are advantageous to the agro-industrial plant, especially when procurement depends on numerous small suppliers. If suppliers organize, the plant has a condition for communication and negotiation with farmers, a channel that can save the plant considerable effort, time, and money. The negotiations/ agreements specify what type of crop to produce and how the crop is to be grown and harvested and the price to be paid to the producer.

## 3. Contracting

Contracts are beneficial to both producers and processors (e.g., risk reduction). The value of contracts ultimately depends on the good-will of the parties involved. Contracts add stability to market transactions through commitment and serve to minimize risks associated with unfavorable changes in market conditions.
The contracts may help create the large and steady flow of commodity deliveries that large plants need to operate efficiently and minimize processing costs. Contracts may also limit the income risks faced by farmers and shift risks to the large and diversified processors who may be better situated to bear them. But processors may also be able to exercise market power when they have few competitors, forcing agricultural prices below competitive levels. A key issue is whether contracts can facilitate the exercise of market power. Contracting is one of a risk management strategy. Marketing contract can reduce the income risks faced by growers through the terms specified in the contract pricing mechanism.

There are two basic types of contracts: marketing contracts and production contracts. Differences in the two types include management responsibility, crop ownership, and provision of crop inputs. Within these basic types there are a number of possible arrangements. Possible alternations within the contract types include pricing, storage, and transportation and quality determination. The most appropriate contract for a

given situation depends on the market structure. In general, more complex, differentiated product markets benefit from higher levels of coordination. Extensive technology or capital investment for production involves perishable products, requires special management skills, requires specific quality attributes, or emphasizes product uniformity.

Contracting may influence productivity by reducing production costs or raising production values. It does so by altering the incentives that market participants face, or by facilitating coordination among stages of production. It helps in speeding technology adoption, improving information flows, managing quality, delivery, enhancing access to credit.

The supply of raw materials is to extend purchase contracts to producers; long-term contracts based on fixed prices may be convenient to produces and processors because they increase economic certainty and facilitate financial planning; this avoids risks of variability under spot pricing.

The contract could fix the price on cost plus a fixed fee or margin. Another possibility would be based on opportunity costs, thus minimizing crop shifting and stabilizing supply. Yet another alternative would be to pay a base price and variable bonus derived from the final prices of the processed products. In examining these various contract alternatives, the analyst should weigh the costs against the certainty of supply obtained under each.

Income from farming is risky because it depends on prices and output that may fluctuate widely and are difficult to forecast with accuracy. Risks matter for several reasons. First, some farmers may dislike income fluctuations. Second, risk can impose costs: when income is variable and uncertain, farmers may find it difficult to meet recurring financial obligations or to plan production and investment decisions. When farmers as a group try to such as pesticides or fertilizer, or altering cropping patterns, they affect prices, incomes, and input usage patterns.

There are two sources of income risk. These are yield (or production) risk and price risk. Yield risks for crops result from unpredictable events such as drought, frost, etc. while livestock production risks can arise from disease, feed supply shortages, extreme temperatures, etc. Price risks arise from unanticipated changes in output or

input prices. Agricultural prices often fluctuate widely because of unexpected changes in production or demand in market environments in which supply and demand are insensitive to price movements. Such market insensitivity is frequent in agriculture because agricultural commodity costs form small shares of processed food costs and because farmers have limited ability to adjust to changes in price after they have planted their crops or sunk resources into production. Therefore, farmers who are averse to risks may be willing to pay a price or forego some income in order to reduce their risks. The amount of income they would be willing to give up would measure the degree of their aversion to risk.

Contracts can relieve the failure of spot markets. By using a contract to specify a compensation scheme with the processor before making an investment, the farmer can eliminate the risk of holdup. Indeed, in some cases processors may directly finance investments through the contract. By offering contracts, the processor can obtain investment commitments from farmers and assure the commodity supply needed to support an expensive investment in processing facilities. Contracts limit the incentives, inherent in these spot markets, to forego substantial long-term gains in favor of fleeting short-term advantages.

Contracts may help firms procure specific attributes by precisely setting forth production, harvest, and/or marketing practices, and providing for onsite monitoring and advice. Initial grower recruitment can be done through farm inspections. Processors then obtain attribute certification through contractual control of practices: in contrast, certification in spot markets relies on post-harvest testing and measurement.

Firms might accompany contract pricing with benefits to suppliers such as technical assistance or advances of working capital. Working capital requirements for purchase of raw materials and for storage are an important dimension of procurement operations and should be given special attention. Providing credit to supplies increases the agro-industry's financial exposure and special attention in providing credit to supplies increases the agro-industry's finance

The agro-industry can encourage producers to organize by incorporating incentives in its procurement strategy. One effective methods is to identify the multiple constraints surrounding the small farmers' efforts in marketing their produce and then to suggest

a solution. Because the marketing system is a social system, barriers from social obligations and behavioral patterns can also be expected.

By improving technical production inputs, a guaranteed market outlet and fair prices paid upon delivery, cooperatives can increase their income and thereby increase their purchasing power of buying industrial products. This can also strengthen the linkage between industrial firms and out-growers sustainable.

## 4. Linkage between Wonji sugar factory and sugarcane producer cooperatives

The single dominant industry, with a total value added of about 50 million dollars in 2002, accounting on average for about 20 percent of the value generated by the sector, is sugar and sugar confectionary (EEA report, 2004). It is also the largest single industry in terms of its share in fixed capital assets. The sugar industry enjoys monopoly price.

Wonji sugar Estate is one of the oldest factories in Ethiopia. This factory has contributed a lot to the Ethiopian economy in producing sugar.
The cooperatives around Wonji-Sugar Factory were formed in the year 1978/79 with the help of Wonji Sugar Estate and Ministry of Agriculture and Population Settlement with the hope to improve the standard of living and better future life for the farmers and sustainable cane supply to the factory. Each member of the cooperatives pooled out equal share of land in his/her respective cooperative. The cooperatives occupied 1120.80 hectares of land and have been growing sugar cane for more than two decades.

The cooperatives around Wonji Sugar Factory (Kuriftu, Boku, Adulala, Waketio, Wakema, Bishola and Hargitti) made contractual agreement with the factory whereby they would grow cane under certain conditions for several years. The cooperatives bound themselves to grow only sugarcane on the common landholding. In addition, they planned all crop produced to sell to the factory. The factory, on the other hand, agreed to prepare soil and provide modern agricultural inputs, credit services and technical assistance.

- Technical Assistance - The factory provided experts in view of sugarcane growing culture and development. Besides permanent employees, the factory provided technicians for pump repair and maintenance upon request of cooperatives.
- Credit Service - The credit provision was used as a means of transferring important inputs to out-growers for sustainable cane production
- Sugarcane transaction - buying sugarcane Major Problems occurred were: The high cost of production led most cooperatives to a great loss in 1995/1996 crop year.

At present the relationship between the factory and out-growers has shown a remarkable improvement after the establishment of union by the cooperatives. The factory has tried to motivate cooperative members by increasing the price of sugar cane, by providing enough credit for buying inputs (such as fertilizer, chemicals) and agricultural implements. The price of sugar cane has increased from Birr 2.88 in 1994/95 to Birr 5.88 in 2002/2003. Moreover, the cooperatives are excluded from payment of interest rate considering them as part of the factory. These incentives helped to increase the production of sugar cane from 1204 quintal/ha to 1604 quintal/ha and, ninety percent of the cooperatives have become profitable. Due to this, some cooperatives have succeeded in establishing grain mills and safe drinking water facilities.
Moreover, out-grower cooperatives and their members still expect a lot from the factory. They feel motivated if their basic needs such as health care, safe drinking water, housing, etc. are satisfied.

## 5. Conclusion and recommendations

The linkage between agro-industries and agricultural sector is very weak in Ethiopia. For this reason, agro-industrial enterprises could not contribute much to the economic development of the country especially for the development of agricultural sector.

Some agro- industrial enterprises in Ethiopia failed to see and plan the constraints and opportunities arising from interdependencies between agricultural and agro-

industrial enterprises, in general, and in the commercialization of agriculture, in particular.

Agro-industries can open market opportunities to small-scale growers /farmers. Growers can boost their income by selling agricultural products to agro-industrial firms. Improving farm productivity for increased sales could be one way of stimulating commercial activity thereby linking farmers to markets. The link of smallholders with agro-industries can also improve livelihoods and alleviate poverty in many farm households.

Vertical coordination is an important part of a competitive strategy for producers in the agricultural sector and processing plants. The processing plant can open market opportunities to out-growers. It can also disseminate agricultural production techniques that increase farm productivity. This enables the farmers to boost their income and cultivate new land for the crop. The processing plan can also avoid the risks of variability under spot price. It increases the supply of raw materials of quality by improving farm technology. It enables a firm to plan its production effectively.

Long-term contracts based on voluntary basis may be convenient to producers and processors. These contracts increase economic certainty and facilitate financial planning. They create advantage for both parties. The contractual agreements can avoid the risks of variability under spot pricing. These kinds of agreements enable the parties involved to help each other's efforts and develop together in a coordinated manner.

This presentation is not intended to initiate researchers to conduct an in-depth study on the issue in the future.

## References

Ethiopian Economic Association/Ethiopian Economic Policy Research Institute EEA/EEPRI). (2004). Industrialization and Industrial policy in Ethiopia. Addis Ababa, Ethiopia.

International food and Agribusiness Management review (2001). Agro-industry for Rural and small farmer Development: Issues and lessons from India. Ahmedabad.

James E. Austin (1992). Agro-industrial project Analysis: Critical Design Factors. USA.

Negussie Seme. (1996). Socio-Economic Study of Sugar Cane Producing Cooperatives (out-growers). Addis Ababa, Ethiopia.

# INTEREST RATE AND THE SAVING-INVESTMENT PROCESS IN ETHIOPIA

## (A preliminary look at the impact of financial liberalization and the role of interest rate)

Andualem Berhanu[1]

*Abstract*

*The general research question of this paper is "to what extent has the interest rate liberalization measure taken so far (in Ethiopia) achieved its purpose?" A more realistic and important concern is to have at least a preliminary look at the impact of interest rate liberalization measure taken so far on savings and investment. The research question should be humbler in this sense because the question ultimately boils down to testing the hypothesis forwarded by McKinnon and Shaw with respect to liberalizing interest rate, which would be challenging in the following sense. Given the short period of time since the liberalization took place (1992-2004, only twelve years) and given lack of quarterly data on important variables like GDP and its components including investment, which is basically to be derived from the National Accounts data, trying to come to a complete answer would be too ambitious. Therefore, statistical techniques will necessarily be used to generate some important quarterly data and the results obtained from the corresponding analysis may not be free from errors to lead us to meaningful solutions of policy significance. However, the results obtained give us strong clues to stop and carefully investigate the real significance of interest rate liberalization.*

*In the process of testing the hypothesis forwarded by McKinnon and Shaw, the present paper looks at the relationship between real interest rate on the one hand and saving and investment on the other. These relationships are done separately. To be able to have sufficient data points, GDP and its components are disaggregated in to quarterly figures[2] using appropriate methodology while quarterly data on most other variables considered in the study are readily available.*

[1] Planning and Business Development Department, Awash International Bank S.C.
E-mail: andualemberhanu@yahoo.com

[2] A description on the details of disaggregation of GDP both from the production and expenditure sides will be given.

## 1. Introduction

One of the major arguments in modern day economic reform programs of the former centrally planned economies, in general, and Less Developed Countries (LDCs) including Ethiopia, in particular, has been liberalizing the financial sector. The centerpiece in the process of liberalizing the financial sector is doing away with the policy of controlled and low interest rates or more precisely negative real interest rates. This prescription basically presupposes an important role interest rates could play in the economy, especially with respect to increased saving mobilization, enhanced investment efficiency, increased volume of investment and the resultant impact on economic growth. The essential theoretical framework for these relationships emanates from the path-breaking works of McKinnon (1973) and Shaw (1973), which came to be widely known in the literature as the theory of financial repression.

The economic reform program in Ethiopia including financial sector liberalization started in late 1992. The major component of the financial sector liberalization program has been to revise interest rates in such a way that their levels be positive in real terms (both for depositors and lenders) and there may be no ownership and sector wise discrimination in their structure. Accordingly, the first adjustment with the intention of such an outcome was done on the nominal interest rates, both deposit and lending, on October 1 1992. Interest rates have been revised a number of times since then. As of the date of finalizing this paper the interest rate policy of the country is that lending rate is completely de-regulated (beginning from January 1998) while there is only a minimum deposit rate fixed by law at 3 percent, above which the commercial banks could freely decide on the level they want to provide.

Accordingly, the research question broadly addressed in this paper is *"to what extent has the interest rate liberalization measure taken so far achieved its purpose in Ethiopia?"* More specifically, it attempts to make a preliminary assessment on the impact of interest rate liberalization measures taken so far on savings and investment. The research question should be humbler in this sense because the question ultimately boils down to testing the hypothesis forwarded by McKinnon and Shaw with respect to liberalizing interest rate, which would be challenging in the following sense. Given the short period of time since the liberalization took place (1992-2004, only twelve years) and given lack of quarterly data on important

variables like GDP and its components including investment, which is basically to be derived from the National Accounts data, trying to come to a complete answer would be too difficult. Therefore, statistical techniques will necessarily be used to generate some important quarterly data and the results obtained from the corresponding analysis may not be free from errors to lead us to meaningful solutions of policy significance. However, the results obtained give us strong clues to investigate the impact of interest rate liberalization.

In the process of testing the hypothesis forwarded by McKinnon and Shaw, the present paper looks at the relationship between real interest rate, on the one hand, and saving and investment, on the other. These relationships are done separately. To be able to have sufficient data points, GDP and its components are disaggregated into quarterly figures[3] using appropriate methodology while quarterly data on most other variables considered in the study are readily available.

Looking at developments in the performance of Ethiopian economy during the post-reform period (post-October, 1992), a number of reports written indicate that some positive achievements have been recorded. Available data on the macro-economy also confirm to such reports. Real GDP over the period 1992/93 to 2003/04, for instance, has been growing at an annual average rate of 5.1 percent (by 6.7 percent if the years 1997/98 and 2002/03 are omitted on account of abnormality as these were years of war with Eritrea and bad weather respectively); real GDP per capita at 2.2 percent (3.7 percent if the years 1997/98 and 2002/03 are omitted for similar reasons); gross domestic savings, gross domestic capital formation, and the sum of net factor income and net current transfers from rest of the world respectively at –1.9 percent, 21.1 percent, and 24.6 percent per annum on average over the same period. Although the performance of the overall economy is largely tied with the performance of the agricultural sector, which again is heavily dependent on weather conditions, the multiple liberalization measures taken by the government have had their own impacts and contributions.

Among these, a number of financial liberalization measures have been taken: the sector has become open for national private investors, credit rationing has been eliminated, lending interest rate has been completely deregulated while the deposit

[3] For details on the disaggregation of GDP both from the production and expenditure sides, please see Annex I.

rate on time and saving deposits has been partially liberalized in the sense that only minimum rate is fixed. Besides, a number of restructuring measures in terms of management and organization have been taken in order to re-orient the sector from socialistic operational mechanism towards market mechanism. A bird's eye view of the performance of the financial sector, specially the banking sector, indicates that resource mobilization, in terms of time and saving deposits, has improved. Also, credit extended to the private sector and to the overall economy, in general, has significantly increased.

Assuming what is proposed under the McKinnon and Shaw's theory of financial repression, i.e. liberalizing the interest rate brings about a simultaneous increase in saving and investment, holds true then what is observed in Ethiopia seems to conform to this. Although this is not the prime motivation for this paper, highlights will be given on whether there is any evidence to this effect so far from the Ethiopian financial sector's performance.

The theme of this paper is to investigate the role of interest rate in the saving-investment process in Ethiopia. What has been the impact of interest rate changes or liberalization measures on the saving-investment process? What lessons could be derived out of the process of interest rate liberalization measures taken so far? These are the kinds of issues and questions that this paper attempts to answer. To get a feel of the framework of the analysis it is important to do a broad survey of the theoretical and empirical literature regarding the role of interest rate, section 2.

Section three is devoted to background information on financial sector liberalization measures taken so far in Ethiopia. Data and methodology, model specification, and estimation and results are respectively presented in sections four, five and six. Finally, section seven concludes the paper with some remarks.

## 2. The role of interest rate: theory and practice

### 2.1 Interest rate in theory

It has been theoretically contentious as to how interest rate affects the behavior of economic agents. Especially its relation to saving, investment and growth has been

one of the liveliest theoretical debates among economists. The original debate was between Keynes/Keynesians and classical economists. As this debate was made in the earlier periods of the 20th Century and is generally in the context of countries with relatively higher level of financial development, the practical importance to countries like Ethiopia is not of that much significance.

During the second half of the 20th Century another dimension of the debate came to the forefront with the pioneering works of McKinnon and Shaw in 1973. That was what came to be known as the theory of financial repression. This later theoretical argument put forward by McKinnon and Shaw best fits the reality of developing countries in general, including Ethiopia.

It could be summed up by saying that all earlier theories of interest rate, be it Keynesian or classical/ monetarists, have been much more concerned with equilibrium interest rates and thus put as a basket of equilibrium interest rate theories. Then, what later came to be called the theory of financial repression could be termed as dis-equilibrium interest rate theories. What follows, now, is a brief summary of the theoretical arguments put forward by those theoreticians. Such a review will obviously help to put things in their proper perspective.

### 2.1.1 Equilibrium interest rate theories

The classical/monetarist, neo-classical and Keynesian theories of interest rate are put in the literature as one or another variant revolving around the concept of equilibrium interest rate. As in any goods market, this equilibrium interest rate concept presupposes the existence of an organized market for saving and investment, the interplay of their demand and supply setting a level of interest rate, which clears the market.

For classical economists, the rate of interest is that factor which brings the demand for investment and the willingness to save into equilibrium, investment representing the demand for investible resources while saving, the supply for them (Keynes, 1935:175). According to this school, interest rate is the price, which brings the demand for investible resources into equilibrium with the supply of the same. This implies that the demand for and supply of investible resources is sufficiently responsive to interest rate changes.

Another variant of equilibrium interest rate theory is the neo-classical framework, the full exposition of which is credited in the literature to Irving Fisher (AACB, 1985:3). Under this framework, it is generally assumed that outside finance (finance obtained through borrowing or other commercial means) is the sole source for undertaking investment, there exists only one interest rate, and expected inflation is equal to actual inflation. While retaining the classical assumption of determination of the equality between savings and investment through the real interest rate, Fisher clearly recognized a situation of real interest rate disequilibrium due to the existence of unexpected inflation, in which case suppliers of investible resources fail to perceive fully the loss derived from rising prices. The fall in the real interest rate resulting from such unexpected inflation could cause a spurt in real investment leading to a state of temporary or partial equilibrium. In essence, the classical and neo-classical views regarding interest rate are the same.

Keynes, on the other hand, strongly opposed the core classical assumption that it was the rate of interest which brought equilibrium between savings and investment. For him, the balance was brought about by means of changes in income and output.

He argued that the classical theory couldn't be called theory of interest rate, as it did not actually show how the interest rate was itself determined. He developed an alternative theory of interest rate in which the interaction between the demand for and supply of money affects the level of interest rate.

The key contribution of Keynes to the theory of interest rate is that it is determined in the money market in which money supply is exogenously determined by the monetary authorities and the demand for money is divided into three, namely transactions demand for money, precautionary demand for money and speculative demand for money. According to Keynes and the Keynesians it is speculative demand for money which is sensitive to interest rate. The two are inversely related in the sense that interest rate is the inverse of the price of bond in which case a fall in interest rate **(r)** means a rise in the *expected rate of interest* (**r)** or a fall in the expected price of bond and hence a shift from holding bond to holding more money.

For Keynes, there is a minimum level of interest rate, below which it cannot go irrespective of the increase in money supply in which the economy is said to be stuck in a liquidity trap. In the classical case the rate of interest is flexible enough to bring

about equilibrium between savings and investment at very low rates of interest and the system always settles down in a full equilibrium state. Under the Keynesian case, when there is unemployment, monetary expansion can reduce the interest rate without creating inflation. The implication of this is that as interest rate (**r)** falls down to its equilibrium level at the point of equality between the demand for and the supply of money there would be no effect on income and investment of any further increase in the supply of money; rather, at this level of interest rate (**r)** people would prefer to hold liquid wealth as cash balances in anticipation of a rise in interest rate (**r)** in the future (AACB:4-5). The existence of a liquidity trap in the Keynesian case means that the demand for money is perfectly elastic at that point.

Diametrically opposite to the Keynesian case of perfect interest elasticity of the demand for money, the monetarists (represented here by the quantity theory of money) argue that the demand for money is totally irresponsive to interest rate. Rather the demand for money is a function purely of income. They also argue that a rise in money supply brings about inflationary pressure with a concomitant increase in interest rate, the exact level of which being dependent on the level of people's expectation about inflation.

At the end of the day, the central controversy between the Keynesians and the monetarists or classical boils down to the efficacy of monetary or fiscal policy. While the monetarists argue that fiscal policy is not effective in bringing about fundamental economic change and rely rather on monetary policy, Keynesians argue the other way. The important point to note for our purpose, here, is that both schools rely on the important role that interest rate plays in connection with saving and investment. There is the central assumption of the existence of well-developed and integrated market system in both cases. But, this is virtually absent in developing countries and a quest for knowledge continued towards understanding the role interest rate could play in such cases, which culminated in the birth of what came to be known in the literature as the theory of "financial repression". This theory is attributed to the earlier works of McKinnon and Shaw and dates back to 1973.[4]

[4] Ronald I. McKinnon (1973); “Money and Capital in Economic Development”, the Brookings Institution, Washington D.C; Edward Shaw (1973); “Financial Deepening in Economic Development”, Oxford University Press, London

### 2.1.2 The theory of financial repression

According to McKinnon, financial repression is a situation in which organized banking services, especially bank credit, are extremely limited in rural areas, in general, and to small borrowers, in particular, in which case financing of this sector must be met from the meager resources of money lenders, pawnbrokers, and cooperatives. The two major features central to the theory of financial repression are first, that interest rates are generally administered, and second, inflation and low interest rates have resulted in low and frequently negative real interest rate, which is detrimental to financial and economic growth (AACB, 1985:13)

One of the essential elements in the theory of financial repression is that liberalization of interest rate and the resulting positive real interest rate help both saving and investment to grow. This result is dependent on some assumptions peculiar to Less Developed Countries (LDCs). First, self-finance is the dominant or sole source of investment financing, which means there is very low level of financial intermediation and depth. Second, the existing meager capital is unrealistically undervalued, which means interest rate is very low and does not measure the actual cost of capital. Third, money and capital are complementary with each other not substitutes, which means a rise in interest rate leads to a rise both in savings and investment. Based on such assumptions both McKinnon (1973) and Shaw (1973) came up with the conclusion that financial liberalization is pro-growth in LDCs.

A number of empirical analysts have adopted the theory of financial repression to the situation prevailing in developing countries, in general, and African countries, in particular.

## 2.2 The role of interest rate: recent empirical findings

The empirical literature on the role of interest rate is mainly concerned with understanding how the change in real interest rate affects economic performance, especially saving and investment [Giovanni (1983), Oshikoya (1992), Hyuha (1993)]. The results obtained in most cases fall in either of two categories: real interest rate affects savings and investment positively and significantly [McKinnon (1973), Shaw (1973)], through the complementarity hypothesis (the theory of financial repression)

OR real interest rate affects savings either negatively or positively while it always affects investment negatively.

This diversity in empirical findings is basically due to the interplay of two opposing effects; namely the substitution and income effects. Interest is an income to savers and a cost to borrowers of funds. At the micro level, a rise in the interest rate tends to push households to defer current consumption into the future and hence raise savings, substitution effect. At the same time, it is an income for savers and hence tends to push current consumption up, income effect. The net effect of interest rate change on saving, therefore, becomes an empirical issue. But, for investors, interest rate is always the cost of capital and hence affects it negatively.

T.W. Oshikoya (1992) in his study on the role of interest rate on the saving-investment process in Kenya concluded that the evidence he got about the positive correlation between real interest rate, on the one hand, and credit availability and investment, on the other, was rather tenuous at best as it was not robust across sub-periods. He also noted that the impact of positive real deposit rate on saving rate was not strong, although was positive. Another study by Deena R. Khatkhate (1988) on the impact of interest rates on 64 Less Developed Countries (LDCs) indicated that the level of real interest rate by itself has little or no impact on saving rate, investment rate, investment efficiency, real economic growth and real financial assets.

On the contrary, there are some studies indicating a positive and significant impact of real interest rate on saving and investment in developing countries. For instance, Florence Charlier & Charles N'cho Oguie (2002) found out that a higher real deposit rate is conducive to higher investment and growth in West Africa as indicated in the traditional financial liberalization literature. They used a pooled macroeconomic data on 24 countries and over the period 1970-1995.
Such diverging empirical findings indicate that the impact of real interest rate on the saving-investment process of nations is at best amenable to critical investigation. A number of country-specific issues need to be brought to the forefront in the respective studies.

Ibrahim (1989) undertook a study on the importance of interest rate in the Ethiopian setting. The study was undertaken with the prime objective of making a preliminary evaluation of the interest rate policy issued in 1986 with the twin objectives of

enhancing the mobilization of savings and promoting investment in priority sectors. The policy embodied changes in the structure and level of interest rates both on deposits and loans by banks. The result suggested that there is poor correlation between real interest rate and growth in savings. He also attempted to investigate whether there had been significant changes in the pattern of credit allocations to different sectors by respective banks. The finding suggested that it was very difficult to identify the impact of the regulation on credit demand by different sectors of the economy as the regulations have not been in place for long.

A recent study by Abu (2004) indicates that the empirical relationship between real interest rate and aggregate saving rate in Ethiopia is somewhat complicated. In fact, he did not directly measure the level of elasticity of the saving rate to real deposit rate although he mentioned this to be 0.05 as reported by other researchers. On the other hand, Fasika (1995) in his unpublished master thesis did a test on McKinnon and Shaw hypotheses of positive relationships between saving, investment, and investment efficiency, on the one hand, and real interest rate, on the other, in Ethiopia. He did separate tests on these relationships. His result suggests that the positive interest elasticity of aggregate savings is doubted while he argued that higher interest rates encourage financial over non-financial forms of savings without actually altering the magnitude of aggregate savings.

## 3. Background to interest rate liberalization in Ethiopia

The rationale put under the proposed interest rate changes accompanying the overall economic reform program started in late 1992 was to make both the deposit and lending rates positive in real terms. To this end, the National Bank of Ethiopia (NBE, henceforth), in whose trust is the management of interest rate laid as per article 30 of the Money and Banking Proclamation No. 83/94, took the first measure on October 1, 1992. A series of interest rate changes were made since then, which culminated in complete deregulation of the lending rate on January 1, 1998. What follows is an anatomy of the interest rate structure between October 1992 and May 2004.

As summarized in Table 1 (Annex II), the NBE has revised the interest rate directives seven times since 1992. The first was made on October 1 1992 and its major objective was to correct the previously distorted interest rate structure in favor of the socialized sectors and against the private sector. On the deposit side, for instance, the previously ownership-based structure was changed by deposit rates differentiated by length of time for time deposits for all depositors. The average time deposit was fixed at 11.25% and that of saving deposits at 10%.

Similarly, on the lending side, the previously state and cooperative favoring rates were changed in 1992. Agriculture, housing and construction sectors were favored sectors relative to the other sectors [Table 1-Annex II]. Lending to the Central Government was almost considered as lending to any other sector. This indicates that the objective of the interest rate directive was directed at establishing a market-determined rate in a step-by-step fashion.

Both the deposit and lending interest rates were revised many times since then. In 1995 the deposit and lending rates were partially liberalized. On the deposit side, a floor deposit rate was set at 10% on January 2 1995, which was raised to 11% in December 1995, back to 10% in 1996 and ultimately down to 3% in 2002. On the lending side, the sectoral discrimination that was prevalent in the initial reform measure was dropped and all sectors were treated equally beginning from 1995. Not only all sectors were treated equally but also that short, medium and long-term loans were treated similarly, in which maximum lending rates were fixed at the same level for all sectors and for all types of terms, leaving the actual rates to be determined by the market. Lending to commercial banks (discount rate) and other financial institutions by the NBE was also liberalized in 1995. Finally, the lending rate was completely de-regulated beginning from January 1, 1998.

## 4. Methodological issues and model specification

One of the problems in undertaking empirical research in developing countries, in general, and in Ethiopia, in particular, is paucity of sufficient data both in terms of quality and quantity. By the latter we mean sufficient level of disaggregation (e.g. bi-annual, quarterly, monthly, etc) and details. The current work has also been affected by such problems. It is, therefore, worth mentioning how the quarterly desegregation

of a number of important macroeconomic variables has been undertaken.[5] Otherwise, the data is obtained mainly from the quarterly bulletins of the NBE and Ministry of Finance and Economic Development in some cases.

Regarding methodology, the Engle-Granger Two Stage (EGTS) procedure is adopted, as the Augmented Dickey Fuller test run on all the variables used indicated, as it is almost always the case regarding economic time series, that most of the variables are non-stationary (or more specifically I(1)). Running a simple OLS regression on such variables simply becomes spurious, which is why EGTS becomes one appealing regression approach. Accordingly, the appropriate Error Correction Models (ECM) are estimated to understand the short-run dynamic adjustment mechanisms.

As this paper is interested in understanding the role of interest rate in the saving-investment process, the models specified here are for savings and investment.

In modeling savings, available variables that are expected to determine saving rate besides real deposit rate are included. Accordingly, it is specified as follows:

*RATERGDS/RQM = f(RATESAVR, RTEMPINC, RPERMINC, RATEFSR, FINDEP,,*
*(+) (+) (-) (-) (+)*
*PBB , FOREX, DDRT, DWAR)* ***(1)***
*(-)* (+)

Where:

RATERGDS is the ratio of gross domestic savings to GDP at current market price, both in real terms;
RQM is real quasi money (proxy for real financial savings);
RATESAVR is the real ex-post deposit rate;
RTEMPINC is temporary income in real terms measured as a difference between GDP at current market price and permanent income, both in real terms;
RPERMINC is permanent income proxied by four-quarter average in real terms;

[5] For details please see Annex 1

RATEFSR is rate of foreign savings, defined as the ratio of the difference between actual fixed capital formation and gross domestic savings to GDP at current market price, both in real terms;
FINDEP is financial deepening measured as the ratio of broad money ($M_2$) to GDP at current market prices;
PBB is population per bank branch;
FOREX is foreign exchange reserve, which is measured as net gold and foreign exchange holdings of NBE and Commercial Banks up to 1999/00 and Net Foreign Assets, thereafter; and
DDRT and DWAR are dummy variables for the occurrence of drought and war respectively.

Both from classical and financial repression theories, real deposit rate and financial deepening are expected to affect savings positively. From the permanent income theory of consumption and savings, temporary and permanent incomes, respectively, are expected to affect savings positively and negatively, respectively. The inclusion of foreign savings is obtained from empirical literature (e.g. Oshikoya, 1992) and it is expected to affect domestic savings (crowding out of domestic savings by foreign savings) because of its positive additional impact on consumption. The inclusion of population per bank branch and foreign exchange reserve is adopted from Fasika (1995) and are expected to affect savings positively and negatively, respectively.

In modeling private investment, again all available variables expected to have impact on the investment process are included. The specification is as shown below:

$$RPINVGDP = f(RATESAVR, RPUBINVGDP, RATEFSR, DSR, FOREX, \underset{(+/-)}{} \underset{(+/-)}{} \underset{(+/-)}{} \underset{(-)}{} \underset{(+)}{}$$
$$RGROWTH, INFL, REERI, PVTCRDT, DDRT, DWAR) \quad \textbf{(2)}$$
$$\underset{(+)}{} \quad \underset{(-)}{} \quad \underset{(-)}{} \quad \underset{(+)}{} \quad \underset{(-)}{} \quad \underset{(-)}{}$$

Where:

RPINVGDP is the ratio of private investment to GDP in real terms;
RPUBINVGDP is the ratio of public investment to GDP at current market prices in real terms;
DSR is debt service ratio;
RGROWTH is the rate of economic growth in real terms;

INFL is rate of CPI inflation;
REERI is real effective exchange rate index defined as the ratio of relative prices between the domestic and foreign economies[6];
PVTCRDT is the credit disbursement to the private sector; and
The others are as defined in equation (1).

The theoretical arguments behind the signs indicated above are as follows. From the theory of financial repression it is expected that money and capital are complementary and hence a rise in real deposit rate tends to push savings and hence investment up, whereas it pushes investment down as per the theoretical presupposition of the mainstream economics. Therefore, the sign of RATESAVR is an empirical question. Similarly, the sign of public investment is an empirical question depending on whether it crowds out or crowds in private investment. Inflation, which is a proxy for macroeconomic stability/instability, debt service ratio, which measures the extent of debt burden on foreign exchange reserves and the real effective exchange rate index, which is measured as the relative price between the foreign and domestic economies, are expected to affect real private rate of investment negatively.[7] On the other hand, foreign exchange availability, real rate of growth of the economy (from the flexible accelerator model) and availability of credit to the private sector are all expected to affect the rate of private investment positively.

## 5. Estimation and interpretation of results

### 5.1 Interest elasticity of rate of gross domestic savings (GDS)

The estimated long-run and short-run dynamic adjustment models for real gross domestic saving rates are reported below. Two long-run equations for the rate of gross domestic savings are reported in order to show how insignificant the real

[6] REER is computed as $W_i$*$WPI_i$*$ER_i/CPI_{eth}$, where Wi stands for trade weight of Ethiopia's trade partner, $WPI_i$ stands for whole sale price index of the same country, $ER_i$ stands for the exchange rate of the corresponding trade partner's currency in terms of USD against the Ethiopian Birr and $CPI_{eth}$ stands for consumer price index of Ethiopia. Countries with total trade share of 1% and above with Ethiopia are considered in the index. Finally, the REER is converted to index by taking 1996/97 as the base year. For further details one can look at NBE; Quarterly Bulletin, Vol. 20, No. 1, 2004/05, pp. 54-56.

[7] Please notice that a rise in REERI is a deterioration in competitiveness (real appreciation) and hence a negative impact on private investment and vice versa.

deposit rate is in explaining aggregate domestic savings. Alternatively, it is dropped and the second equation is estimated and reported below.

**Long-run relationship**

***(6.1a)*** *Log (RATERGDS) = 3.758 + 0.0036* Log (RATESAVR) - 0.2402* Log (PBB)*
*(4.407) (0.159) (-3.971)*
*- 0.1387* Log (RPERMINC) - 0.1463* Log (RATEFSR)*
*(-4.279) (-13.518)*
*+ 0.0166* Log (RGROWTH)*
*(2.351*

The alternative and chosen model is shown below:

***(6.1b)*** *Log (RATERGDS) =3.6824 - 0.2347*Log (PBB) - 0.1361 Log*(RPERMINC)*
*(5.257) (-4.807) (-4.882)*
*-0.1461 Log*(RATEFSR) + 0.0161Log*(RGROWTH)*
*(-13.773) (2.607)*
Adjusted $R^2$ = 0.86; D.W. = 2.59; A.I.C. = -4.60; F-Statistic = 67.44 (0.00)

**Short-run relationship**

The corresponding short-run model for chosen equation is estimated to be the following:

***(6.1c)*** *$\Delta$Log (RATERGDS) = 0.0014 +0.5647*$\Delta$Log (PBB (-2)) - 0.601* $\Delta$Log (PBB (-3))*
*(0.413) (2.470) (-2.477)*
*- 0.1651* $\Delta$Log (RPERMINC) - 0.1334* $\Delta$Log (RATEFSR)*
*(-6.373) (-18.909)*
*+ 0.0145*$\Delta$Log (RGROWTH) - 0.9899*$\varepsilon$ (-1)*
*(3.579) (-7.161)*

Adjusted $R^2$ = 0.96; D.W. = 1.76; A.I.C. = -4.94; F-Statistic = 156.48 (0.00)

Jarque-Berra = 0.42 (0.81);
Breusch-Godfrey Serial Correlation F-Statistic = 0.17 (0.84)
ARCH Test F-Statistic = 0.002 (0.97)
White Heteroskedasticity Test Obs*R-squared = 18.37 (0.10)
Ramsey RESET Test F-Statistic = 5.65 (0.02)

From equation 6.1a we could simply deduce that although real deposit rate affects the aggregate saving rate positively, the elasticity is statistically zero. This conforms to findings of other studies in Ethiopia (e.g. Abu, 2004, p.21). Hence, a need for dropping it and go to equation 6.1b, in which expansion of branch networks of commercial banks (PBB), real permanent income (RPERMINC), real foreign saving rate (RATEFSR) and growth rate of real GDP (RGROWTH) found to be the significant determinants of aggregate savings in the post-reform period.

The negative coefficient of permanent income seems to conform to the permanent income hypothesis of consumption, which postulates a positive relationship between consumption and permanent income. As aggregate savings is defined as the difference between aggregate income and aggregate consumption, a rise in permanent income and hence a corresponding rise in consumption would mean a decline in aggregate savings. Accordingly, the negative coefficient could be interpreted as the existence of strong trade-off between consumption and saving in the long-run. This could also be taken as one piece of information for justifying some findings in the empirical literature on savings that enhancement of savings could better be met through direct consumption tax than indirect measure of interest rate changes. It is also found out that foreign saving rate significantly crowds out domestic saving (similar result was obtained by Oshikoya, 1992 for Kenya) and real growth helps enhance aggregate savings, as postulated in the flexible accelerator model.

Coming to the short-run ECM, the coefficient on the error correction term indicates that any short-run shock adjusts to the long-run path almost fully within a single quarter.

## 5.2 Interest elasticity of real financial savings (Quasi-Money)

As savings could be modeled either in terms of aggregate domestic savings or total financial savings, an alternative model representing financial savings is presented below. Financial savings is defined as the total sum of saving and time deposits (quasi-money) with commercial banking system.

**Long-run relationship**

***(6.2a)*** *Log (RQM)[8] = 35.5145 + 0.1471* Log (RATESAVR (-1)) - 2.8406* Log (PBB)*
*(4.887) (2.946) (-5.08)*
*+ 0.1147* Log (FOREX) + 0.192* Log (RGDPCUM)*
*(3.919) (2.069)*
*+0.1165* DDRT + 0.0125*TREND*
*(4.749) (2.624)*

Adjusted $R^2$ = 0.98; D.W. = 0.84; A.I.C. = -2.71; F-Statistic = 506.61 (0.00)

**Short-run relationship**

The corresponding short-run model is estimated to be the following:

***(6.2b)*** *ΔLog (RQM) = 0.0064 + 0.5737* ΔLog (RQM (-1)) + 0.2391* ΔLog (RQM (-3))+*
*(0.821) (5.585) (2.357)*
*0.0901*ΔLog (RATESAVR) - 0.7342*ΔLog (PBB) +*
*(5.618) (-2.202)*
*0.5634*ΔLog (PBB (-2)) -0.0275* ΔLog (FOREX (-3)) +*
*(2.152) (-1.807)*
*0.1415* ΔLog (RGDPCUM) - 0.1657* ε (-1)*
*(4.358) (-2.099)*

Adjusted $R^2$ = 0.68; D.W. = 2.09; A.I.C. = -4.47; F-Statistic = 11.79 (0.00)
Jarque-Berra = 7.32 (0.03);
Breusch-Godfrey Serial Correlation F-Statistic = 0.28 (0.76)

[8] Financial savings is modeled in terms of levels and not rates, because no co-integration relationship is detected between rate of financial savings and interest rates but in levels.

ARCH Test F-Statistic = 0.05 (0.83)
White Heteroskedasticity Test Obs*R-squared = 25.74 (0.06)
Ramsey RESET Test F-Statistic = 1.69 (0.20)

As could be expected, real deposit rate is statistically significant to determine financial savings positively both in the long and short-runs. The long-run effect is with one-quarter lag and the elasticity of financial savings to real deposit rate is higher in the long-run than in the short-run. Given the low level of market information system, this is logical. Looking at the sizes of the coefficients both in the long and short-run equations, expansion of bank branches seems to be the most important variable to enhance financial savings. The fact that most of the rural areas are not served with banking facilities is a serious impediment towards increasing savings. This has got an important policy implication for the future. The result suggests that expansion of rural banking should be given utmost importance.

Looking at equation 6.2b the very low level of coefficient for the ECM term indicates that there is very slow adjustment during a quarter of any shock.

## 5.3 Interest elasticity of private investment rate

According to the theory of financial repression financial liberalization (or more specifically interest rate increment/rationalization) is expected to enhance both savings and investment, because of McKinnon's complementarity hypothesis. As could be seen from the following models, this does not seem to have empirical justification from the Ethiopian data.

**Long-run relationship**

*(6.3a) Log (RPINVGDP) = -1.2306 - 0.8441* Log (RATESAVR) - 0.1495* Log (PUBINVGDP)*
*(-2.072) (-6.376) (-3.805)*
*+ 0.2309* Log (FORSAVR) + 0.0743* Log (RGROWTH (-1))*
*(6.303) (2.872)*
*-0.2326* INFL*
*(-4.637)*

Adjusted $R^2$ = 0.81; D.W. = 1.02; A.I.C. = 1.79; F-Statistic = 36.19 (0.00)

**Short-run relationship**

*(6.3b) ΔLog (RPINVGDP) = 0.0082 + 0.4142* ΔLog (RPINVGDP (-2)) - 0.2021* ΔLog*
*(0.952) (3.958)*
*(RPINVGDP (-3)) -0.6761*ΔLog (RATESAVR)*
*(-2.324) (-7.260)*
*- 0.1652*ΔLog (RATESAVR (-3))-0.0889*ΔLog*
*(RPUBINVGDP)*
*(-4.107) (-4.738)*
*+ 0.0812*ΔLog (RPUBINVGDP (-2)) + 0.0752*ΔLog*
*(RPUBINVGDP (-3))*
*(2.782) (2.813)*
*+ 0.1004*ΔLog (FORSAVR) - 0.1574*ΔLog (FORSAVR (-1))*
*(2.952) (-4.244)*
*- 0.2639 *ΔLog (FORSAVR (-2))+ 0.0759*ΔLog*
*(RGROWTH)*
*(-5.476) (3.656)*
*+ 0.1031*ΔLog (RGROWTH (-1)) + 0.0546*ΔLog*
*(RGROWTH (-2))*
*(7.319) (2.889)*
*- 0.1017*ΔLog (INFL) - 0.5069* ε (-1)*
*(-2.899) (-4.477)*

Adjusted $R^2$ = 0.92; D.W. = 1.33; A.I.C. = -2.80; F-Statistic = 34.15 (0.00)
Jarque-Berra = 0.99 (0.61);
Breusch-Godfrey Serial Correlation F-Statistic = 2.34 (0.12)
ARCH Test F-Statistic = 0.54 (0.47)
White Heteroskedasticity Test Obs*R-squared = 34.92 (0.25)
Ramsey RESET Test F-Statistic = 0.05 (0.83)

Some important insights that could be made out of the models reported above are worth mentioning. First, the McKinnon's complemenarity hypothesis, which essentially postulates that financial and real assets are complementary to each other and hence a rise in real interest rate in Less Developed Countries (LDCs) would lead to a rise in both savings and investment, is not proved to be the case in Ethiopia. The negative

and statistically significant coefficients of real deposit rates are the evidences for this. Although strong argument in favor of the importance of cheaper credit for private investment expansion in the Ethiopian case could not be forwarded based on this result (basically because of problems related to data generation mechanisms mentioned in section 1), it gives us a clue that one should at least stop and think before deciding to go in the direction of McKinnon's complementarity hypothesis. Second, there has been strong crowding out of private investment by the public investment both over the long and short-runs. This might be because of data definition in which private investment is defined as a residual between gross fixed investment and public investment. Third, foreign saving has got a positive impact on private investment while it has negative impact in the short-run. This could be interpreted as the competition for the limited investment opportunities has got a negative impact on domestic private investment, at least in the short-run. Fourth, there is a strong multiplier effect as represented by the coefficient of real economic growth (RGROWTH) both in the long and short-runs. The more there is real economic growth the more investment to expand. Finally, price stability is proved to be an important determinant of private investment in Ethiopia both in the short and long-runs, which gives some insight into the importance of macroeconomic stability as proxied by price stability.

A somewhat surprising finding in modeling private rate of investment is the non-importance of bank credit disbursement as compared to the variables reported above. Private credit is found to be statistically zero in determining the rate of private investment, although the sign is positive.

Looking at the ECM, the pace of adjustment is only about 51 percent within a quarter.

## 6. Concluding remarks

Using the Engle-Granger Two Stages (EGTS) procedure, the present paper attempted to analyze the importance of interest rate in the saving-investment process in Ethiopia over the period from the second quarter of fiscal year 1992/93 to the end of fiscal year 2002/03.

Mixed results are obtained from the analysis. While interest rate liberalization is found to be important in mobilizing financial savings, it is statistically zero in determining aggregate savings. The long-run and short-run interest elasticities of financial savings over the post-reform period have been 0.15 and 0.09 respectively, indicating that savings in general are inelastic to interest rate changes. On the other hand, the long-run elasticity of financial savings to branch expansion is found to be 2.84, indicating that it is highly elastic to branch expansion. A decline in population per bank branch by 1 percent (increased number of branches relative to population) leads to about 2.84 percent increase in financial savings. This has an important policy implication that accessibility of financial services has to be eased to most segments of the society.

Looking at the impact of interest rate on private investment, the result obtained indicates that what is postulated under the theory of financial repression does not seem to work in the case of Ethiopia. As opposed to the McKinnon-Shaw proposition, it is found out that real interest rate affects private investment rate negatively both in the long and short-runs. Further, additional insights obtained from modeling private investment rate in Ethiopia during the post-reform period have been the crowding out of private investment by public investment, the importance of foreign savings in the long-run private capital accumulation but negative impact in the short-run probably due to limited investment opportunities, the existence of strong multiplier effect in private capital formation and the importance of price (macroeconomic) stability in private capital accumulation.

All in all, it could be argued that the monetary authority, which is the National Bank of Ethiopia, does not have strong ground to consider interest rate as an important monetary policy instrument. Rather, it is argued that aggressive measures should be taken to encourage banks to expand their services to larger and increasing segment of the population.

## References


Abu Girma "Financial Sector Liberalization in Developing Countries", from the website.

Apergis N. & Eleftheriou S. (June 2002). "Interest Rates, Inflation, and Stock Prices: the case of the Athens Stock Exchange"; **Journal of Policy Modeling**; Vol. 24, No. 3,; pp. 321-236.

Aron J. et. al. (2002). "Interest Rate effects on output: evidence from a GDP forecasting model for South Africa", **IMF Staff Papers**, Vol. 49, Special Issue.

Arrieta G.M. G. (1988). "Interest Rates, Savings, and Growth in LDCs: An Assessment of Recent Empirical Research" in **World Development**, Vol. 16 No. 5, pp. 589-605.

Association of African Central Banks (AACB) (April 1985). "The Role and Structure of Interest Rates in Africa", Dakar, Senegal.

Atkinson G. & Hamiliton K. (November 2003) "Savings, Growth and the Resource Curse Hypotheses" in **World Development**, Vol. 31, NO. 11 pp. 1793-1808.

Azam J.P. (1996). "Savings and Interest Rate: The Case of Kenya", in **Savings and Development**, No. 1, pp. 33-43.

Baharumshah Z.A. & Thannoon A.M. (2003). " Determinants of Gross National Savings in Malaysia: A Macroeconomic Analysis, 1960-2000", in **Saving and Development Quarterly Review** No. 4, XXVII, pp. 421-440.

BIS (Monetary & Economic Department) (March 1994). "National Differences in Interest Rate transmissions", Basle.

_____. (March 1985). "Nominal and Real Interest Rates: Determinants and Influences", Basle.

Browning M. & Crossley T.F. (2001). "The Life Cycle Model of Consumption and Saving", in Journal of Economic Perspectives, Vol. 15(3), pp. 3-22.

Ceimile S. (2002). "Financial Liberalization and Real Investment: evidence from Turkish Firms", **IMF Working Paper**, WP/02/100.

Chandavarkar A.G. (March 1971). "Some Aspects of Interest Rate Policies in Less Developed Economies; The Experience of Selected Asian Countries, in **IMF Staff Papers**, Vol. 18, pp. 48-110.

Chiang T.C. (Autumn 1984). "On the Relationship between the Exchange Rate and the Interest Rate Differential in Monetary Models", in **Quarterly Review of Economics and Business**, Vol. 24, No. 3, pp. 49-55.

Deaton A. (1989). "Saving in Developing Countries: Theory and Review", in Proceedings of the **World Bank Annual Conference on Development Economics**, pp. 61-96.

Dooley M. & Mathieson D. (September 1987) " Financial Liberalization in Developing Countries"

Edwards S. & Khan M.S. (June 1985). "Interest rates in developing countries: The role of domestic and external influences in determining interest rates" in **Finance and Development**, Vol. 22, No. 2, pp. 28-31.

Equar Desta (2001). "Determinants of Real Exchange Rate in Ethiopia: An Empirical Investigation; 1985Q1-2000Q2 (Unpublished master thesis)

Fasika Damte (June 1995). "Real Interest Rate, Saving and Investment in Ethiopia: A test of the McKinnon-Shaw Hypotheses"; A Thesis presented to the School of Graduate Studies, AAU.

Fry M.J. (1982). "Models of Financially Repressed Developing Economies", in **World Development**, Vol. 10, No. 9, pp. 731-750.

Fry M.J. (1980). “Savings, Investment, Growth and the cost of Financial Repression” in **World Development, Vol. 8 No. 4**; 1980, pp. 317-328

Giovannini, A. (1983). “The Interest Elasticity of Savings in Developing Countries: The Existing Evidence”; in **World Development,** Vol. 11 No. 7, pp. 601-607.

Gross B.D. & Souleles S.N. (February 2002). “Do Liquidity Constraints and Interest Rates Matter for consumer behavior?”, Quarterly Journal of Economics, Vol. CXVII, Issue 1; pp. 149-186.

Hahn H.F. & Brechling R.P.F. (eds.)(1966). “The theory of Interest Rate: Proceedings of a Conference held by the International Economic Association”.

Hyuha M.A. (February 1993). “Interest Rate Policy and the Saving-Investment Process in Uganda: A Policy Stance”, Paper prepared for presentation at a public lecture organized by the Uganda Institute of Bankers, Kampala.

_____. (January 1982). “Financial Intermediation and Economic Growth in Developing Countries”, in **Journal of Economic Reflections**, Vol. II, No. 1, pp. 32-47.

Ibrahim A. (March 1991). “Proposal for the Revision of Interest Rates in Ethiopia”, Economic Research and Planning Department, the National Bank of Ethiopia.

_____. (1989). “The Ethiopian Interest Rate Policy of July 1986: A Preliminary Evaluation”; Economic Research and Planning Department, the National Bank of Ethiopia.

Keynes J. M. (1935). “The General Theory of Employment, Interest and Money”; New York, Harcourt, Brace and World Inc.

Khatkhate D.R. (1988). “Assessing the Impact of Interest Rates in Less Developed Countries” in **World Development**, Vol. 16, No. 5, pp. 577-588.

_____. (June 1986). “Estimating real interest rates in LDCs: An assessment of the common approaches, and an alternative for use in setting nominal interest rates”; in **Finance and Development**, Vol. 23, No. 2, pp. 45-48.

King R.G. & Levine R.(1993). “Finance and Growth: Schumpeter might be right”, in **Quarterly Journal of Economics**, Vol. 108, No. 3, pp. 717-737.

Landau D.F. (June 1989). “Management of Interest Rate Risk by LDCs”, in **Finance and Development**, Vol. 26, No. 2, pp. 20-22.

Lanyi A. & Saracoglu R. (June 1983) “The importance of interest rates in developing economies”, in **Finance and Development**, Vol. 20, No. 2, pp. 20-23.

Mantfort M. (2002) “Financial Reforms and Interest Rate Spreads in the Commercial Banking System in Malawi”, IMF Working Paper, WP/02/6.

Mavratos G. & Gelly R. (2001) “Savings Mobilization and Financial Sector Development: The Nexus”, in **Savings and Development Quarterly Review** – No. 1-XXV, pp. 33-66.

McKinnon R. I. (1973) "Money and Capital in Economic Development", the Brookings Institution, Washington D.C.

Mehra H., Laurens B. and Quintyn M. (eds.) (July/August 1995). **“Interest Rate Liberalization and Money Market Development; Selected Country Experience”**, IMF, pp. 29-57 (The case of Korea).

Mwega F.M., Ngola S.M. and Mwangi N. (1990). “Real Interest Rates and the Mobilization of Savings in Africa”, **African Economic Research Consortium**, Research Paper No. 2, Initiative Publishers, Nairobi.

Normal L. & Rashmi S. (2000). “Private Saving in India”, World Bank Economic Review, Vol. 14(3), pp. 571-594.

Ogaki, Masao, Jonathan Ostry J.D. and Reinhart C.M. (1996). "Saving Behavior in Low-and Middle-Income Countries: A Comparison" In IMF Staff Papers, 43(1) pp. 38-71.

Oshikoya, J. W. (1992). “Interest Rate Liberalization, Savings, Investment and Growth; the case of Kenya”, in **Savings and Development**, XVI, pp. 305-320.

Ostry J. D. & Reinhart C.M. (December 1995). “Saving and the Real Interest Rate in Developing Countries”, in **Finance and Development**, Vol. 32, No. 5, pp. 16-18.

Patinkin D. (1969). “Money, Interest and Prices: An ingeneration of monetary and value theory; 2nd editions, A Harper international edition.

Saidane D. (2002). “The Role of financial Liberalization in Development: Weakness and Corrections”, in **Savings and Development; Quarterly Review** – No. 3-XXVI, pp. 259-276.

Schmidt L. N., Hebbel K. & Serven L. (2000). “Saving in Developing Countries: An Overview”, in World Bank Economic Review, Vol. 14(3), pp. 393-414.

Shaw E. (1973). "Financial Deepening in Economic Development", Oxford University Press, London.

Soyibo A. & Adkanye F. (November 1992). “Financial System Regulation, Deregulation and Savings Mobilization in Nigeria”, **African Economic Research Consortium** Research Paper Eleven.

Vega C. G. (1982). “Arguments for Interest Rate Reform”, in **Savings and Development** No. 3, VI; pp. 221-229.

Villanueva D. & Mirakhor A. (December 1993). “Interest Rate Policies in Developing countries”, in **Finance and Development**, Vol. 30, No. 4, pp. 31-33.

Wan H. G. (et. al.) (2003). “Saving behavior in a transition economy: An empirical case study of rural China” in **Saving and Development Quarterly Review** No. 4, XXVII, pp. 399-420

# Annex I: Generating quarterly series of important macroeconomic variables

## *1.1 Disaggregating Components of National Income Accounts (production approach)*

### *A. Agricultural Production*

Data on annual agricultural production is available beginning from 1960/61 fiscal year but with no quarterly breakdown. Quarterly coefficients for disaggregating these annual figures were obtained from a study made by Equar Desta[9]. These coefficients were obtained by taking into account the labor input required in the various agricultural processes in the production of five major cereal crops namely barley, wheat, teff, maize and sorghum during the 1990's. A summary table of the result is indicated below:

*Annex table 1: Deriving quarterly coefficients for disaggregating agricultural production*

| Activity | Cereal Name | | | | | | Ratio |
|---|---|---|---|---|---|---|---|
| | Barley | Wheat | Teff | Maize | Sorghum | Average | |
| 1st plough | 4 | 4 | 5 | 7 | 5 | **5** | **0.075** |
| 2nd plough | 4 | 4 | 5 | 7 | 5 | **5** | **0.075** |
| 3rd plough | 3 | 3 | 5 | 3 | - | **3** | **0.045** |
| Planting, sowing & covering | 4 | 4 | 6 | 8 | 4 | **5** | **0.075** |
| 1st weeding | 15 | 11 | 22 | 20 | 24 | **18** | **0.268** |
| 2nd weeding | - | - | - | 24 | 7 | **6** | **0.089** |
| Harvesting | 13 | 18 | 18 | 9 | 9 | **6** | **0.194** |
| Threshing, widowing (shelling) | 7 | 10 | 17 | 19 | 9 | **13** | **0.179** |
| **Total** | **50** | **54** | **78** | **88** | **63** | **67** | **1.000** |

Source: Equar Desta (2001).

Notice that planting, sowing & covering including first weeding are done during the first quarter; 2nd weeding and harvesting during the second quarter; threshing and

[9] Equar Desta (2001) Annex 1.

widowing (shelling) during the 3rd quarter; and 1st, 2nd and 3rd plough during the fourth quarters of the Ethiopian fiscal year. Accordingly, the coefficients for the 1st, 2nd, 3rd and 4th quarters are derived to be 0.343, 0.283, 0.179 and 0.195 respectively. The '*belg'* season, which is a small rainy season that comes before the main (*'meher')* season is not considered as it covers only for about 5 percent of total agricultural production every year.

An additional assumption made in the present work is that there is not any significant technical change in agricultural production, especially the cereals listed above. Hence, these coefficients are assumed to be the same during the whole period considered in this study (i.e. 1970/71:1 - 2002/03:4).

### *B. Industrial production*

Data on annual industrial production is available beginning from 1960/61 Ethiopian fiscal year but with no quarterly production. In disaggregating industrial production for the recent period of 1990/91 to 2002/03, the coefficients obtained from Equar (2001) is used. He derived these coefficients from quarterly data obtained on production of 28 major public enterprises for the period 1993/94 to 1999/00. Accordingly, the coefficients for the 1st, 2nd, 3rd and 4th quarters of fiscal years 1990/91 to 2002/03 were 0.217, 0.259, 0.265 and 0.259 respectively.

The coefficients for the period from the 1st quarter of fiscal year 1983/84 to the 4th quarter of 1989/90 were obtained from quarterly data on the value of industrial production at constant 1978/79 prices. Although in most cases the quarterly coefficients were similar over those periods they were specific to the respective fiscal years. For the period from the 1st quarter of 1970/71 to the 4th quarter of 1982/83 the coefficients were derived from quarterly data on electricity consumption by the industrial sector.

### *C. Production of distributive services*

Data on annual production of distributive services is also available from fiscal year 1960/61 onwards. This sector includes activities like domestic trade, international trade, hotels and restaurants including transport and communication. Because quarterly data on most of these activities are not available the coefficients are derived

based on quarterly data on the total value of export and import of goods and non-factor services. The coefficients are specific to all the fiscal years covered in the study.

### *D. Production of other services*

Other services include banking, insurance, real estate, public administration and defense, education, health and other services. This part of production is, therefore, assumed to be evenly distributed among the four quarters and hence a coefficient of 0.25 is attached to all the quarters covered in the study.

### *1.2 Disaggregating Components of National Income Accounts (Expenditure approach)*

From the expenditure side the components of National Income are government & private consumption, government & private investment and export of goods and non-factor services net of import of goods and non-factor services. In disaggregating government consumption expenditure the coefficients are ratios of quarterly recurrent expenditure of the government in the respective annual totals while for private consumption a constant coefficient of 0.25 is used throughout. Similarly in disaggregating government expenditure the ratio of quarterly capital expenditure in total annual capital expenditure is used while a constant coefficient of 0.25 is used for private investment. For export and import of goods and non-factor services their respective quarterly shares in the respective annual performances is adopted.

Based on these, quarterly data on gross domestic savings (GDS) and gross national savings (GNS), gross domestic product at current market prices (GDPCUM) and gross national product at current market prices (GNP) are generated.

## Annex II: Interest rate reform in Ethiopia since October 1992.

The following table describes the seven interest rate revisions undertaken since October 1992 in Ethiopia:

**Annex Table 1: Interest rate structure as per the law**
**A. Lending rates (by CBE and specialized banks)**

| | Through September 30, 1992 | | | Oct. 1, 1992-Aug 31, 1994 | | Sept.1,1994 - Jan. 1, 1995 |
|---|---|---|---|---|---|---|
| | Coops. | State | Private | | | |
| **Sector** | | | | | | |
| Agriculture | 5 | 6 | 7 | 11.0-12 | Lending to all sectors | 14-15 |
| Industry, mining, power, and water resources | 6 | 8 | 9 | 13.0-14 | | |
| Domestic trade | 6 | 8 | 9.5 | 14.0-15 | Lending to the Central Gov't | 12-13 |
| Transport and communications | 6 | 8 | 8 | 13.0-14 | | |
| Export trade | 6 | 6 | 6 | 13.0-14 | NBE Lending to: | |
| Import trade (agricultural inputs) | 5 | 6 | 7 | 14.0-15 | CBEs/ Discount Rate/ | 10.5 |
| Import trade (other) | 6 | 8 | 9.5 | 14.0-15 | | |
| Hotels and tourism | 6 | 8 | 9 | 14.0-15 | Other Financial Inst. | 10.5 |
| Construction | 6 | 8 | 9 | 11.0-12 | | |
| Housing (1) purchase | 6 | 6 | 8 | 11.0-12 | Interbank Rate | 10 |
| (2) construction | 4.5 | 4.5 | 7 | 11.0-12 | | |
| Central Government | -- | 3.0-5.0 | -- | 12.0-13 | | |
| Banks and financial institutions | -- | 2.5-4.5 | -- | 10.0 | | |
| Personal loans | -- | -- | 10 | 14.0-15 | | |

**Table 3.1: Contd.**

**B. Deposit rates**

| | Through September 30, 1992 | Oct. 1, 1992-Aug 31, 1994 | Sept.1,1994-Jan. 1, 1995 |
|---|---|---|---|
| **1.Time deposits** | | | |
| 30 days notice | -- | 10.5 | 10.5 |
| 3 months to less than 6 months | -- | 10.5 | 10.5 |
| 6 months to less than 12 months | -- | 11 | 11 |
| 1 year to less than 2 years | Differed by ownership | 11.5 | 11.5 |
| 2 years and above | and maturity | 12 | 12 |
| Memorandum Items: | | | |
| Rate differentials for 1 year and over | | | |
| Financial institutions (1 year): | 1.0 | | |
| Gov't-owned undertakings (1 year): | 1.0 | | |
| Individuals, savings and credit | | | |
| cooperatives; self-help organizations: | | | |
| 1 year | 6.0 | | |
| 2 years | 6.5 | | |
| 3 years | 7.0 | | |
| 5 years | 7.5 | | |
| Others: 1 year | 4.0 | | |
| 2 years | 0.8 | | |
| 3 years | 5.0 | | |
| 5 years | 5.5 | | |
| **2.Savings deposits** | Differed by ownership and maturity | 10 | 10 |
| Rate differentials: | | | |
| Individuals, savings and credit cooperatives; | | | |
| self-help organizations: | | | |
| Up to Br. 100,000 | 6.0 | | |
| In excess of Br. 100,000 | 2.0 | | |

**Table 3.1: Contd.**

**C. Minimum and Maximum Interest Rates**

| | Jan. 2, 1995-Nov. 30, 1995 | Dec. 1, 1995-May 30, 1996 | June 1, 1996-Sep. 15, 1996 | Sep.16,1996-Dec. 31,1997 | Jan. 1,1998-Mar. 4,2002 | Mar. 4,2002-August-02 | August 02 to date |
|---|---|---|---|---|---|---|---|
| Minimum interest rates on Time and Savings Deposits | 10 | 11 | 10 | 7 | 6 | 3 | 3 |
| Maximum lending rate by commercial banks & other financial institutions, except for central government loan | 15 | 16 | 15 | 10.5 | Market determined | Market determined | Market determined |
| Central Government loan | 12 | 12 | 12 | 12 | 6 | 6 | 5 |

Source: National Bank of Ethiopia, Quarterly Bulletin.

# THE ARITHMETIC OF DEBT SUSTAINABILITY AND ITS FISCAL POLICY IMPLICATIONS: THE CASE OF ETHIOPIA

Haile Kebret[1]

*Abstract*

*The objective of this paper is to examine the sustainability of Ethiopian public debt and to infer its fiscal policy implications. It evaluates debt sustainability using conventional techniques of stationarity and co-integration. It further evaluates the fiscal policy implications of debt relief under different donors' behavior and growth scenarios. The results suggest that while conventional tests indicate that the Ethiopian debt is sustainable but these tests are inadequate and do not address the fiscal implications of the burden of debt and its inter-temporal trade offs. When such issues are incorporated, the opportunity cost of the debt is significant.*

[1] Head, Macro Division, EEA/EEPRI.

## 1. Introduction

The interaction between government revenue and expenditures and their net inflows that determine the growth of the accumulated debt stock has been of serious macroeconomic concern in recent years. Among the main reasons for this concern are the following: First, the amount of debt that has been accumulated by some poor countries is huge relative to the size of their economies, as measured relative to their GDP; second, the recent economic growth performance of these countries has been modest, at best, to make the accumulated debt sustainable; third, even if they were willing to pay, the opportunity cost of doing so would have severe socio-economic and possibly political consequences in these countries; and, fourth, due to the above reasons the international pressure on lenders to grant debt relief has been mounting in recent years, spearheaded by institutions like the Jubilee 2000.

The above factors have prompted the donor community in general and the multilateral institutions in particular, to design a scheme whereby poor countries that fulfill certain conditions will be granted a debt relief under what is known as the HIPc initiative[2]. Including Ethiopia, about 27developing countries, most of them in Africa, have qualified to be covered under this initiative. As it is well known by now, detailed evaluation of the initiative and the conditions under which these countries qualified for such a grant will not be made here. Suffice it to say that, being poor with a huge accumulated debt and carrying out prescribed policy reforms that are deemed necessary for growth and poverty reduction are the general prerequisites to qualify. Hence, the expected outcomes of such debt relief are adequate economic growth performance that would enable countries to achieve a sustainable debt burden following a partial debt relief and at the same time to reduce poverty in their respective countries via what are termed pro-poor policies.

Accordingly, owing to its huge debt burden, severe poverty and willingness to carry out the prescribed reforms, Ethiopia became eligible for debt reduction under the HIPC initiative and reached this year (2004) the final stage or what is termed the 'completion' point. According to IMF figures, its total nominal debt stock at the end of fiscal year 2002/2003 was about $6.8 billion (or $4.5 billion in net present value

[2] For detailed discussion of the HIPc initiative and conditions attached to it see Boote and Thugge (1997) and Cohen(2000).

(NPV) terms). This debt is huge relative to the size of the economy and the performance of exports. That is, this constitutes about 100% of GDP or about 246% of exports. Even after the scheduled debt relief under the initiative is applied, the IMF projects that Ethiopia's outstanding debt in NPV terms will be reduced to $3.9 billion or to about 90% of the current GDP in nominal terms.

The most important rationale of the HIPC initiative is that once these countries are granted the partial debt relief, they will achieve a sustainable debt burden. The objective of this paper is, therefore, to (a) examine whether the existing stock of total (both domestic and foreign) debt is sustainable during the post-HIPC era, and (b) to compute the fiscal path that traces debt sustainability under alternative growth scenarios and its policy implications.

The remainder of the paper is organized as follows. Following this brief introduction, Section Two highlights some basic macroeconomic attributes and outlines the historical evolution of debt in Ethiopia. Section Three presents the models that will be used in analyzing debt sustainability and the primary government budget balance that is compatible with a sustainable debt. This section will also present the summary of the results related to debt sustainability. The results and the policy implications of the findings regarding the required primary balance to ensure debt sustainability are discussed in Section Four. A brief summary and conclusions of the study are presented in Section Five.

## 2. Some basic macroeconomic attributes and Evolution of debt in Ethiopia

### 2.1 Some basic macroeconomic attributes

In terms of broadly defined economic development, Ethiopia lags behind in almost every measure. Socio-economic development could be examined in absolute terms, relative to other countries or in terms of improvements overtime (dynamic changes). Regardless of the approach one takes, Ethiopia is one of the least developed countries in the world and its economic structure has not changed much over the years. Both broad social indicators and narrow economic aggregates, support this observation. For instance, both the structure of the economy and the provision of

social services indicate that the level of development of the country is at a very low level. Using the conventionally used measure of poverty ( 1$ a day), about 44 per cent of Ethiopia's population falls under the poverty line, which is close to the African Average but very low by LDCs standards. According to World Bank Development indicators (2004), if one uses the $2 a day measure, the percent of population that falls under the poverty line exceeds 80%.

Despite some improvements in the overall macro-economic performance in the last decade (GDP growth averaging about 5%), the majority of its people still live in abject poverty. With a GNP per capita of US $100 (compared to an average of 480 in Sub-Saharan Africa and 520 for all LDCs), a life-expectancy at birth of 43 years (relative to 51 and 63 years in Sub-Saharan Africa and all LDCs, respectively), with only 26 per cent of its population having access to safe water (compared to 47 and 74 per cent for Sub-Saharan Africa and all LDCs, respectively) Ethiopia is very poor by any standard. Due to the above and other socioeconomic indicators, Ethiopia ranks bottom even among the least developed countries according to the UNDP's recent Human Development Indices.

Further, the dominant sector of the economy is traditional agriculture while industry which is believed to be the engine of economic growth is at its rudimentary level. All the remaining sectors are also weak. Consequently, the ability of the economy to mobilize resources to save and invest is limited. And resource limitations coupled with inefficient use of the meager available resources have made the economy incapable of fully financing its recurrent and capital expenditures. Therefore, the economy is in essence dependent on foreign assistance and loans both to finance its food deficiency and other development expenditures.

In terms of specific macroeconomic aggregates, as noted in Appendixes 1 and 2, the share of saving in GDP is very low both in absolute terms and relative to investment. This indicates the subsistence nature of the economy and the attendant resource gap (ranging between 9 to 20% of GDP in the last ten years). Such a resource gap in turn suggests that the country is dependent on external sources to finance this gap. Consequently, the Ethiopian economy has had a persistent deficit in its balance of payments and accumulated an external debt that is huge relative to its GDP. The accumulation of such a huge debt implies that in the absence of debt relief or an

export boom its ability to service its debt (which is at times as high as 40 per cent of its exports) will render any meaningful domestic investment effort.

In addition to the saving-investment gaps noted above, the country's external sector and its fiscal balance are also weak. In particular, the economy has suffered a consistent budget deficit and balance of payments crisis over the years. For instance, the size of the budget deficits (excluding grants) and the current account deficit (excluding transfers) averaged 8.8 and 8.4% of GDP, respectively, between 1995/96 and 2002/2003. Due to all the above resource shortfalls the country has been dependent on external financial flows in the form of loans, grants and aid. Consequently, as noted above, the country has accumulated a huge amount of both external and internal debt over the years

## 2.2 Historical evolution of Ethiopian debt

As noted above, Ethiopia is one of the highly indebted countries, even by the standards of HIPCs of Sub-Saharan Africa. Even though slightly decreased in recent years, owing to some cancellation and rescheduling, and mainly due to the granted debt relief amounting to US$1.3 billion (in NPV terms) under the HIPC initiative, the remaining balance is still high relative to GDP. The largest share of this debt is owed to the World Bank Group (IDA). Specifically, out of the total stock of debt outstanding, about 65 per cent is owed to the IDA group of creditors.

To put it in a historical context, the size of the debt and its composition has changed since the mid 1970s. During the Imperial regime the size of the debt was modest. The magnitude of the debt in 1975 when the Imperial regime fell was only US$371 million. But by the end of 1991 (the time the present government took power) it reached US$8790 million. More than half (US$4744 million or 54%) of the total debt was contracted for defense purposes. Consequently, the major share (76.4 per cent) of the debt was owed for bilateral creditors in which the Former Soviet Union alone accounted for about 78 per cent of the total bilateral debt. In contrast to the composition of the present debt, the share of Multilateral Institutions in the total debt was only 16.8 per cent during the previous regime (Teklu, 2000).

Clearly, the debt contracted until the 1990s was largely used for defense purposes and helped neither in improving the productive capacity of the economy nor in alleviating poverty. The macroeconomic performance indicators attest to this observation as reflected in negative growth rate in GDP per capita, huge external imbalances and very low Human Development Indices during the period.

To cope with its unsustainable debt, Ethiopia has been engaged in negotiations with its creditors since 1992. Consequently, a total of US$ 372.89 million was agreed to either be canceled (US$ 101.60 million) or rescheduled (the remaining US$ 271.29 million). In addition to these 'London Terms' or Enhanced Toronto Terms', the second round negotiations with the Paris Club Creditors for debts contracted before 1989 resulted in debt reduction on 'Naples Terms'. Accordingly, a 67 per cent reduction on the net present value of the eligible debt was applied, which resulted in a total debt relief of US$164.8 million (constituting 24.3 per cent cancellation and 75.7 per cent rescheduling). Hence, the total debt relief obtained through the two negotiations amounted to US$537.7 million (consisting of 26.3% cancellations and 73.7% rescheduling). Owing to the HIPC initiative, recent IMF figures (IMF, 2004) show that to date Ethiopia has benefited a debt relief amounting to US$1275 million in NPV terms.

The questions that this paper poses are then, (1) after all the debt relief is granted, will the Ethiopian debt be sustainable? (2) Will this sustainability depend on extending concessional (subsidized) loans beyond the HIPC era? And (3) what are the fiscal and social (such as poverty reduction) implications of attempting to achieve debt sustainability? These are crucial questions for a country like Ethiopia whose economic capacity to finance basic social provisions is limited and has been dependent on foreign financial flows to meet even its basic needs.

## 3. Model and estimation

### 3.1 Modeling sustainability

The standard formulation of debt sustainability starts from the basic government budget constraint which could be written as:

$$D_{t+1} = (1+\rho) D_t + G_t - R_t \quad \textbf{(1)}$$

Where D is the level of outstanding public debt, ρ is the real interest rate; G and R are real government expenditure and revenue including seignorage, respectively.

Solving for $D_t$ and taking expectations, (1) becomes:

$$D_t = -E \Sigma_{j=0} (1+ \rho)^{-(j+1)}(G_{t+j} - R_{t+j}) + \lim_{j\to\infty} E_t (1+ \rho)^{-(j+1)} D_{t+j+1} \quad \textbf{(2)}$$

(2) is the conventional inter-temporal government budget constraint which simply states that the outstanding debt in period t must equal the expected sum of the discounted value of budget deficit and the limit term which accounts for the discounted value of the debt in some future period.

In the recent research literature, testing for sustainability of debt proceeded along two lines: one focusing on the flow and the other on the stock components of equation (1). The first approach (for instance used by Hamilton and Flavin (1986), Kreamers (1988), Wilcox(1989), Haug (1991) and Crosetti and Roubini (1991)), focused on testing whether the limit term converges to zero or not. This has been examined using a unit root test to see whether the discounted debt stock is stationary or not whereby stationarity of the series is interpreted as indication of sustainability.

The second approach starts from the proposition that for the stock of debt to converge to zero, the flow or the budget balance must on average be zero. This suggests that the necessary and sufficient condition for debt sustainability is for government revenue and expenditures to be co-integrated. As in Trehan and Walsh (1988, 1991), Hakkio and Rush (1991), Arghyrou (2003) the typical model specified in such analyses takes the following form.

$$R_t = \alpha + \beta G_t + u_t \quad \textbf{(3)}$$

Where R and G are as defined above, u is a white-nose error term and α, β are coefficients.

Even though in principle equation (3) could be estimated in many ways, Arghyrou (2003, p. 6) favors using Dynamic OLS (DOLS). He argues that DOLS "is asymptotically equivalent to Johansen's (1988) maximum-likelihood estimator and is known to have a superior performance in small samples". The main advantage of the

Stock and Watson (1993) or what is known as the DOLS model is that because of the lags and leads that are included, it captures any feed back the dependent variable might have on the independent variable(s) and hence ensures consistency of estimates. Accordingly, the usual equation estimated including in this study takes the following form.

$$R_t = \alpha + \beta G_t + \sum_{i=-k}^{k} \gamma_i \Delta G_{t-i} + u_t \qquad \textbf{(4)}$$

A tests for the existence of co-integration (or there lack of) between Rt and Gt indicates whether a given debt is sustainable or not. That is, if the two flow variables are co-integrated, a debt is said to be sustainable. Alternatively, once it is established that the variables are co-integrated, sustainability could be further tested using an Error-Correction formulation and checking the significance of the error correcting term.

$$\Delta R_t = \delta + \sum_{t=1}^{m} \Psi_i \Delta R_{t-n} + \sum_{n=1}^{j} \gamma_i \Delta G_{t-n} + k\Phi_{t-1} + v_t \qquad \textbf{(5)}$$

Where Φ is the error-correcting term, δ, Ψ, γ, and k are respective coefficients, and Δ is first difference operator.

Hence, if k in (5) is significant it suggests that debt is sustainable otherwise it indicates lack of equilibrium and, therefore, un sustainability of debt.

## 3.2 Estimation results

In this study, both equation (4) and (5) are estimated for Ethiopia for the period 1965 to 1998. In short, as could be seen from the various test-results in appendixes 3 to 6, the findings could be summarized as follows. First, real government revenue and government expenditures are I(1) variables. Second the error term is stationary. Third, estimating (5) suggests that the error-term is significantly different from zero with a plausible speed of adjustment of abut 68% per year. All these results suggest that according to these findings, the Ethiopian debt is sustainable.

The weakness of such results in addressing debt sustainability issues is that they don't address the time frame in which such sustainability will be achieved and do not take into account the fiscal policy requirements to achieve such sustainability. That is, they only focus on the co-movements of government revenue and expenditure to determine sustainability with the implicit assumption that there will be no shock that affects the behavior of the variables in the future. In short, they take the statuesque of the budget structure as given for the indefinite future[3]. But as is well known, most government expenditures in countries like Ethiopia are financed from foreign sources. Therefore, an increase or a decrease of such assistance will have an impact on the fiscal policy stance. In particular, one could envisage a scenario during the post-HIPC era in which access to subsidized loans or aid will be reduced once debt relief is granted. The relevant question to ask is, then, will Ethiopia be able to sustain its debt in the absence of such assistance? What will be the degree of indebtedness and the required fiscal policy path under different growth and foreign assistance scenarios that would ensure debt sustainability? The next sub-section attempts to address these questions.

## 3.1 Debt sustainability, fiscal policy path and debt relief

To address the above questions, this study follows the model developed by Edwards (2002) to examine the required fiscal policy path to achieve sustainability of the total public sector debt. His model is suited to project the fiscal stance which is consistent with a sustainable public sector debt during the post-HIPC era.

Edawards (2002) started from the basic conventional debt accumulation equation, which states that the changes to the accumulated debt ($\Delta D_{t}$ ) at any point in time is equal to the interest payment on foreign debt ($r^*DF_{t-1)}$ and domestic debt ($rDD_{t-1}$), plus the primary government balance less the change in the monetary base ($\Delta B_t$ ) , which is used as a proxy for seignorage revenue. That is,

$$\Delta D_t = \{r^*DF_{t-1} + rDD_{t-1}\} + pb_t - \Delta B_t \qquad \textbf{(6)}$$

[3] Some Studies (Arghyrou, 2003, for instance) attempted to address such issues by introducing non-linearity in the budget structure.

r*, r are nominal interest rates on foreign and domestic debt respectively. And DD could be interpreted as commercial debt, be it foreign or domestic while DF refers to foreign debt obtained on concessional (or subsidized) terms.

The variable of interest in (6) is the government primary balance ($pb_t$). That is, what is the primary balance which is consistent with a sustainable debt burden after the debt forgiveness is granted? Edwards (2002, p. 5) defines debt sustainability as "a situation where increases in each type of debt are in line with the pace at which national and international creditors desire to accumulate government-issued securities". And since the flow of both domestic and foreign loans have an upper limit, they are assumed to behave as follows: During the post- HIPC era, international donors will increase concessional loan by an amount equal to or less than θ, and domestic creditors are willing to increase their credit by an amount equal to β. As an upper limit, creditors are assumed to increase their lending by an amount equal to the real growth rate of GDP (g) and the dollar inflation (target) rate (π*). That is, the limits of θ and β are:

$$\theta \leq (g + \pi^*) \text{ ; and } \beta \leq (g + \pi^*) \qquad \textbf{(7)}$$

Given the above basic relationships, the dynamic path of the sustainable primary government balance could be written as:

$$\{ pb_t / Y_t) = [\{\theta - r^*\}(DF_0 / Y_0)e^{(\theta - g - \pi^*)(t-1)} + \{\beta - r_t\}(DD_0 / Y_0)\, e^{(\beta - g - \pi^*)(t-1)}] [1/(1+g+\pi^*)] - (g + \pi)(B_0 / Y_0). \qquad \textbf{(8)}$$

Similarly, the steady-state sustainable primary balance could be written as follows[4]:

$$\{ pb / Y ) = \{g + \pi^* - r\}(DD_0 / Y_0) \quad [1/(1+g+\pi^*)] + (g + \pi)(B_0 / Y_0). \qquad \textbf{(9)}$$

$DF_0 / Y_0$ is the initial ratio of the face value of concessional loan to GDP
$DD_0 / Y_0$ is the initial domestic debt to GDP ratio
π is the target rate of domestic inflation
$B_0 / Y_0$ is the initial ratio of base money to GDP

[4] Alternative formulations of equations (8) and (9) for different scenarios are presented in Appendix 3.

$t_0$ should be interpreted as the time following the period after all the HIPC initiative debt reductions are carried out.

Clearly, the sustainable primary balance that is consistent with a sustainable debt is determined by both initial ratios of domestic and foreign debts to GDP, nominal domestic and foreign interest rates, domestic and foreign inflation rates, the rate of growth of real GDP, and the sustainable increases in both foreign and domestic debt ($\theta$ and $\beta$).

Given the above basic relationship between government primary balance and debt outstanding, it is possible to conjure up various scenarios regarding the likely behavior of the determinants of debt sustainability. Among others, just to name a few, it is possible to consider different credit flows from the donor community, variations in GDP growth rates, changes in both foreign and domestic interest rates[5] and inflation rates, and changes in the domestic exchange rate which may affect the domestic inflation rate if there is a substantial pass through to the domestic economy. As a first step, this study is limited to considering the impact of different assumptions on the flow of concessional credit once the HIPC initiative ran its course under plausible different GDP growth scenarios[6].

In particular, the study will examine the following issues.

(1) What will be the dynamic path of sustainable primary balance to GDP ratio if:
(a) The donor community decreases its credit facility to zero in the post-HIPC era once debt forgiveness is granted?
(b) The flow of concessional loans in the post-HIPC era is not zero, but some new partial funding is still forthcoming? and
(c) The flow of foreign financial flows continues at a rate that prevails today?

(2) Under the above three scenarios, that range from the least favorable to the most unfavorable, the primary balance required to achieve debt sustainability will be examined for different plausible GDP growth rates.

[5] Results for lower domestic and foreign interest rates are reported in Appendices 8 to 10.
[6] Consideration of alternative scenarios and other extensions that include different parameter values and policy changes such as exchange rate devaluation are in progress in a separate paper.

(3) Further, the evolution of Ethiopia's debt under the first two scenarios will be examined to evaluate the speed at which it converges to a steady state. The third case will not be computed since it is trivially the initial value by construction.

## 4. Dynamic path of a sustainable primary balance

The above outlined scenarios are evaluated using the recent Ethiopian data. The parameter values used to evaluate the alternative scenarios are summarized below. It has to be noted that some of the parameters chosen are on the low side due to the volatility of the values and owing to expectations that their future values will be less than what they are today.

**Summary of parameters and values used for simulation**

| Variable | Value | Explanations |
|---|---|---|
| $Pb_t / Y_t$ | … | Primary balance to GDP (to be computed). |
| $\theta$ | … | Values vary depending on assumptions. |
| $r^*$ | 0.03 | The approximate interest rate for concessional laons |
| $DF_0 / Y_0$ | 0.8 | Ratio of foreign debt to GDP |
| $g$ | | Different growth rates (ranging from 2 to 10%) are used to reflect its volatility |
| $\pi^*$ | 0.025 | Since most debt is denominated in US$ and inflation in the US averaged around 2.5% in recent years. |
| $\beta$ | $g + \pi^*$ | Assumed a constant domestic debt burden equal to this rate. |
| $r_t$ | 0.085 | The recent commercial lending rate in Ethiopia is about 8.5% |
| $DD_0 / Y_0$ | 0.4 | The domestic debt is about 40% of GDP. |
| $\pi$ | 0.085 | Since this is dollar denominated target domestic inflation, it is taken as a sum of average depreciation rate of the Birr (6%)+US inflation (2.5%). |
| $B_0 / Y_0$ | 0.2 | Recent ratio of base money to GDP. |

Using the above parameters, the first case considered is case A, in which it is assumed that in the post HIPC era, no additional new funding will be forthcoming once the debt relief under the HIPC initiative is completed. This means, it is assumed that θ=0 in (9) above.

The results obtained using the above parameters in the model are reported in Table 1 below for different growth rates. It has to be noted that even though the average GDP growth rate in Ethiopia has been around 5.5% and its future growth rate is projected by the IMF to be around 6%, the yearly growth rates have been very volatile ranging from -4 to 12 % in the last few years. Hence, alternative growth rates that range from 2 to 10% are used to capture this volatility.

It has to be also noted that a negative primary balance implies that the government has to run a budget surplus to achieve a sustainable debt while a positive primary balance indicates that the government could afford to incur a deficit and yet maintain a sustainable debt.

**Table1: Debt sustainability Case A (no availability of new concessional loans)**

| Year | Alternative Growth Rates | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2%** | **3%** | **4%** | **5%** | **6%** | **7%** | **10%** |
| 1 | -1.73 | -1.11 | -0.50 | 0.10 | 0.69 | 1.27 | 2.99 |
| 2 | -1.70 | -1.08 | -0.46 | 0.15 | 0.75 | 1.35 | 3.09 |
| 3 | -1.70 | -1.05 | -0.42 | 0.20 | 0.82 | 1.42 | 3.19 |
| 4 | -1.73 | -1.01 | -0.37 | 0.26 | 0.88 | 1.49 | 3.29 |
| 5 | -1.64 | -0.98 | -0.33 | 0.31 | 0.94 | 1.56 | 3.38 |
| 6 | -1.62 | -0.95 | -0.29 | 0.36 | 1.00 | 1.63 | 3.46 |
| 7 | -1.59 | -0.92 | -0.25 | 0.41 | 1.05 | 1.69 | 3.54 |
| 8 | -1.57 | -0.89 | -0.21 | 0.45 | 1.11 | 1.75 | 3.62 |
| 9 | -1.55 | -0.86 | -0.17 | 0.50 | 1.16 | 1.81 | 3.69 |
| 10 | -1.53 | -0.83 | -0.13 | 0.55 | 1.21 | 1.87 | 3.76 |
| Steady state | 0.57 | 1.16 | 1.75 | 2.33 | 2.90 | 3.47 | 5.12 |

Looking at Table 1, it is clear that for any GDP growth rate less than 5%, the government has to run a primary budget surplus for, at least, more than 10 years to maintain a sustainable debt. Even at a GDP growth rate of 5% and by the $10^{th}$ year, the amount of deficit compatible with a sustainable debt is only 0.5% of GDP. It has to be noted that the budget deficit in Ethiopia averaged about 9% of GDP during the

last 10 years. It is not, therefore, difficult to see how daunting a task this will be to maintain a surplus and even to only incur such a small deficit. The possible negative implications of such envisioned budgetary discipline will be noted later. It should further be noted that even the steady state primary balance required for debt sustainability is only about 5% of GDP, assuming an average GDP growth rate of 10%.

Admittedly, the above scenario that assumed no new concessional loans will be available in the post-HIPC era might be unrealistic. Instead a more plausible assumption might be that even after the debt forgiveness under the HIPC initiative is completed, there will be a flow of new subsidized loans albeit relatively less than before. Accordingly, the following exercise considers what the dynamic path of the primary balance will be assuming that the new loan will be, $\theta = (g/2+\pi^*)$. The results of using this value for $\theta$ in the model (with all other variables taking the previous value) are reported in Table 2.

**Table 2 Debt Sustainability CASE B (partial availability of concessional loans)**

| Year | Alternative Growth Rates | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2%** | **3%** | **4%** | **5%** | **6%** | **7%** | **10%** |
| 1 | 0.95 | 1.92 | 2.88 | 3.82 | 4.74 | 5.66 | 8.32 |
| 2 | 0.95 | 1.91 | 2.85 | 3.78 | 4.69 | 5.58 | 8.17 |
| 3 | 0.95 | 1.90 | 2.83 | 3.74 | 4.64 | 5.51 | 8.02 |
| 4 | 0.95 | 1.89 | 2.81 | 3.71 | 4.58 | 5.44 | 7.88 |
| 5 | 0.94 | 1.88 | 2.79 | 3.67 | 4.53 | 5.37 | 7.74 |
| 6 | 0.93 | 1.87 | 2.77 | 3.64 | 4.49 | 5.31 | 7.61 |
| 7 | 0.93 | 1.86 | 2.75 | 3.61 | 4.44 | 5.24 | 7.49 |
| 8 | 0.93 | 1.85 | 2.73 | 3.58 | 4.39 | 5.18 | 7.38 |
| 9 | 0.92 | 1.84 | 2.71 | 3.55 | 4.35 | 5.12 | 7.27 |
| 10 | 0.92 | 1.83 | 2.69 | 3.52 | 4.31 | 5.06 | 7.16 |
| Steady State | 0.57 | 1.16 | 1.75 | 2.33 | 2.90 | 3.47 | 5.12 |

As is clear from Table 2, Under scenario B, the government will be able to incur a deficit under all growth scenarios even though it is only if the economy grows at 10% every year that the ratio of the primary balance to GDP will get closer to what prevailed in recent years. But even in the steady sate (last row of Table 2), the equilibrium primary balance is lower than what is historically observed in the presence of grants and concessional loans.

To cover alternative scenarios, the third case considers, case C, in which it is assumed that donors will continue providing financial aid at the prevailing rate. In 2002, Africa Development Bank (2003/2004) Report indicates that the ratio of aid flows to GDP for Ethiopia from all donors was around 20% of GDP. This ratio is the closest to the assumption that $\theta = (g+\pi^*)$ in this model's formulation.

The results obtained after simulating the model using the above value for $\theta$ are reported in Table 3, below.

**Table 3: Debt sustainability CASE C (financial flows continue at existing rate)**

| Year | Alternative Growth Rates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **2%** | **3%** | **4%** | **5%** | **6%** | **7%** | **8%** | **9%** | **10%** |
| 1 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 2 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 3 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 4 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 5 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 6 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 7 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 8 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 9 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| 10 | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |
| Steady-State | 1.72 | 3.06 | 4.38 | 5.68 | 6.96 | 8.21 | 9.45 | 10.67 | 11.88 |

It has to be noted that, considering this scenario is interesting in illustrating what debt sustainability will look like if the existing state of dependency continues. But, it has to also be noted that it is unrealistic to assume that donors will continue assisting countries like Ethiopia indefinitely. Instead a more plausible assumption is that donors are likely to reduce their aid flows, if nothing else for the simple reason that as dependency continues what is named "Aid Fatigue" will set in before long if it has not already. Further, the primary motive of the HIPC initiative is that once the indebted countries received debt forgiveness, they will maintain a sustainable debt in the future on their own, without resorting to concessional loans.

The next issue to be addressed is the evolution of the concessional loan over time under the three scenarios considered for alternative real GDP growth rates. As is

evident from Table 4, the yearly decline in the ratio of subsidize loans to GDP is very gradual. For instance, for any GDP growth rate below 5%, it takes about ten years to bring the ratio of debt to GDP to about 50%. Even in the more realistic growth (at least in historical terms) rate of 5-to 6%, it takes about seven years to bring the ratio of debt to GDP to about 50%.

**Table 4 Evolution of debt - Case A**

| Year | Alternative Growth rates | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2%** | **3%** | **4%** | **5%** | **6%** | **7%** | **10%** |
| 1 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| 2 | 76.48 | 75.72 | 74.97 | 74.22 | 73.48 | 72.75 | 70.60 |
| 3 | 73.11 | 71.67 | 70.25 | 68.86 | 67.49 | 66.16 | 62.30 |
| 4 | 69.90 | 67.83 | 65.83 | 63.88 | 61.99 | 60.16 | 54.98 |
| 5 | 66.82 | 64.20 | 61.68 | 59.27 | 56.94 | 54.71 | 48.52 |
| 6 | 63.88 | 60.77 | 57.80 | 54.98 | 52.30 | 49.75 | 42.82 |
| 7 | 61.07 | 57.51 | 54.16 | 51.01 | 48.04 | 45.24 | 37.79 |
| 8 | 58.38 | 54.44 | 50.76 | 47.32 | 44.13 | 41.14 | 33.35 |
| 9 | 55.81 | 51.52 | 47.56 | 43.90 | 40.53 | 37.41 | 29.43 |
| 10 | 53.36 | 48.77 | 44.57 | 40.73 | 37.23 | 34.02 | 25.97 |
| Steady State | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The second scenario considered (which assumes that new additional subsidized loans will be available) shares with the firs case in that the decline in the share of debt to GDP ratio is gradual. Due to the accumulation of new loans, even in the best case scenario of a 10% real GDP growth rate the share of debt to GDP will remain above 50% after 10 years. But note that in both cases, the ratio of debt to GDP will be zero at the steady state. It is also important to note that, under the scenarios considered, the time frame in which the debt to GDP ratio will converge to zero takes a long time. For instance, under scenario A, the debt to GDP ratio will range from 7 to 0.5% of GDP for respective growth rates ranging from 2 to 10% after 50 years. On the other hand, for scenario B, since new loans are also added, in 50 years, the ratio of debt to GDP will only decline in the range of 7 to 49% for growth rates ranging from 2 to 10%.

The evolution of debt under scenario C in which it is assumed that financial flows will continue indefinitely, of course suggests that the rate of indebtedness will continue at

the initial rate with no change in the future since by construction the flow is equivalent to what exists at the initial time period.

**Table 5: Evolution of debt - Case b**

| Year | Alternative Growth Rates | | | | | | |
|---|---|---|---|---|---|---|---|
| | **2%** | **3%** | **4%** | **5%** | **6%** | **7%** | **10%** |
| 1 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| 2 | 79.20 | 78.81 | 78.42 | 78.02 | 77.64 | 77.25 | 76.10 |
| 3 | 78.42 | 77.64 | 76.86 | 76.10 | 75.34 | 74.59 | 72.39 |
| 4 | 77.64 | 76.48 | 75.34 | 74.22 | 73.11 | 72.03 | 68.86 |
| 5 | 76.86 | 75.34 | 73.85 | 72.39 | 70.95 | 69.55 | 65.50 |
| 6 | 76.10 | 74.22 | 72.39 | 70.60 | 68.86 | 67.16 | 62.30 |
| 7 | 75.34 | 73.11 | 70.95 | 68.86 | 66.82 | 64.85 | 59.27 |
| 8 | 74.59 | 72.03 | 69.55 | 67.16 | 64.85 | 62.62 | 56.38 |
| 9 | 73.85 | 70.95 | 68.17 | 65.50 | 62.93 | 60.46 | 53.63 |
| 10 | 73.11 | 69.90 | 66.82 | 63.88 | 61.07 | 58.38 | 51.01 |
| Steady state | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

It is worth noting that the above analysis is not to suggest that accumulating debt is always necessarily bad. But what matter are the size of the debt relative to the size of the economy since servicing the debt has significant opportunity costs and possibly adverse social consequences, and the purpose for which it is used. And since we are mainly examining the debt accumulated to finance the to date accomplished economic activities, it is clear that an optimal benefit has not been derived from the accumulated debt if the attendant performance of the economy is the appropriate yardstick to measure it with.

## 5. Summary and conclusions

This paper attempted to examine debt sustainability in general and in the post-HIPC era, in particular. Starting from conventional estimates of debt sustainability, it further examined what the sustainable primary balance will be under different scenarios of donor behavior in terms of allowing access to subsidized loans once the HIPC initiative is over. The findings could be summarized as follows.

First, the simple primary balance flow based tests suggest that the Ethiopian debt is sustainable. The unit root and co-integration tests seem to indicate that given the attendant flow of revenue and expenditures, the current outstanding debt is sustainable.

Second, when the primary balance that is compatible with a sustainable debt is computed, it suggests that the fiscal policy effort required to achieve this sustainability is daunting. This is because the computed required primary balance under different economic growth scenarios that are consistent with a sustainable debt are much lower than what is historically observed.

Third, examining the evolution of the debt under the two scenarios considered suggest that the decline in the debt to GDP ratio is gradual in all the alternative growth rates considered.

The important contribution of this exercise is that it helps us gauge the extent to which the existing fiscal structure exhibits some equilibrating characteristics as indicated in the first set of estimations. It also highlights the degree of fiscal effort required to achieve a primary balance that is compatible with a sustainable debt. The important message that comes from this study is that even under the more optimistic scenario that the donor community will continue to offer concessional or subsidized loans even after the end of the HIPC initiative, the public sector primary balance required to maintain a sustainable debt is going to be constraining even under the more optimistic scenario of high GDP growth.

The impact of such a constraint on an economy that has a big public sector relative to GDP, high unemployment rate, high incidence of poverty, low tax base is not difficult to imagine. The alternative growth rates considered seem realistic, at least based on the recent growth experience of the economy. And therefore, if the assumptions regarding the flow of new loans in the post-HIPC era materialize, the required tight fiscal policy stance implied by the above results will likely have a significant adverse effect on national efforts to address the multidimensional socio-economic development concerns of the country that range from multifaceted issues such as poverty reduction, in general, and specific social provisions (such as health and education), in particular.

## References


African Development Bank. (2003/2004). *African Economic Outlook*.

Allen, T. And D. Weinhold. (2000). "Dropping the Debt for the New Millennium: Is It Such a Good Idea?" *Working Paper Series*, No. 00-09, London School of Economics.

Andrews D., A.R. Boote, S.S. Rizavi, and S. Singh. (2004). "Debt Relief for Low Income Countries: The Enhanced HIPC Initiative", IMF Pamphlet Series, No. 51.

Arghyrou, M. (2003). " Debt Sustainability, Structural Breaks and Non-linear adjustment: A testing Application to Greek fiscal policy", Department of Economics and Finance, Brunel University.

Bangura, Sheku. D. Kitabire and R. Powell. (2004). "External Debt Management in Low-Income Countries" IMF, *Working Paper* No. 00/196.

Boote, A. and K. Thugge. (1997). Debt Relief for Low-Income Countries: The HIPIC Initiative, International Monetary Fund, Pamphlet Series No. 51.

Boote, A. R and Kamau T. (2004). "Debt Relief for Low-Income Countries and the HIPC Initiative", IMF, *Working Paper* Series No. 97/24. ohen, Daniel. (2000). The HIPIC Initiative: True and False promises. OECD Development Centre, Technical Paper No. 16.

Corsetti, G. and Roubini N. (1991). "Fiscal deficits, public debt and government Solvency: Evidence from OECD countries", *Journal of Japanese and International Economies*, 5, PP. 354-80.

Easterly, William. (2000). "Growth Implosions and Debt Explositions: Do Growth Slowdons Cause Public Debt Crises?" *World Bank* (October, unpublished paper)

_____, How Did Highly Indebted Countries Become Highly Indebted? Reviewing Two Decades of Debt Relief" *World Bank* (June, unpublished paper).

Edwards, S. (2002). "Debt Relief and Fiscal Sustainability," NBER Working Paper Series 8939.

Government of Ethiopia, "Interim Poverty Reduction Strategy paper. 2000/01- 2002/03". September 2000, Addis Ababa, Ethiopia.

Gunter, Bernhard G. (2001). "Does the HIPC Initiative Achieve its Goal of Debt Sustainability?". WIDER, Discussion Paper No. 2001/100 (September)

Hakkio, C. S. and Rush M. (1991). "Cointegration and Government Borrowing Constraints: Evidence for the United States", *Journal of Business & Economics Statistics,* 9, PP. 429-445.

Hamilton, J. and Flavin M. A. (1986), "On the Limitations of Government Borrowing: A Framework for Testing," *American Economic Review*, 76, pp. 808-819.

Hung, A. A. (1991), "Cointegration and Government Borrowing Constraints: Evidence for the United States", *Journal of Business & Economics Statistics",* 9, PP. 97-101.

Jakob, E. C. (2004), "Domestic Debt Markets in Sub-Saharan Africa"

IMF, Working Paper No. 04/46. Kremers, J. J. (1988), “Long-Run limits on the US federal debt”, *Economic Letters*, 28, pp. 259-262.

MoFED. (2002). “”Ethiopia: Sustainable Development and Poverty Reduction Program”, Federal Democratic Republic of Ethiopia (FDRE), Ministry of Finance and Economic Development MOFED).

Peterson, S. B. (2001). "Financial Reform in a Devolved African Country: Lessons from Ethiopia", *Public Administration and Development,* Vol.2 (pp. 1-18). Roubini, Nouriel (2001), “Debt Sustainability: How to Assess Whether a Country is

Insolvent”, Stern School of Business, New York University (December 20). Stock, J. and Watson. M. (1993). “A Simple Estimator of Cointegrating Vectors in Higher Order Integrated System”, *Econometrica*, 5, pp. 1035-1056.

Teklu, Tefera. (2000). External Resource Mobilization and External Debt Situation", Paper presented at a "Symposium for reviewing Ethiopia’s

Socio-Economic Performance 1991-1999". Inter-African Group. Trehan, B. and Walsh C. E. 1988). “Common Trends, The Governemnt’s Budget Constraint and Revenue Smoothing”, *Journal of Economic Dynamics and Control*, pp. 425-444.

Wilcox, D. (1989). “The Sustainability of Government Deficits: Implications of the Present-Value Borrowing Constraint,” *Journal of Money, Credit and Banking*, 21, pp. 291-306.

Yan, S. (2004). “External Debt Sustainability in HIPC Completion Point Countries” IMF, Working Paper No. 04/160.

## Appendices

**Appendix 1: Selected Macroeconomic Aggregates -% GDP (unless otherwise indicated) (1962/65-2002/03)**

| Aggregate | '62/3-66/7 | '67/8-7/72 | '72/3-76/7 | '77/8-81/2 | '82/3-86/7 | '87/8-92/3 | '92/3-99/0 | 2000/1 | 2001/2 | 2002/3 |
|---|---|---|---|---|---|---|---|---|---|---|
| Real GDP growth rate (%) | 4.7 | 4.0 | 1.3 | 2.3 | 3.7 | -0.01 | 5.7 | 7.7 | 1.2 | -3.8 |
| Investment | 13.5 | 12.6 | 9.7 | 11.0 | 14.3 | 13.4 | 15.9 | 17.8 | 20.5 | 21.2 |
| Saving | 11.4 | 11.0 | 9.0 | 4.7 | 6.5 | 7.1 | 5.3 | 3.1 | 2.5 | 1.8 |
| Exports+Imports | 24.1 | 22.1 | 26.5 | 29.1 | 26.0 | 20.2 | 37.8 | 29.5 | 34.9 | 34.3 |
| Inflation (%) | | 1.7 | 11.4 | 10.7 | 3.4 | 11.8 | 3.8 | -5.2 | -7.2 | 15.1 |
| Export as % of Import | 83.6 | 86.6 | 95.8 | 53.6 | 53.7 | 52.3 | 56.4 | 29.9 | 25.1 | 25.4 |
| Government Revenue | 9.8 | 11.0 | 16.3 | 18.5 | 18.8 | 13.6 | 12.6 | 18.8 | 20.1 | 19.6 |
| Government Expenditure | 12.2 | 13.1 | 21.2 | 25.1 | 29.8 | 23.5 | 17.2 | 28.4 | 32.2 | 34.8 |

Source: Computed based on (MOFED) and CSA data (various years) and IMF (2004) estimates.

**Appendix 2 Selected Financial Aggregates (as % of GDP unless otherwise indicated)**

| Aggregate | 1995/6 | 1996/7 | 1997/8 | 1998/9 | 1999/0 | 2000/1 | 2001/2 | 2002/3 |
|---|---|---|---|---|---|---|---|---|
| Broad Money growth % | 11.6 | 3.4 | 12.7 | 5.9 | 14.0 | 9.5 | 12.3 | 10.4 |
| Resource gap | -9.9 | -9.1 | -9.4 | -14.9 | -17.0 | -14.7 | -18.0 | -19.4 |
| C/A balance* | -5.4 | -3.0 | -6.5 | -5.6 | -11.2 | -9.7 | -12.9 | -12.8 |
| Budget Deficit* | -8.5 | -6.0 | -7.2 | -12.2 | -15.1 | -9.6 | -12.1 | -15.3 |
| Domestic debt | 32.2 | 28.6 | 29.0 | 31.2 | 42.2 | 37.4 | 39.8 | 39.1 |
| External Debt | 151 | 79.9 | 78.4 | 82.8 | 86.5 | 86.3 | 109.8 | 98.7 |

Source: IMF (2001 and 2004).

*Excluding transfers and grants, respectively..

**Appendix 3: Sustainable and Steady-state Primary Balance and Debt to GDP ratios Under Alternative Scenarios.**

| | Dynamic Path | Steady-state sustainable primary balance to GDP ratio | Stationary Susidized debt to GDP ratio | Stationary domestic debt to GDP ratio |
|---|---|---|---|---|
| Case A: $\theta=0$ | $\{ pb_t /Y_t) = [\{ -r^*\}(DF_{0/} Y_0)e^{-(g+ \pi^*)(t-1)} +\{g+ \pi^*-r\}(DD_0 /Y_0) [1/(1+g+ \pi^*)] + ( g + \pi)(B_0 / Y_0)$ | $\{ pb_t /Y_t) = (g+ \pi^* -r) (DD_0/Y_0)[1/(1+g+ \pi^*)] +( g + \pi)(B_0 / Y_0)$ | (DF/Y) =0 | (DD/Y) = $(DD_o/Y_o)$ |
| Case B: $\theta=(g/2+ \pi^*)$ | $\{ pb_t /Y_t) = [\{ g/2+\pi^*-r^*\}(DF_{0/} Y_0) e^{-g/2(t-1)} +\{ g+ \pi^*-r\}(DD_0 /Y_0) [1/(1+g+ \pi^*)]+( g + \pi)(B_0 / Y_0)$ | $\{ pb_t /Y_t) = (g+ \pi^* -r) (DD_0/Y_0)[1/(1+g+ \pi^*)] +( g + \pi)(B_0 / Y_0)$ | (DF/Y) =0 | (DD/Y) = $(DD_o/Y_o)$ |
| Case C: $\theta=(g+ \pi^*)$ | $\{ pb_t /Y_t) = (D_{0/} Y_0)[( g+ \pi^*)-r^* ( DF_0/D_0) -r\}(DD_0 /D_0)] [1/(1+g+ \pi^*)]+( g + \pi)(B_0 / Y_0)$ | $\{ pb_t /Y_t) = (D_{0/} Y_0)[( g+ \pi^*)-r^*( DF_0/D_0) -r\} (DD_0 /D_0)][1/(1+g+ \pi^*)] + ( g + \pi)(B_0 / Y_0)$ | (DF/Y) = $(DF_o/Y_o)$ | (DD/Y) = $(DD_o/Y_o)$ |

**Appendix 4 Unit Root Tests for Real Government Expenditures**

| PP Test Statistic | -4.009161 | 1% Critical Value* | -3.6422 |
|---|---|---|---|
| | | 5% Critical Value | -2.9527 |
| | | 10% Critical Value | -2.6148 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3 ( Newey-West suggests: 3 )

Residual variance with no correction 1191402.

Residual variance with correction 1102528.

Phillips-Perron Test Equation

Dependent Variable: D(LRTGE,2)

Method: Least Squares

Date: 10/20/04 Time: 17:01

Sample(adjusted): 1967 1999

Included observations: 33 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| ΔLRTGE(-1) | -0.712142 | 0.175159 | -4.065686 | 0.0003 |
| C | 276.7239 | 204.3546 | 1.354136 | 0.1855 |
| R-squared | 0.347778 | Mean dependent var | | 42.16324 |
| Adjusted R-squared | 0.326738 | S.D. dependent var | | 1372.503 |
| S.E. of regression | 1126.174 | Akaike info criterion | | 16.94973 |
| Sum squared resid | 39316275 | Schwarz criterion | | 17.04043 |
| Log likelihood | -277.6706 | F-statistic | | 16.52980 |
| Durbin-Watson stat | 1.928091 | Prob(F-statistic) | | 0.000304 |

**Appendix 5 Unit Root Tests for Real Government Revenue**

| PP Test Statistic | -5.357541 | 1% Critical Value* | -3.6171 |
|---|---|---|---|
| | | 5% Critical Value | -2.9422 |
| | | 10% Critical Value | -2.6092 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 3 ( Newey-West suggests: 3 )

| | |
|---|---|
| Residual variance with no correction | 0.028965 |
| Residual variance with correction | 0.026547 |

Phillips-Perron Test Equation

Dependent Variable: ΔLRTGR

Method: Least Squares

Date: 10/20/04 Time: 17:46

Sample(adjusted): 1963 1999

Includeed observations: 37 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| Δ LRTGR(-1) | -0.904109 | 0.168006 | -5.381400 | 0.0000 |
| C | 0.034584 | 0.029405 | 1.176132 | 0.2475 |
| R-squared | 0.452778 | Mean dependent var | | 0.001811 |
| Adjusted R-squared | 0.437143 | S.D. dependent var | | 0.233241 |
| S.E. of regression | 0.174986 | Akaike info criterion | | -0.595678 |
| Sum squared resid | 1.071709 | Schwarz criterion | | -0.508602 |
| Log likelihood | 13.02005 | F-statistic | | 28.95946 |
| Durbin-Watson stat | 1.749698 | Prob(F-statistic) | | 0.000005 |

**Appendix 6 Static Equation**

Dependent Variable: LRTGR
Method: Least Squares
Date: 10/21/04 Time: 11:12
Sample(adjusted): 1967 1998
Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 5.666999 | 1.044749 | 5.424269 | 0.0000 |
| LRTGR(-1) | 0.270089 | 0.135226 | 1.997323 | 0.0564 |
| LRTGE | 6.83E-05 | 1.54E-05 | 4.447672 | 0.0001 |
| Δ LRTGE(-1) | 6.04E-05 | 1.97E-05 | 3.067002 | 0.0050 |
| Δ LRTGR(-2) | 0.218345 | 0.140820 | 1.550528 | 0.1331 |
| Δ LRTGE(1) | 3.76E-05 | 1.49E-05 | 2.520137 | 0.0182 |

| | | | |
|---|---|---|---|
| R-squared | 0.929582 | Mean dependent var | 8.429470 |
| Adjusted R-squared | 0.916040 | S.D. dependent var | 0.317083 |
| S.E. of regression | 0.091877 | Akaike info criterion | -1.769364 |
| Sum squared resid | 0.219478 | Schwarz criterion | -1.494539 |
| Log likelihood | 34.30983 | F-statistic | 68.64483 |
| Durbin-Watson stat | 1.393231 | Prob(F-statistic) | 0.000000 |

**Appendix 7 Error –Correction Model**

Method: Least Squares
Date: 10/29/04 Time: 10:19
Sample(adjusted): 1969 1998
Included observations: 30 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| Δ LRTGE | 4.89E-05 | 1.75E-05 | 2.795519 | 0.0100 |
| Δ LRTGE(-1) | 4.68E-05 | 2.43E-05 | 1.925927 | 0.0660 |
| Δ LRTGE(1) | 3.64E-05 | 1.50E-05 | 2.430339 | 0.0229 |
| Δ LRTGE(-2) | -5.03E-05 | 1.93E-05 | -2.606061 | 0.0155 |
| Δ LRTGR(-1) | 0.284700 | 0.191816 | 1.484234 | 0.1508 |
| Φ(-1) | -0.684511 | 0.234643 | -2.917240 | 0.0075 |

| | | | |
|---|---|---|---|
| R-squared | 0.698913 | Mean dependent var | 0.033998 |
| Adjusted R-squared | 0.636187 | S.D. dependent var | 0.158785 |
| S.E. of regression | 0.095774 | Akaike info criterion | -1.676788 |
| Sum squared resid | 0.220145 | Schwarz criterion | -1.396549 |
| Log likelihood | 31.15183 | F-statistic | 11.14226 |
| Durbin-Watson stat | 2.052731 | Prob(F-statistic) | 0.000012 |

**Appendix 8 Case A (With reduced domestic and foreign interest rates)**

| Year | Alternative Growth Rates | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | 5% | 6% | 7% | 10% |
| 1 | 0.3775 | 0.9730 | 1.5610 | 1.5610 | 1.5610 | 1.5610 | 1.5610 |
| 2 | 0.3927 | 0.9956 | 1.5908 | 1.5981 | 1.6054 | 1.6127 | 1.6343 |
| 3 | 0.3927 | 1.0178 | 1.6199 | 1.6343 | 1.6485 | 1.6626 | 1.7040 |
| 4 | 0.3775 | 1.0397 | 1.6485 | 1.6696 | 1.6903 | 1.7108 | 1.7703 |
| 5 | 0.4375 | 1.0613 | 1.6765 | 1.7040 | 1.7309 | 1.7573 | 1.8334 |
| 6 | 0.4522 | 1.0826 | 1.7040 | 1.7376 | 1.7703 | 1.8022 | 1.8934 |
| 7 | 0.4667 | 1.1035 | 1.7309 | 1.7703 | 1.8085 | 1.8456 | 1.9504 |
| 8 | 0.4810 | 1.1242 | 1.7573 | 1.8022 | 1.8456 | 1.8875 | 2.0047 |
| 9 | 0.4952 | 1.1445 | 1.7832 | 1.8334 | 1.8816 | 1.9279 | 2.0563 |
| 10 | 0.5093 | 1.1645 | 1.8085 | 1.8637 | 1.9165 | 1.9670 | 2.1054 |
| Steady state | 1.9086 | 2.4896 | 3.0634 | 3.6302 | 4.1903 | 4.7438 | 6.3667 |

**Appendix 9 Case B (With reduced domestic and foreign interest rates)**

| | Alternative Growth Rates | | | | | | |
|---|---|---|---|---|---|---|---|
| Year | 2% | 3% | 4% | 5% | 6% | 7% | 10% |
| 1 | 3.0569 | 4.0062 | 4.9413 | 5.8628 | 6.7710 | 7.6662 | 10.2778 |
| 2 | 3.0455 | 3.9836 | 4.9041 | 5.8077 | 6.6947 | 7.5657 | 10.0870 |
| 3 | 3.0455 | 3.9613 | 4.8677 | 5.7539 | 6.6207 | 7.4686 | 9.9056 |
| 4 | 3.0569 | 3.9394 | 4.8320 | 5.7015 | 6.5489 | 7.3749 | 9.7330 |
| 5 | 3.0119 | 3.9178 | 4.7969 | 5.6503 | 6.4791 | 7.2844 | 9.5688 |
| 6 | 3.0009 | 3.8966 | 4.7626 | 5.6005 | 6.4115 | 7.1970 | 9.4126 |
| 7 | 2.9901 | 3.8756 | 4.7290 | 5.5518 | 6.3459 | 7.1127 | 9.2641 |
| 8 | 2.9793 | 3.8550 | 4.6960 | 5.5044 | 6.2822 | 7.0312 | 9.1228 |
| 9 | 2.9687 | 3.8347 | 4.6637 | 5.4581 | 6.2203 | 6.9525 | 8.9884 |
| 10 | 2.9581 | 3.8146 | 4.6320 | 5.4130 | 6.1603 | 6.8766 | 8.8605 |
| Steady state | 1.9086 | 2.4896 | 3.0634 | 3.6302 | 4.1903 | 4.7438 | 6.3667 |

**Appendix 10 Case C (With reduced domestic and foreign interest rates)**

| Year | Alternative Growth Rates | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% |
| 1 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 2 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 3 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 4 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 5 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 6 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 7 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 8 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 9 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| 10 | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |
| Steady-State | 3.82 | 5.14 | 6.44 | 7.72 | 8.98 | 10.22 | 11.44 | 12.65 | 13.83 |

# RECONSIDERING THE DESIGN OF INTER-GOVERNMENTAL TRANSFER SYSTEM: THE CASE OF ETHIOPIA

Molla Mengistu

## I. Introduction

Following the end of the Cold-War and the collapse of the Soviet Union Block, global economic developments have dictated countries to loose some of the conventional authority they previously had in regulating and controlling their economies. This global challenge was further intensified by internal political developments that demanded for the devolution of power to lower tiers of governments. As a result, during the last two decades, the world has witnessed a widespread interest in decentralization across the globe.

Industrial, developing and transition countries alike have pursued decentralization as part of a priority political agenda along with economic development considerations. Apart from the global influence, developing countries have been attracted by it as a means to the advancement of better governance and democratization. However varied the initiatives towards decentralization are, generally their sources stem either from internal factors or external influence or a combination of both.

Ethiopia is one of the developing countries that adopted the decentralization strategy, recently, as a *modus operandi* of the structure and function of the government at its various levels. Similarly, the decentralization strategy pursued by Ethiopia was driven by a number of external factors as well as internal political, social and historical factors. Historically, the country had a long tradition of centralization that culminated in 1991 following a change of the Mengistu regime.

Ethiopia has a diverse population, with more than 70 distinct ethnic and linguistic groups. The 1995 constitution established Ethiopia as a federation and created nine regions along the country's main ethnic groups and two special administrative regions composed of multi-ethnic groups. The new government promoted this reorganization mainly as a means of governing the country's ethnic diversity.

These regional governments are characterized by a wide degree of variation in terms of population size, area coverage, and the number of Zones and Woredas they consist. The regional governments are subdivided into 66 Zones which in turn are divided into 556 Woredas.

## 1.1 The problem

Thus far, the system of intergovernmental relation is working fairly smoothly and the legal framework accords extensive responsibilities to lower level governments. However, there are still outstanding concerns that need be addressed if the decentralization strategy is to yield the desired outcome.

The system of fiscal relationship among the various levels of governments is characterized by a substantial degree of fiscal imbalances. These fiscal imbalances are manifested as:

a) Vertical fiscal imbalance
b) Horizontal fiscal imbalance

Presently, due to the significant incongruence between the extent of expenditure needs and revenue raising power bestowed to the regions, there is a pronounced fiscal imbalance of a vertical nature.

Furthermore, as the country is characterized by a high degree of regional variation in terms of both the level and mix of revenue-raising capacities, there is wide regional disparity among the various regions leading to a significant horizontal fiscal imbalance. The problem of such an imbalance is further compounded by the heterogeneity of demographic and other socio-economic factors that lead to discrepancies in the expenditure need of the different regions.

Thus far, intergovernmental transfers have been the only means of dealing with these twin fiscal imbalances - vertical and horizontal. As a result, intergovernmental transfers play a significant role as they account for a substantial part of the central and regional government budgets. There are several distinguishing features of the inter-governmental transfer mechanism in Ethiopia. The allocation of transfers from the center to the regions is based on predefined criteria involving some indicators. With the aim of seeking for improvements, the prevailing design of intergovernmental transfers could be evaluated against the background of the principles of fiscal decentralization.

Therefore, the broader problem this study attempts to address is given as:

*How can the problem of fiscal imbalances be resolved in the context of the principles of fiscal decentralization?*

To answer this broader problem, I have attempted to explore and evaluate the existing intergovernmental fiscal relations with special emphasis on the distributive function. To this end, the study has specifically tried to carry out the following distinct tasks:

- To describe and analyze the distinguishing features of the system of intergovernmental fiscal relations
- To measure the extent of the need-capacity gap of the various regions within the federal set up and thereby to evaluate the equalization effect of intergovernmental transfers;
- To critically examine the appropriateness of the design of the existing arrangements for inter-governmental fiscal transfers in terms of their redistributive function;

## 1.2 The research question

In the literature of fiscal decentralization, there are different designs of intergovernmental transfer systems depending on the objective they are assigned to. Presuming that the major goal attached to the prevailing design of intergovernmental transfer system by the federal government is based on equity considerations, we can

then enquire whether the existing system of transfer is well designed in terms of achieving the intended objective.

Therefore, the main research question to be addressed in this study will be:

*To what extent does the design of the prevailing intergovernmental transfer system conform to the basic principles of fiscal federalism in terms of its equalizing effect?*

### 1.3 Hypothesis

The current transfer system could be evaluated against the sound principles of fiscal federalism suggested in the literature in terms of its redistributive function. One way of doing this is to compare the pattern of actual transfer values with the corresponding hypothetical values determined on fiscal gap consideration. Eventually, I expect in operational terms the following outcome:

*In terms of its equalizing effect, the pattern of the prevailing intergovernmental transfer values significantly diverges from the ideal intergovernmental transfer values that are derived from a need-capacity gap formula.*

### 1.4 Basic assumption

The approach employed in this study largely depends on the normative theory of public finance that attempts to define when and how the government should use the fiscal and legal instruments at its disposal to secure adjustments in the allocation of resources and income distribution in pursuit of the public interest. Thus, the existence of a welfare-maximizing government is assumed.

## 2. Survey of literature

### 2.1 General framework of fiscal federalism

The basic theory of fiscal federalism lays out a general normative framework for proper alignment of functions to different levels of government with the corresponding fiscal instruments required for carrying out these functions (Musgrave, 1959; Oates,

1972). The conventional theory of fiscal federalism categorizes these functions into three principal branches: resource allocation, redistribution and stabilization. Consequently, the subsequent literature on important public finance issues in a federal set up has paid considerable attention to these assignments of functions in analyzing the proper allocation of fiscal functions among the different tiers of government.

**a) Resource allocation**

On grounds of economic efficiency, decentralized levels of government are likely to generate an optimal pattern of outputs. Under the presumption that the central government tends to entail the provision of a uniform level of services across jurisdictions, it is argued that decentralized provision of public goods with local effects would result in welfare gains. The magnitude of these gains depends on the extent of the heterogeneity in demand across jurisdictions and any inter-jurisdictional difference in costs. The two main reasons forwarded in favor of decentralization in the realm of resource allocation function are (Oates, 1999, p.1123):

- Individual local governments are in a better position than the central government as they are closer to the people and geography of their respective jurisdictions. This situation creates a comparative advantage for them to possess knowledge of local preferences and cost conditions that the central government lacks.
- There are typically political pressures that limit the capacity of the central government to provide differentiated levels of public services to different jurisdictions.

Thus, in view of these important informational and political constraints decentralized provision of public services are likely to generate optimal pattern of resource allocation.

However, the literature suggests that there are certain circumstances under which centralized provision of public goods might be necessary in the sphere of the allocative function. Although sub-central governments are more suitable in the provision of many of the locally consumed goods, in the presence of externalities and substantial economies of scale the intervention of the central government is called for. When the benefit of public services extends beyond the providing jurisdiction, such as highways, there is a possibility of under-provision of the service, as the extra

cost will not be internalized. In such instances, the central government should play a central role in providing public goods that spill over local jurisdictional boundaries.

The second relates to the situation where the provision of certain public services is characterized by economies of scale. It is argued that such services are best suited for the central government for cost saving reasons. Thus, such services whose unit costs tend to fall with larger groups of consumers due to production and managerial cost advantages are better suited for central provision.

**b) Redistribution**

The precepts discussed in the preceding section that emphasize on the gains from decentralizing services should be considered in conjunction with other policy functions of government. One such important function worth considering is the role of the different levels of government in redistribution. The theory of fiscal federalism generally contends that the central government should have the basic responsibility for income redistribution function. The reason stems from two independent premises.

The first states that the mobility of economic units can severely limit attempts to redistribute income by lower levels of government. This is so due to the fact that any effort by a given jurisdiction to redistribute income, say in favor of the poor, is likely to induce an influx of the poor and an exodus of the rich who must bear the tax burden. Hence, the existence of mobility could easily impair the redistributive objective of such a programme. In such situations, it is likely that local redistributive programmes could entail some kind of inter-jurisdictional externalities that will result in sub-optimal levels of support for the poor (Brown and Oates, 1987).

The second premise is that support for the poor is a national public good in the sense that the well-being of the poor in all parts of the nation is of general concern to the populace at large (Ladd and Doolittle, 1982). In fact this proposition is not without any criticism. Among others, Pauly (1973) has on the contrary argued that people are much more concerned with the well-being of the poor in their jurisdiction than elsewhere and has extended his argument to suggest for the possibility of a significant role of decentralized redistributive activity.

However, at its most general level, the theory of fiscal federalism contends that the central government is better suited to income distributive activities than local governments.

**c) Stabilization**

The theory of fiscal federalism also proposes that the central government should play a major role in macroeconomic stabilization function. The basic rationale for the argument arises from some fundamental constraints on lower levels of government. As this function requires a sovereign power to control the supply of money and credit, sub-central authorities, which actually do not have this power, cannot play a meaningful part in stabilization. What this argument forwards is that if sub-central governments were given monetary prerogative, this would essentially allow them to finance local programmes at the expense of the rest of the economy through money creation (Oates, 1999).

In this connection, Weingast (1995) and McKinnon (1996) have argued that sub-central governments should not be allowed to have access to money creation but instead face 'hard budget constraints'. Furthermore, since they are highly open economies that cannot contain much of the expansionary impact of fiscal stimuli, lower levels of government simply have very limited means for controlling their economies through traditional macroeconomic instruments.

## 2.2 Intergovernmental transfers & fiscal decentralization

The philosophical underpinning of fiscal decentralization is founded on devolution of governance to the people by way of giving sub-national governments some taxing power and expenditure responsibility. It is intrinsically related with the extent of expenditure responsibilities and fiscal autonomy entrusted to lower levels of government.

The term fiscal decentralization also involves an intergovernmental fiscal system that is usually described by the answers to the following four important questions: *Who expends the money*? (expenditure assignment); *Who levies what taxes?* (revenue assignment); *How is the imbalance between revenues and expenditures of sub-national governments resolved?* (fiscal imbalance which is usually resolved through intergovernmental transfers); and *how fiscal institutions equilibrate for the difference in needs and capacities among government units at the same level of government?* (horizontal fiscal imbalances that are also usually settled through transfers).

Drawing from the general framework of fiscal federalism, the principle of fiscal decentralization suggests which level of government in a federal set up should be assigned with what types of expenditure discretions and revenue raising powers. Thus, the former is termed as *expenditure assignment* while the latter is referred to as *revenue assignment* in the literature of public finance.

Whatever tax system is established, it is likely that either vertical fiscal imbalance or horizontal fiscal disparities will follow because local expenditure needs typically tend to outstrip local resources. In such a situation, there will be a need for transfers from higher level of governments to compensate for vertical fiscal imbalance or to offset horizontal fiscal disparities.

**Vertical fiscal imbalance**: arises when there is disparity between the budgetary implication associated with expenditure responsibilities assigned to each level of government and the fiscal resources available to them to discharge these responsibilities.

**Horizontal fiscal imbalance**: arises due to differences in revenue raising capacities and expenditure needs across jurisdictions within the same level of government. Significant variation in economic and fiscal disparities among jurisdictions is usually the main source of such an imbalance.

## 2.3 Rationale for intergovernmental transfers

Indeed, different countries use transfers to achieve a variety of political and economic objectives. In the political realm, they are employed by federated governments to pursue a nation-building goal. They serve as an important instrument for the central government in its effort to keep the country together and enable sub-national units meet their end.

In the economic sphere, intergovernmental transfers can serve as a policy instrument to the federal government to fulfill its national efficiency, stability and equity objectives. This paper tries to investigate the prevailing system of intergovernmental transfers from an economic perspective and hence it will evaluate them mainly in terms of meeting the objectives stated in this sphere.

Intergovernmental transfers constitute a distinctive and important policy instrument in fiscal federalism. Along with resolving the fiscal imbalances, they can be designed to pursue a variety of public policy objectives. According to the literature, intergovernmental transfers are one of the policy instruments in a federal setting that can be used to achieve a variety of objectives that include:

- Closing the fiscal gap
- Ensuring Equalization
- Correcting Spillovers
- Macroeconomic stabilization
- Enabling provision of minimum standard of services

### 2.3.1 Closing the fiscal gap

Even if the assignment of functions among the different levels of governments is done efficiently, usually there will arise fiscal imbalance of a vertical nature. This is because; on one hand, highly income elastic tax and debt instrument are assigned to the central government on redistributive and stabilization considerations. On the other hand, sub-national governments are believed to be in a better position to provide public services that are tailored to the particular tastes and circumstances of their respective jurisdictions on efficiency considerations.

As a result, expenditure needs at the sub-national levels tend to outstrip the revenues generated from a relatively income-inelastic revenue system. Hence, there arises a mismatch between revenues and expenditure levels, where the former usually falls short of the latter even in the richest unit of sub-national government (Bird, 1993).

The underlying implication is that the inadequacy of the revenue means sets a limit for sub-national governments to provide the public good in accordance with their expenditure assignment. Grants, therefore, will have to play a role in resolving this problem.

### 2.3.2 Ensuring equalization

The second but most important justification for intergovernmental transfers relates to the redistribution of income among the different layers of government on equity grounds. Different regions in a country are usually characterized by varying degree of fiscal conditions due to discrepancies in natural resource endowment, variations in the level of income, disparity in cost disability factors (i.e. existence of terrain or extent of threshold for scale economies) and differences in demographic factors. Consequently, the tax and spending decisions of the sub-national governments create Net Fiscal Benefits (NFBs refer to the difference in the value of benefits received from and taxes paid to the local jurisdiction by individuals) for citizens such that otherwise equal individuals receive different levels of net benefits in different states (Buchanan, 1950). Alternatively, the richer regions have a relatively higher fiscal capacity to provide the desired level and mix of public service to their residents than their poorer counterparts

Thus, equalization transfers are called for to ensure horizontal equity across jurisdictions. The equity argument for transfers is further reinforced on efficiency grounds. As Shah (1994) argues, in the presence of significant NFB differentials among jurisdictions, economic agents will tend to migrate to the relatively richer communities attracted by the positive NFBs out there. This would then create inefficiency and reduce welfare since resources will be allocated in such a way that the marginal product plus NFBs are equated instead of equating only marginal product. Therefore, equalization transfers can enhance the overall welfare of citizens by achieving a population distribution where marginal products are equated and national income is maximized. Since the source of the problem lies in differential NFBs, as long as transfers equalize per capita NFBs between jurisdictions, then resources will be allocated in such a way that marginal products are equated.

Therefore, the argument for equalization transfers is justified on efficiency and equity considerations in view of reducing or eliminating NFBs across jurisdictions. This is one of the rare instances in economics where efficiency and equity considerations are claimed to be complementary rather than conflicting.

### 2.3.3 Correcting spillovers

One of the justifications for interregional transfers lies in the existence of benefit spillovers across jurisdictions. In the presence of inter-jurisdictional externalities, there will be a spill over of benefits from the one providing the public service into another. In such instances, as the external benefit is not captured by the donor jurisdiction, it leads to the undersupply of the service which is not socially optimal.

Thus, the need for conditional transfers in the form of matching grants from the central government to decentralized governments is called for to subsidize the delivery of such services. The main purpose of such grants is thus presumed to enhance efficiency by encouraging the provision of certain specific services that generate spillover benefits beyond their origin of jurisdiction. To insure a socially optimal provision of public services, the central government is required to make transfers proportional to the extent of spillovers involved in the public service programmes undertaken. (Rao, 1997)

In a nutshell, the main purpose of such grants is thus presumed to enhance efficiency by encouraging the provision of certain specific services that generate spillover benefits beyond their origin of jurisdiction.

### 2.3.4 Macro-economic stabilization

The rationale for intergovernmental transfers also rests on economic-stabilization considerations (Musgrave 1959). The basic idea here is that the central government shall stabilize sub-national public spending fluctuations associated with business cycle- in any affected region- through the intergovernmental transfer system. The main thrust of the argument is that short-run deficit problems due to adverse cyclical conditions in some regions could be better tackled by the central government through the provision of transfers.

Yet, whether macroeconomic management for stabilization purposes should be the sole responsibility of the central government is not a settled issue. For instance, Gramlich (1987) contends that sub-national governments are in a better position to address certain macroeconomic shocks- that differently affect regions- than the

central government which often tends to take a uniform measure across all regions through its demand management instruments

However, recent literature has again pronounced the role of intergovernmental transfers as an inter-regional risk-sharing device. The main thrust of the argument is that short-run deficit problems due to adverse cyclical conditions in some regions could be better tackled by the central government through the provision of transfers. Thus, it is argued, such a stabilization function would serve as an 'insurance' to smooth state specific income shocks (Von Hagen & Hepp, 2000; Bird & Smart, 2002; Buettner, 2002).

### 2.3.5 Enabling provision of minimum standard of services

The last argument for transfers is based on efficiency-cum-equity issues to ensure common minimum standards of services across jurisdictions in a federation. The argument states that on one hand, certain services such as health and education programmes are redistributive in character suggesting involvement by the central government. On the other hand, these services could be efficiently provided by lower units of government since preferences could be better matched at those levels. In such situations, equity objectives of the federal government and efficiency requirements at the local level could simultaneously be met through conditional grants (Boadway, et al, 1994).

Moreover, there is a second justification for the provision of minimum package of services that relates to efficiency consideration. As claimed by Shah (1994), the establishment of common minimum standards of public services can assist in reducing the interregional barriers to the mobility of factors and goods and thereby generating efficiency gains. The provision of certain minimum standards of social services (eg. health and education) may encourage labour mobility while that of infrastructure capital (eg. transport and power utilities) may enhance mobility of factors and goods.

Thus, conditional grants from the central government are recommended for the provision of these services by lower levels of governments.

## 3. Research design & methodology

In general, this case study attempts to examine the design of the existing intergovernmental fiscal structure of the government on the basis of the basic principles proposed by the literature. Hence, the research methodology is designed in such a way that a combination of both qualitative and quantitative techniques is involved in collecting, analyzing and interpreting data.

The paper first tries to cast light on the major features of the design of the prevailing intergovernmental transfers and next it critically analyzes their redistributive function using quantitative approach. To this end, data were obtained using structured and unstructured questionnaires; personal observations, personal interviews, government documents and other relevant techniques.

### 3.1 Theoretical framework: the redistributive mechanism

Indeed, the main objective of equalizing grants is to reduce horizontal imbalances across regions that result from regional disparities and inequities by compensating sub- national governments with greater fiscal need and smaller fiscal capacity.

Basically, the methodology is derived from the work of Musgrave (1961) who laid the foundation model for redistribution of transfers to subordinate governments by the central fisc. In this work, he elaborates the superiority of using a redistribution mechanism on the basis of the potential fiscal capacity and expenditure need of regional governments in allocating intergovernmental transfers.

Since sub-national level governments are characterized by variation in their fiscal conditions, as suggested by the need-capacity gap, their capacity in delivering a standard package of services at a reasonable tax rate imposed on their respective residents also differs. Then, the equity objective of central governments should address this problem through a transfer mechanism that reflects this fundamental principle. The theoretical framework adopted in this paper is therefore founded on this need-capacity gap approach. Essentially, the actual structure of the model draws from the above fundamental work; and subsequent contributions of Ladd (1999), Shah (1996) and Ma Jun (1997).

Hence, the equalizing effect of a given grant system can be evaluated in terms of its outcome on these factors of fiscal condition. In effect, this means the impact of a prevailing transfer system on the various regions' abilities to provide public service at similar levels of tax effort could be assessed using the *need-capacity gap* approach.

*Need-capacity gap*, defined as the excess of expenditure need over fiscal capacity for a given sub-national government, is the ideal formula that provides the potential for full equalization.

Formally, the need-capacity gap is represented as:

$$\mathbf{T_i = N_i - C_i - H_i}$$

Where:
$T_i$ = transfer to the $i^{th}$ region ;
$N_i$ = fiscal need of the $i^{th}$ region;
$C_i$ = fiscal capacity of the $i^{th}$ region;
$H_i$ = targeted transfers (such as specific purpose transfers) the $i^{th}$ region receives from the center; such transfers are used to pursue certain objectives by the federal government.

Of this equation, the relevant measure of equalization grant is $N_i - C_i$ , which stands for a measure of the gap between the fiscal need and fiscal capacity (potential own sources of revenue) of a given region within the federal government.

The formula states that the central government provides transfers to each region on the basis of the *need-capacity* gap that arises from the discrepancy between fiscal need and fiscal capacity. The objective of such transfer is to enable each region to provide a given level of public service at a given tax rate. As a result, the fiscal disadvantages associated with lower revenue capacity and higher unit cost of any public service are offset by the transfer.

## 3.2 Measurement and definition

Economic theory suggests that an ideal transfer system need to take into consideration both expenditure need and fiscal capacity of the various government levels. The argument for equalization transfers rests on differences in net fiscal

benefits across regions that arise from differences in revenue raising capacity and the differentials in expenditure need. In designing an equalization formula, actual revenues and expenditures are not appropriate measures of fiscal capacity and expenditure need, respectively. This is because their use would tend to provide a perverse incentive for regional governments to increase spending while reducing own revenue collections with the understanding that the federal government will finance the difference. In general, the variables that should be used to measure fiscal capacity and fiscal need have to be beyond the control of any level of government. Instead, they have to be determined independent of the behavior of regional or federal government.

### 3.2.1 Fiscal need

It is defined as the expenditure need of a certain region to provide the desired level of public service to its residents. The specific formula for measuring the equalization entitlement for a given category of expenditure *i* for a given regional state could be stated as:

$$Ni = M*V*DX$$

Where*:*
*Ni*= expenditure need for the $i^{th}$ category ( eg. education, health, etc.); thus $\Sigma_j N_i$ represents the total expenditure need for all expenditure categories of the given region.

*M*= measurement unit referring to the number of units that receive services from the regional government;

*V*= stands for average per unit cost computed as the total local expenditure on category i divided by the measurement unit (eg. The average per unit cost of primary and secondary education is given by the ratio of the total expenditure on primary and secondary education to the total number of students in the country);

*DX*= refers to adjustment index which is a combination of factors that differentiate the per unit cost of the service in the region from the national average ( eg. wage index is used if the per unit cost of wage across regions substantially varies).

### 3.2.2 Fiscal capacity

Fiscal capacity is defined as the potential revenues that can be obtained from the tax bases assigned to a region if an average level of effort (by national standard) is applied to those tax bases. The fiscal capacity of a given region *i* could be measured by incorporating the major tax bases and the standard (average) tax rate into the following equation:

$$C_i = \Sigma_j B_{ij} * t_j$$

Where:
$C_i$= tax capacity of the $i^{th}$ region;
$B_{ij}$ = $j^{th}$ tax base of the $i^{th}$ region;
$t_j$ = the standard tax rate on the $j^{th}$ tax base (eg. a national average tax rate);

This method, therefore, yields the fiscal capacity of a given regional state as implied by its respective ability to raise revenues from its own sources.

## 4. Analysis and findings

### 4.1 Features of the intergovernmental fiscal relations

#### 4.1.1 Extent of the problem of fiscal imbalances

It would be worthwhile to pose an important question from the outset. What objectives has the government of Ethiopia stated to achieve through transfers? Pursuant to Proclamation 33/1992 (TGE 1992b), the government intends to achieve multiple objectives through transfers (subsidies). Broadly speaking, the stated objectives of the government correspond to the objectives of efficiency, equity, macroeconomic stabilization and presumably closing the gap that are standard good reasons of any intergovernmental transfers.

At present, the twin issues of fiscal imbalances are addressed through a transfer scheme of block grants from the center to the regional governments on the basis of an objective formula. Though it has undergone subsequent changes since its inception, the predetermined quantitative criterion used by the current formula to allocate the pool of revenues among the regional states depends on three factors (MoFED, 2000):

- share of population (60%),
- development index (25%) and
- revenue effort (15%). A detailed review and analysis on the characteristics of the current formula is deferred to the subsequent part of this paper.

As revealed in the following table, in Ethiopia the share of regional governments' in total expenditure has accounted for slightly over 31% during the consecutive two years beginning 2000/01. However, the bulk of the regional expenditure recently accounting for slightly below 65% is financed through transfer payments from the center and own-revenues cover only the remaining portion.

As shown in Table 4.1, the dependency of regional governments on transfers from the center appears to be significant throughout the period under discussion. The corresponding figure for such dependency has ranged between a high level of more than 68% in 1996/97 to its lowest record in 1999/00. This low figure is mainly explained by the impact of the border conflict that reached its zenith during this year. Then after, the level of transfers has tended to rise again. Particularly, in year 2002/3, the government has almost redoubled the amount of transfers compared to its 1999/2000 level. The amount of resources allocated to regions in the form of transfers was substantially increased following a policy shift towards deepening decentralization to the Woreda level.

**Table 4.1 Subsidies transferred and their share in total regional expenditures (in million Birr)**

| Description | 96/97 | 97/98 | 98/99 | 99/2000 | 2000/01 | 2001/02 |
|---|---|---|---|---|---|---|
| **Share in total expenditure (%)** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** |
| Federal | 58.55% | 59.26% | 68.75% | 75.86% | 68.29% | 68.69% |
| Regional | 41.45% | 40.74% | 31.25% | 24.14% | 31.71% | 31.31% |
| **Total Transfers to regions** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** | **100.00%** |
| Domestic source | 84.44% | 89.25% | 84.27% | 78.62% | 69.63% | 71.78% |
| External source | 15.56% | 10.75% | 15.73% | 21.38% | 30.37% | 28.22% |
| **Share of transfers** In regional expenditure | **68.53%** | **65.61%** | **67.68%** | **59.80%** | **64.68%** | **63.89%** |

Source: Ministry of Finance and Economic Development of Ethiopia ( MoFED 2003.

Although transfers are distributed among regions on the basis of formula, the determination of the pool of resources to be allocated is made on an iterative basis. Usually, the process of determining the share of regions involves observing the projected national revenues, the requirements for spending on priority programmes at the federal level and historical funding levels.

#### 4.1.1.1 Trends in vertical fiscal imbalance

On the basis of data available for the five-year period beginning 1996/97, the study attempts to analyze the nature and trend of the vertical fiscal imbalance experienced by the country. As depicted in the table, the share of regional governments' in total revenue is very low swaying between 17 to 19 percent of the total during the five year period.

**Table 4.2: Trends in Vertical Fiscal Imbalance**

| Year | Percent of states' own revenues to total revenues | Percent of states' own expenditures to total expenditures | Percent of states' own revenues to regional total expenditures | Coefficient of vertical fiscal imbalance |
|---|---|---|---|---|
| 1996/97 | 17.25 | 41.45 | 31.47 | 0.58 |
| 1997/98 | 19.01 | 40.74 | 34.39 | 0.53 |
| 1998/99 | 16.11 | 31.25 | 32.32 | 0.48 |
| 1999/00 | 17.72 | 24.14 | 40.20 | 0.27 |
| 2000/01 | 17.41 | 31.71 | 35.32 | 0.45 |
| 2001/02 | NA | 31.31 | NA | NA |

Source: Computed from Ministry of Finance and Economic Development Database (MoFED 2003)

During the same period however, the share of regional governments' own revenues to regional expenditures has ranged between 31 and 40 percent. Hence the remaining portion of their budget requirement had to be covered through transfers from the central government.

**Table 4.3: Comparison of Vertical Fiscal Imbalance for Selected Countries**

| Country | Year | Sub-national Revenue Share (%) | Sub-national Expenditure Share (%) | Vertical imbalance as measured by Coefficient |
|---|---|---|---|---|
| Argentina | 1995 | 40.3 | 41.5 | .03 |
| Australia | 1996 | 28.2 | 37.3 | .24 |
| Bolivia | 1996 | 6.8 | 19.8 | .66 |
| Brazil | 1993 | 24.3 | 27.4 | .11 |
| Canada | 1995 | 45.3 | 49.4 | .08 |
| China | 1996 | 51.0 | 54.7 | .07 |
| Ethiopia | 2001 | 19.8 | 31.71 | .45 |
| Germany | 1996 | 17.41 | 28.9 | .15 |
| India | 1995 | 28.0 | 39.1 | .28 |
| Malaysia | 1996 | 9.7 | 15.5 | .37 |
| Mexico | 1994 | 12.4 | 19.5 | .36 |
| South Africa | 1995 | 3.8 | 30.9 | .88 |

Source: For Ethiopia, computed from Ministry of Finance and Economic Development of Ethiopia data. For the others, computed from data contained in *Government Finance Statistics Yearbook*, 1997, International Monetary Fund, Washington DC.; in World Bank Report, 2000. Ethiopia: Regionalization Study, June, (No. 18898-ET).

**Coefficient of vertical fiscal imbalance = 1-{(Rs/R)/(Es/E)}**

Where: Rs denotes the total regional revenues from own sources;
R stands for the total national revenues;
Es refers to total regional expenditures and;
E designates total national expenditures

This measure gauges the capacity of regions' to raise their own revenues relative to their spending responsibility. Accordingly, a coefficient of zero indicates very low vertical fiscal imbalance as it implies that regional governments revenues and expenditures match and hence their decision making autonomy is significantly high. At the other end of the extreme, a coefficient of one implies the existence of absolute control of the federal government since the share of regional states' revenue out of the total revenue would be close to nil.

On the basis of this measure, the degree of fiscal imbalance seems to have shown some improvement over the years shown in the table. Excluding the year 1999/00 for

the mere reason stated earlier, the coefficient has declined from 0.58 in 1996/97 to 0.45 in 2000/01.

Although the problem of vertical fiscal imbalance appears to have fairly improved over the years as shown by the coefficient, it would be worthwhile to compare the degree of the problem with other countries to have a better insight over the issue.

Comparing to the experience of other selected federal countries as in the above table, the extent of the problem of vertical fiscal imbalance as measured by the coefficient is fairly high; ranking third next to South Africa and Bolivia.

One of the main reasons for so high vertical fiscal imbalance in Ethiopia relates to low level of own revenues of regional governments. However, we may still enquire why own revenues are so low and what factors are behind.

- First, this stems from assignment of most revenue yielding and buoyant sources to the federal government;
- Second, as the country has embarked on decentralization very recently, as to be expected, there is a severe capacity limitation of regional governments in the mobilization and administration of revenue resources that fall under their mandate. For instance, as argued by Chole (1994), while the law provides for a progressive tax on annual agricultural incomes exceeding Birr 600, presently farmers pay the minimum flat rate of 20 Birr and hence there is great latitude for regional states to increase their revenue from this source considerably.

#### 4.1.1.2 Features of horizontal fiscal imbalance

The problem of horizontal fiscal imbalance in Ethiopia stems from the inequality in revenue mobilizing ability, disparities in expenditure needs and differentials in cost of providing pubic services among the different regional governments. The central government addresses the problem of horizontal fiscal imbalance through unconditional transfers.

Apart from inter-state variations in income, the disparities in the amount of revenues generated by each regional state primarily emanates from significant differences in revenue raising efforts. The paper argues that the major explanation for wide

variation in revenues relates to differences in tax collection efforts as evidenced by the fact that regions with relatively high per capita income raise relatively lower revenues. As depicted in Table 4.4, for instance, Somali and Afar have more than the average per capita income but the percentage of revenues collected from their potential resources amounts only to 0.54 and 0.88, respectively, which are far below the average (2.39).

The degree of horizontal fiscal imbalance, as measured by the ratio of own revenues to expenditure, shows the existence of marked regional fiscal imbalance in Ethiopia. Accordingly, the ability of regions to finance their expenditure need from own-sources ranges from as low as 5% to as high as 37%. The figure for the group of the four relatively underdeveloped regional governments is so low indicating their restrained capacity in meeting their expenditure needs from own sources. Consequently, this category of states which consists of Afar, Gambella, Somali and Benishangul Gumuz have a revenue-expenditure ratio that is 60% lower than the average of 18.81 percent.

The prevailing problem of horizontal fiscal imbalance is also the reflection of the federal government's goal of balanced regional development that treats those disadvantaged regions (those with relatively lower threshold of social and infrastructure development) with higher per capita transfers.

Finally, the mismatch between the sizes of own revenue and expenditure in any given state can occur not only because of inadequate resource base or larger expenditure need, but it may also arise because of its fiscal management. As seen above, it seems that the different regions have exerted varied effort either in terms of mobilizing their resources or managing their spending in cost effective way.

For this reason, special attention should be given to enhance the capacity of administrative and budgetary management of regions so as to raise their own revenues or to utilize their budget efficiently. Such measure will ultimately reduce the dependence of regional governments on transfers from the center.

**Table 4.4: Indicators of horizontal fiscal imbalance in 2000/01**

| State | Per capita income in Birr | Per capita own revenue in Birr | Per capita regional expenditure in Birr | Ratio of own revenue to expenditure (%) | Percentage share of revenue to income |
|---|---|---|---|---|---|
| Tigray | 903.60 | 25.60 | 96.30 | 26.58 | 2.83 |
| Afar | 1,105.62 | 9.75 | 176.90 | 5.51 | 0.88 |
| Amhara | 917.23 | 12.72 | 55.75 | 22.81 | 1.39 |
| Oromia | 1,183.95 | 19.61 | 63.42 | 30.93 | 1.66 |
| Somale | 1,166.42 | 6.25 | 78.55 | 7.96 | 0.54 |
| Benishangul Gumuz | 1,026.81 | 26.42 | 304.19 | 8.69 | 2.57 |
| SNNP | 945.48 | 12.76 | 50.53 | 25.26 | 1.35 |
| Gambella | 1,223.47 | 41.39 | 541.24 | 7.65 | 3.38 |
| Hareri | 1,459.68 | 57.57 | 371.92 | 15.48 | 3.94 |
| Dire Dawa | 1,397.06 | 58.85 | 158.14 | 37.21 | 4.21 |

Source: Computed from data compiled by Ministry of Finance and Economic Development of Ethiopia (MoFED, 2003).

### 4.1.2 Evaluation: System of intergovernmental fiscal relations

Even if the legal framework clearly states addressing external economies among regions as one of the objectives of grants, thus far, virtually all of the transfers are of unconditional form. Although it is not an overriding issue, it seems reasonable to consider the application of specific grants on efficiency grounds to some categories of services in the future. For instance, there are health and education services that give service to neighboring regional states and the application of conditional grants to those regions delivering the service could produce optimum allocation of resources that would be undersupplied otherwise. Such an approach has more relevance at Woreda levels of government as the extent of spillovers is obviously much more pronounced.

The overall down flow pool of resources for transfers is determined on reiterative basis taking into account the general macroeconomic situation of the country, projected size of national revenues and availability of external resources. Though this practice may have the advantage of macroeconomic management in a flexible manner, it has also a disadvantage for regional governments to plan their budget as anticipated resources from the center are not known with certainty ahead of time. Ensuring flow of funds to regional states on a more predictable basis suggests the need for an objective and stable determination of the resource pool. Though there is

not any definitive answer –different countries have different approaches- perhaps this could be achieved by introducing a temporarily (for two or three years) fixed rule of allocating revenues between the center and regional governments.

The current formula on which transfers are redistributed to regional governments has a number of shortcomings that need be corrected. These include:

- It does not encourage regions to raise their revenue effort as the system does not reward those with better performance in resource mobilization.
- The measurement of one of the components of the formula, namely the development index, is unnecessarily complex.
- once again, the development index measure is not based on justifiable factors as it includes expenditure responsibilities that are beyond the domain of regional governments, and secondly, it is based simply on measure of physical stock of services and does not take into account relative performance of these stocks and hence it is likely to lead to create negative incentives in expenditure choices.
- thus, it is critically important that the formula be rectified to avoid the negative incentives in revenue mobilization and expenditure choice of regions. In principle, the formula should not depend on the actual revenues and expenditures but instead on the potential fiscal capacity and expenditure needs of regional states. It should be redefined to support sound allocation of resources by providing more resources to regions with lower tax capacity and greater fiscal need; it has to address the fiscal gap.

Regardless of the provision of the law, in reality there is a weak accounting and auditing mechanism on the utilization of the transfers made to lower level governments.

The capacity of lower levels of governments in general and that of woreda in particular in the process of budget planning, implementation, and reporting is severely limited by shortage of personnel with the required expertise and skill.

It appears that there is a problem of not having the proper perception and understanding of the powers and responsibilities by all stakeholders of the decentralization process.

Overall, the decentralization system seems to emphasis more on the intergovernmental transfers and little importance is attached to mobilization of

revenues from own resources. During the field survey, many of the regions expressed their belief that the amount of revenue could be substantially increased by improved tax assessment and administration. Agricultural income tax and land use tax are the main candidates for improving the size of own revenues by regional governments. In this regard, it is worth noting also that the tax system is undergoing major reform in the country to improve the structure, administration and its assessment.

The field-survey result also discloses that lower level governments show preference to grants from the treasury than from external sources for two reasons:

- Many donors attach stringent conditions of planning; procurement and reporting that are difficult to manage by the regions that lack the required technical know-how.
- Usually externally sourced grants are associated with some degree of uncertainty as to their actual and timely flow. Delay of financing from this source has special significance in the budgeting process. Some donors require the earmarking of counterpart funds but when the assistance is not released in time for various reasons, then the fund set aside by regions will remain idle. For this reason, regional governments have usually revealed their preference towards getting grants from the treasury over those from external assistance.

## 4.2 Design of the distribution mechanism

In this part of the paper, the current transfer system has been evaluated against the principles of fiscal federalism suggested in the literature in terms of its redistributive function. To this end, the pattern of actual transfer values have been compared with the corresponding hypothetical values determined on the fiscal gap consideration.

### 4.2.1 Operationalization method

Though the method outlined in the theoretical framework yields an appropriate approximation of a region's fiscal condition, the computation demands substantial information on a large number of factors that affect the potential revenue raising capacity and the costs of providing public services. Particularly, the unavailability of such data in Ethiopia is the case that poses a serious problem for applying the stated method. For this reason, while the need-capacity gap concept is maintained, fiscal need and fiscal capacity are measured using proxy parameters that are amenable to

the readily available data. It is believed that this estimation method could produce results that closely approximate the likely results from the ideal theoretical model.

#### 4.2.1.1 Measurement of fiscal need

Specifically, the following feasible method will be used to estimate a region's aggregate fiscal needs in the study. Proxy measures that are believed to closely approximate the differential in expenditure needs among regions have been employed. These include size of population, per capita income distance and area size of each region. These variables are highly related with the demand for public services and could well be used to estimate expenditure needs of regions. All other things remaining the same, the greater is the value of any of these variables, the greater will be its accompanying demand for public services in a given region.

- The inclusion of population is apparent, as those relatively populated regions would have more expenditure needs than less populated regions.
- The intent of using per capita income distance is to capture the incidence of poverty in a given region. Those regions, whose per capita income is further away, from that of the richest region, ought to have got more transfers proportional to the distance in per capita income. In so doing, such regions faced with greater burden of tackling poverty should be compensated to nurture their capacity in the provision of the required local public goods.
- Land size is included with the presumption that it could capture differences in the cost of providing services. Typically, regions with larger geographical coverage have higher expenditure needs than others.
- The use of these variables hence assumes that there is a proportional relationship between the factor used and the fiscal need of a given region.

$$N_i = E_t[w_1 (P_i/\Sigma_j P_j)+w_2(Id_i P_i/\Sigma_j ID_i P_j)+w_3(A_i/\Sigma_j Aj)]$$

*Where:*

$N_i$ = the fiscal need of the $i^{th}$ region;
$E_t$ = total expenditure made by all regions;
$P_i$ = population size in the $i^{th}$ region
$w_1$ = weight assigned to population;
$Id_i$ = per capita income distance from the richest region;
$w_2$= the weight assigned to income disparity;
$A_i$ = the area of the $i^{th}$ region;
$w_3$ = the weight assigned to area

*Subject to:* $w_1 + w_2 + w_3 = 1$

#### 4.2.1.2 Measurement of Fiscal capacity

I have applied the following feasible method to estimate the potential fiscal capacity associated with each region.

$$C_i = t^* Q_i$$

Where: $t^* = \Sigma R_i / \Sigma Q_i$

$C_i$ = denotes the estimated fiscal capacity of a given region;
$t^*$ = represents the standard (national) average tax;
$R_i$ = signifies actual revenues collected for each region; and
$Q_i$ = refers to gross regional product of each region

After having estimated the fiscal need and fiscal capacity of each regional government as in the above method, then the need - capacity gap corresponding to each region has been determined. What logically follows is then to address the research question that states:

*To what extent does the design of the prevailing intergovernmental transfer system conform to the basic principles of fiscal federalism in terms of its equalizing effect?*

And test the hypothesis we have outlined in the outset:
*In terms of its equalizing effect, the pattern of the prevailing intergovernmental transfer values significantly diverges from the ideal intergovernmental transfer values that are derived from a need-capacity gap formula.*

### 4.2.2 Analysis of the prevailing transfer mechanism

#### 4.2.2.1 Distinctive features of the transfer mechanism

Essentially the existing intergovernmental fiscal system attaches relatively more priority on the redistributive function. It was developed with the intention of rewarding those regions with relatively higher population size, lower development level and higher revenue raising effort.

The design of the transfer scheme, however, fails to take into account the fiscal conditions of the heterogeneous regions according to the widely accepted principles of fiscal decentralization. Alternatively, it is not based on full consideration of the potential fiscal capacity and fiscal need of regions.

As it stands now, the outcome of the redistributive mechanism would be paradoxically inconsistent with the desired equity objective of the government and the pattern of redistribution unjustified. Thus it should be redefined to support sound allocation of resources by providing more resources to regions with lower tax capacity and greater fiscal need; it has to address the fiscal gap.

#### 4.2.2.2 Testing the hypothesis

The need-capacity gap of each regional government has been estimated following a series of steps. First, value of expenditure need as derived from the respective expenditure assignment is estimated. Next, the potential fiscal capacity of each region is estimated and finally the need-capacity gap is computed as the difference of these two values. The specific procedures followed are outlined next.

With the aim of estimating fiscal need, first indices that reflect the fiscal need of each region along with the corresponding weights have been computed. The results are summarized as follows.

**Table 4.5: Computed Indices of fiscal need of regions**

| Regional Government | Population index | Per capita income distance index | Surface area index |
|---|---|---|---|
| Tigray | 0.060 | 0.081 | 0.047 |
| Afar | 0.020 | 0.017 | 0.086 |
| Amhara | 0.266 | 0.348 | 0.143 |
| Oromia | 0.367 | 0.244 | 0.312 |
| Somale | 0.060 | 0.043 | 0.240 |
| Benishangul Gumuz | 0.009 | 0.009 | 0.041 |
| SNNP | 0.206 | 0.255 | 0.100 |
| Gambela | 0.003 | 0.002 | 0.030 |
| Hareri | 0.003 | 0.000 | 0.000 |
| Dire Dawa | 0.005 | 0.001 | 0.001 |
| Total | 1.000 | 1.000 | 1.000 |

Source: Computed from Ministry of Finance and Economic Development of Ethiopia database (MoFED, 2003).

Whereas the estimated weights are:
$w_1$ = 73% ;
$w_2$ =16% ;
$w_3$ =11%

The estimated indices widely vary reflecting the existence of substantial variance among regions in terms of these indicators of expenditure need. Besides, the relative importance of population size stands out very significant as suggested by the computed weights.

Then by applying the estimated weights on the corresponding indices, the required fiscal need of each region is determined.

Next, the fiscal capacity of each region has been computed by multiplying the gross regional product with the national average tax.

Notice that the size of the computed average tax rate is very small reflecting the current fiscal structure. That is, revenue generated by regions is so low partly due to the assignment problem and partly due to the fact that regions have not fully utilized the taxable base under their domain as discussed before.

**Table 4.6: Gross Regional Product (1997/98) and estimated fiscal capacity of regions (in million Birr)**

| Region | GRP | Estimated capacity | Ranking |
|---|---|---|---|
| Tigray | 3,068.63 | 47.97 | 5 |
| Afar | 1,252.67 | 19.58 | 6 |
| Amhara | 13,740.11 | 214.77 | 2 |
| Oromia | 24,163.24 | 377.70 | 1 |
| Somale | 3,989.16 | 62.35 | 4 |
| Benishangul Gumuz | 508.27 | 7.94 | 7 |
| SNNP | 10,755.78 | 168.12 | 3 |
| Gambela | 238.58 | 3.73 | 9 |
| Hareri | 211.65 | 3.31 | 10 |
| Dire Dawa | 393.97 | 6.16 | 8 |
| **Total** | **58,322.04** | **911.63** | |
| | t*= 0.015631036 = 1.56% | | |

Source: Computed using the estimation methodology proposed in the text. Largely, the basic data are derived from Ministry of Finance and Economic Development of Ethiopia (MoFED, 2003).

As is true for the fiscal need, the estimated fiscal capacity of the various regions also depicts a wide ranging variation reflecting the heterogeneity in revenue base.
after having computed the expenditure need and fiscal capacity of each region, the corresponding hypothetical transfers as given by the fiscal gap have been calculated.
the actual level of transfers have then been compared and contrasted with these hypothetical transfer values, which are assumed to represent a benchmark for pure equalization grants.

Table 4.7 displays the estimated and the actual per capita transfers in thousands of Birr for each regional government. On the average, the per capita entitlements computed amount to about 55.90 Birr while the comparative figure for actual transfers is slightly below 52 Birr.

**Table 4.7: Comparison of per capita transfers among regions: computed and actual (in thousand Birr)**

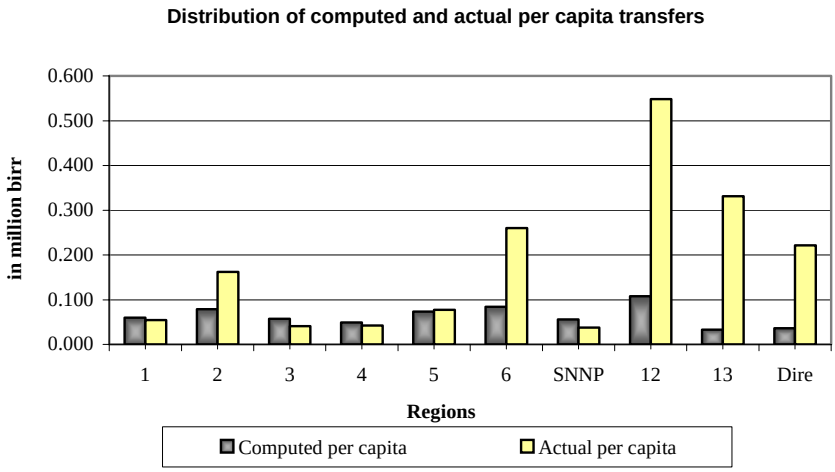
| Region | Computed entitlements | Actual transfers |
|---|---|---|
| Tigray | 0.0599 | 0.0547 |
| Afar | 0.0786 | 0.1621 |
| Amhara | 0.0574 | 0.0413 |
| Oromia | 0.0492 | 0.0424 |
| Somale | 0.0734 | 0.0773 |
| Benishangul Gumuz | 0.0842 | 0.2602 |
| SNNP | 0.0561 | 0.0379 |
| Gambela | 0.1075 | 0.5482 |
| Hareri | 0.0328 | 0.3314 |
| Dire Dawa | 0.0365 | 0.2213 |
| **Average per capita** | **0.0559** | **0.0517** |

Source: own computation

True, the estimated amount exceeds the actual transfers because the method of their derivation is quite different as mentioned above. What is more important is the distribution of these two magnitudes exhibits dissimilar pattern as expected.

The discrepancy of per capita transfers between the two measures is clearly illuminated in the preceding chart. While the distribution of per capita transfers for the estimated amount reveals less variation, the actual one uncovers wide deviation among regions.

**Figure 4.1: Pattern of computed and actual per capita transfers**




**Key:** Tigray (1), Afar (2), Amhara (3), Oromia (4), Somali (5), Benishangul-Gumuz (6), Southern People (SNNP), Gambela (12), Hareri (13) and Dire Dawa (Dire).

The striking feature of the existing system, as depicted in the chart, is that it rewards few regions not commensurate with their fiscal conditions. The most outlandish example in this case is Gambela regional government. Its share out of the total actual distributable pool was as high as ten times the average national per capita transfer. Though in a faintly lower degree, as shown in the chart, other regions including Hareri, Benishangul Gumuz and Dire Dawa used to obtain transfers far above the average figure.

On the other hand, when we assess the distribution of the estimated per capita transfers, there appears a relatively narrow variation among regions. In fact, even according to the transfer system proposed here, Gambella would be entitled the highest per capita that is almost twice than the average transfer. This suggests that, other than the scale of the entitlement, the region has a very distinct fiscal condition justifying preferential treatment in the allocation of resources from the central government.

At this juncture it would be necessary to evaluate the impact of the current transfer system on the redistributive function. To this end, let us compare the degree to which the actual per capita transfers deviate from the proposed values using some measure of variability.

to demonstrate to what extent the pattern of the prevailing transfer system diverges from that proposed by the hypothetical one, a measure of variability has been introduced. The result of the measure is given as follows:

**Table 4.8: Statistical result of variation in per capita transfers**

| Measure | Computed Entitlement | Actual transfers |
|---|---|---|
| Standard deviation | 0.021610791 | 0.158594977 |
| Mean | 0.0636 | 0.1777 |
| **Coefficient of Variation** | **0.3400** | **0.8926** |

the result suggests that the per capita transfer for any given region tends to deviate by 89% from its average that is in marked contrast with the 34% for the pure equalization system. This clearly indicates the extent to which the outcome of the present distribution mechanism differs from the ideal pure equalization system implied by the principles of fiscal federalism. Alternatively, the equalizing effect of the prevailing system of redistribution among regions is much weaker than is implied by the theoretical model.

Essentially the contention suggested here is that as long as the intergovernmental transfer system is designed to explicitly take into account the expenditure need and fiscal capacity of the regions in an objective manner, there is no need to maintain the present distribution mechanism and it is high time now that remedial policy measures be taken to rectify the problem.

To conclude, the evaluation of the Ethiopia's current transfer system in terms of its distributive function suggests that an improvement can be made by explicitly incorporating the fiscal need and fiscal capacity of regions as measured by the appropriate variables. True, the indicators employed here could be greatly improved but whatever indicators are used, it should be stressed that such factors need to reflect the fiscal conditions (fiscal gap) of regions correctly.

## V. Policy recommendation

Even if the revenue means assigned to the regions are not sufficient to cover their expenditure responsibilities, empirical evidences suggest that tapping the potential revenue sources in general could substantially increase the amount of revenues actually generated by all regions. Besides, the amount of effort exerted by each region in utilizing these sources also considerably varies. Consequently, the degree of transfer dependence among regions widely varies. As long as corrective measures are not taken timely, it is likely that states which are more heavily relying on transfers from the central government has less incentive to be fiscally responsible.

The data also reveal the existence of marked regional fiscal imbalance across regional states. Accordingly, the ability of regions to finance their expenditure from own-sources ranges from as low as 5% to as high as 37%. Particularly, a category of four regions ( Afar, Gambella, Somali, and Benishangul Gumuz) that are relatively undeveloped areas have the least capacity to finance their expenditures from their own sources.

According to the empirical finding in this study, the evaluation of the existing pattern of distribution among regional states exhibits wide divergence from that suggested by the basic principles of fiscal federalism in terms of its equalizing effect. The study concludes by recommending that there is a great deal of latitude for improvement in the design of the present intergovernmental system.

Hence, the present formula need to be amended and it should reflect the fiscal gap of each region as measured by the excess of its expenditure need to provide a reasonably comparable package of public services over its potential fiscal resources. It should be redefined to support sound allocation of resources by providing more resources to regions with lower tax capacity and greater fiscal need.

Essentially the basic argument is that as long as the intergovernmental transfer system is designed to explicitly take into account the expenditure need and fiscal capacity of the regions as measured by the appropriate variables, maintaining the present distribution mechanism is not justifiable as it is not in conformity with the principles of fiscal federalism. However, a word of caution is in order that this recommendation is based purely on economic considerations and it does not regard political factors. Yet, political merits and demerits could be weighed as an additional policy instrument after consenting on any variant of such transfer system that would serve as a benchmark.

## References

Bird, R.M. (1993). Threading the Fiscal Labyrinth: Some Issues in Fiscal Decentralization. National Tax Journal. Vol. XLVI, No. 2. PP. 207-27.

Bird, R.M., and Michael Smart. (2002). Intergovernmental Fiscal Transfers: International Lessons for Developing Countries. World Development, Vol. 30, No. 6, PP. 899-912.

Boadway, Robin; Sandra Roberts and Anwar Shah. (1994). The Reform of Fiscal Systems in Developing and Emerging Market Economies: A Federalism Perspective. Policy Research Working Paper 1259. Washington, DC: World Bank.

Brown, Charles C., and Wallace E. Oates. (1987). Assistance to the Poor in a Federal System. Journal of Public Economics. 32 (April): 307-330.

Buchanan, James M. (1950). "Federalism and Fiscal Equity", American Economic Review. Vol. 40(4), pp. 583-99.

Buettner, Thiess. (2002). Fiscal Federalism and Interstate Risk-Sharing: Empirical Evidence from Germany. Economic Letters. 74. pp. 195-202.

Chole, E. (1994). Issues of Vertical Imbalance in Ethiopia's Emerging System of Fiscal Decentralization. Ethiopian Journal of Economics. Vol. III No. 2.

Gramlich, E.M. (1987). Federalism and Federal Deficit Reduction. National Tax Journal. Vol. 40(Sept.). pp. 299-313.

Ladd, Helen F. (1999). The Challenges of Fiscal Disparities for State and Local Government: selected essays. Cheltenham: Edward Elgar.

Ladd, Helen F., and Fred C. Doolittle. (1982). Which Level of Government Should Assist the Poor? National Tax Journal. 35(September): pp.323-336.

Ma Jun. (1997). Intergovernmental Transfers: A Comparison of Nine Countries. The World Bank, Economic Development Institute.

McKinnon, Ronald I. (1996). Monetary regimes, government borrowing constraints and market preserving federalism: Implications for EMU. Unpublished paper (7 November ).

Ministry of Finance and Economic Development of Ethiopia. (2003). MoFED Database (all referenced in the tables and elsewhere as MoFED 2003).

_____. (2000). The Federal Budget Grant Formula in Ethiopia. Government Document (March).

Musgrave, R.A. (1961). Approaches to a Fiscal Theory of Political Federalism, in Public Finances: Needs, Sources and Utilization. National Bureau of Economic Research, New York, Princeton: Princeton University Press, 97-122.

_____. (1959). The Theory of Public Finance: A Study in Public Economy. New York: McGraw-Hill.

Oates, Wallace E. (1999). "An Essay on Fiscal Federalism". Journal of Economic Literature. 37(3), pp. 1120-1149.

_____. (1972). Fiscal Federalism. New York: Harcourt Brace Jovanovich.

Pauly, M. V. (1973). Income Redistribution as a Local Public Good. Journal of Public Economics. 2 (February) pp. 35-58.

Rao, M.G. (1997). Intergovernmental Transfers in India. In Financing Decentralized Expenditures: An International Comparison of Grants. Ehtisham Ahmad, (ed.), Cheltenham: Edward Elgar.

Shah, A. (1994). The Reform of Intergovernmental Fiscal Relations in Developing and Emerging Market Economies. Policy and Research Series, 23. Washington, D.C. : The world Bank

_____. (1996). A Fiscal Need Approach to Equalization. Canadian Public Policy- Analyse de Politiques. Vol. 22 (2), pp. 99-115.

Transitional Government of Ethiopia. (1991). The Charter of the Transitional Government of Ethiopia. (June).

_____. (1992a). A Proclamation to Provide for the Establishment of National/Regional Self Governments. (Proclamation No. 7/1992).

_____. (1992b). A Proclamation to Define the Sharing of Revenue between the Central Government and the National Self-Governments. (Proclamation No. 33/1992).

_____. (1993). A Proclamation to Define the Powers and Duties of the Central and Regional Executive Organs of the Transitional Government of Ethiopia. (Proclamation No. 41/1993).

Von Hagen, J. and R. Hepp. (2000). Regional Risk-sharing and Redistribution in the German Federation. Working Paper, ZEI, University Bonn.

Weingast, Barry R. (1995). The economic role of political institutions: Market-preserving federalism and economic development. Journal of Law, Economics, and Organization. 11 (April): 1-31.

# Part III

# Social Sector

# POWER RELATIONS AS REFLECTED IN DISPUTES AND THEIR RESOLUTIONS: EVIDENCE FROM SIX SITES IN THE WELLBEING IN DEVELOPING COUNTRIES PROJECT[1]

Alula Pankhurst[2]

*Abstract*

*This paper considers how disputes and the ways they are resolved provide evidence on power relations within four rural and two urban communities where the Wellbeing in Developing Countries project is carrying out in-depth research, in two urban sites in Addis Ababa (Kolfe area) and Shashemene (Kebele 08/09), and in four rural sites, two in Amhara Region (Dinki in Tegulet wereda, northern Shewa Zone, and Yetmen in Enemay wereda, East Gojjam Zone) and two in Oromia Region (Korodegaga in Dodota-Sire wereda, Arsi Zone and Turufe Kecheme, in Shashemene wereda, Eastern Shewa Zone).[3]*

*The paper explores how various types of disputes can be classified into different levels, within and between households and within and between communities and throws light on crucial statuses, divides and key issues. The paper is based on interviews with representatives of both formal and customary dispute settlement institutions, classification of disputes that were noted by researchers working in the sites, and follow up cases of several disputes from the perspective of litigants from both sides and mediators or neutral persons. The paper comprises four sections. The first considers customary dispute settlement within the Ethiopian context and characterises its strengths and weaknesses in comparison with the formal system, and outlines research on the subject in the Ethiopian context. The second part reviews the judicial process as seen from the perspectives of both formal and customary institutions and considers the relations between the two. The third part attempts to provide a classification of levels and types of disputes that are important in the communities studied. The concluding part discusses key issues relating to power relations at different levels and in different types that emerge from the case material.*

[1] This study has been carried out as part of the Wellbeing in Developing Countries project of the University of Bath ESRC Research Group, which sponsored research in four countries: Bangladesh, Ethiopia, Peru and Thailand. The research carried out in 2004 and 2005 has focused on the linkages between poverty, inequality and quality of life. For further information see www.wed-Ethiopia.org and www.welldev.org.uk.
[2] Associate Professor, Department of Sociology and Anthropology, Addis Ababa University.
[3] The four rural sites are ones for which successive rounds of panel household data has been collected by the Economics Department of Addis Ababa University in collaboration with the Centre for the Study of African Economies of Oxford University and the International Food Policy Research Institute.

# 1. Introduction

Disputes and the ways they are handled at a local level can be a window onto often invisible relational dynamics within communities. Differences between social categories and groups can be revealed through their interactions in conflicts and processes and outcomes of their resolutions. Disputes can also reflect and highlight inequalities and in terms of gender, generation, kinship, class, wealth, and other social divisions.

Analysing disputes can also enable us to understand the role of indigenous institutions involved in customary dispute resolution. Their norms, rules and procedures offer insights into local representations of power relations. The contrasts and relations between customary dispute resolution and formal and government established institutions allow us to understand different and possibly contradictory conceptions and relations of power between communities and government.

## 1.1 Defining customary dispute resolution

There is a conceptual problem in defining community-based institutions involved in dispute resolution. Four designations might be considered appropriate: 1) Alternative Dispute Resolution, 2) Informal Dispute Resolution, 3) Traditional Dispute Resolution, and 4) Customary Dispute Resolution. Each of these terms highlights particular aspects.

Alternative Dispute Resolution has become widely recognised internationally on the assumption that in many parts of the world the formal, state-organised legal system is prevalent and predominant, and other forms of dispute resolution offer alternatives. The expression has the merit of suggesting that such forms of justice are different from those established by the state and legal institutions, and that they provide other avenues or options for resolving conflicts. However, in the Ethiopian context in some regions of the country these forms of dispute resolution are fairly strong in contrast to the state justice system, and they have important roles to play which may be thought to go beyond offering “alternative” justice. In fact in some of the more peripheral areas they are the “primary” justice system.

The designation Informal Dispute Resolution highlights the fact that such institutions they are generally not formally recognised, tend to operate without written records, tend to vary from place to place and group to group and are often not organised into a clear hierarchical structure. The expression has the merit of highlighting the distinction with the formal, state-organised and legally recognised structure and emphasises the flexible, informal, nature of the institutions under consideration. However, in the Ethiopian context, some of these institutions have highly elaborate rules, many have been gradually becoming more formal, and some receive a degree of recognition from the legal or state authorities. Some are also organized like the formal justice system with three tiers: first instance, appeal and cassation. The term "informal" also characterises such institutions primarily in negative terms as lacking formality and may not convey the importance that they hold for the people who make use of them.

The expression Traditional Dispute Resolution draws attention to the fact that such institutions are based on customs, but may convey the impression that such institutions are rigid and unchanging, and may also suffer from the negative associations of tradition as contrasted with modernity.

Customary Dispute Resolution may be considered preferable to the other options, since it highlights the cultural basis of such institutions which operate within the framework of customary norms as opposed to those set out from above by the state or from outside internationally. The expression also has the advantage of being used in some of the legal statutes in contrast with the formal state legal system, within the Ethiopian context. However, the expression may still suggest that such institutions are fixed rather than dynamic and may not necessarily convey the religious basis of some such institutions. Legal documents sometimes use two terms "customary and religious courts" together in one phrase[4].

## 1.2 The legal framework in Ethiopia

The Federal Constitution permits the establishment and recognition of customary and religious laws and courts for the settlement of family and personal disputes. Article 78(5) states:

[4] See article 78(5) of the federal Constitution.

> Pursuant to sub-Article 5 of Article 34 the House of Peoples' Representatives and state Councils can establish or give official recognition to religious and customary courts. Religious and customary courts that had state recognition and functioned prior to the adoption of the Constitution shall be organized on the basis of recognition accorded to them by this Constitution.

Articles 34(5) states:

> This Constitution shall not preclude the adjudication of disputes relating to personal and family laws in accordance with religious or customary laws, with the consent of the parties to the dispute. Particulars shall be determined by law.

State Constitutions have also followed the same pattern[5].

Thus customary and religious courts that existed and were recognized prior to the enactment of the Constitution are permitted to continue operating. After the Constitution was enacted it became possible for Regional States to recognize or create customary or religious courts. However, under Article 34(5) their jurisdiction is limited to resolving family and personal disputes submitted to them with the consent of the parties. The particulars of the operation of those courts are to be set down in law. However, the only courts of this type recognized in federal or state law are the *Sharia* courts.[6]

It is clear that the Constitution permits the autonomous operation of customary and religious courts, using customary and religious law. Thus these courts could, and in the case of *Sharia* courts do, exist separately from and parallel with the formal system. Should States wish to accord specific courts jurisdiction over personal and family disputes that are within the ambit of state jurisdiction they may enact laws that do so.

[5] See for example, Arts. 34(5) & 62 of the Oromia State Constitution; Arts. 34(5) & 73 of the SNNP State Constitution and Arts. 34(5) & 65 of the Amhara State Constitution.
[6] See the Organization of *Sharia* Courts ((Proclamation n° 188/1999)

## 1.3 A comparison of customary and formal systems

A study submitted to the Ethiopian Federal Ministry of Justice[7] characterizes the customary and formal systems and their relative advantages and disadvantages as follows.

### 1.3.1 Characteristics of Customary Dispute Resolution systems (CDR)

Generally CDR systems:

- Deliver justice through the vehicle of participant-selected or community-selected decision makers. Those who are selected are usually those with experience, knowledge or skill in dispute resolution. Although in some cases they are hereditary positions.
- Operate locally, that is, they resolve disputes within specific ethnic groups and often within specifically proscribed geographic locations. Very few have developed the capacity to resolve inter-ethnic disputes.
- Deliver justice in accordance with norms accepted by participants.
- Require the loser or wrongdoer to pay compensation, though sometimes both parties are considered guilty and expected to make amends. Compensation is often paid by one family or clan to another.
- Consider the responsibility for the harm rests, not with the individual but with the broader social grouping of family or clan.
- Aim to restore peace and harmony between the disputing family or clan.
- Are not static but have evolved over generations to their current status, and may have changed recently to become more formalized in response to regional, national or international pressures.

### 1.3.2 Advantages of CDR

1. ***Accessibility*:** Many CDR systems are delivered at a very local level by local decision makers. They are conducted in the local language and are almost

[7] Abebe *et al.* (2004) Strengthening Ethiopian Justice Systems: the relative roles of formal, semi-formal and customary justice systems in Ethiopia. Interim Recommendation Report submitted to the FDRE Ministry of Justice, December.

exclusively oral proceedings obviating the need for litigants or participants to be literate. However, increasingly some written record of proceedings and especially of decisions or agreements is becoming more common.

2. ***Timeliness*:** Most CDR systems are able to respond immediately or very quickly to disputes that arise.
3. ***Cost*:** The cost of resolving disputes in CDR systems is generally very low. Litigants may have to provide the elder with a small payment in the form of livestock or host a reconciliation feast.
4. ***Legitimacy*:** CDR systems are culturally relevant and often viewed as the legitimate source of justice to the participants. The systems reflect widely held beliefs and norms of the community.
5. ***Restorative*:** Most CDR systems focus upon restoring harmony within the community when a dispute has arisen. They operate to restore the parties to their previous status and recognize the harm done to the community. Often this is done by requiring that the aggrieved receive compensation (in the form of livestock or money). In many communities in absence of CDR a system of revenge would prevail.
6. ***Participatory*:** Many CDR systems conduct proceedings in public places within the community. The community often participates in most aspects of the proceedings. The decisions taken are therefore publicly known and communicated, forming part of the local "legal" norms.
7. ***Predictable*:** Most CDR systems operate on the basis of a known set of rules often based upon local case precedent. These rules and precedents are communicated orally among those who are responsible for delivering justice and are understood by the community.
8. ***Enforceable*:** The decisions of most CDR systems are, in their local context, easily enforced. Failure to comply will often result in social ostracism.

### 1.3.3 Disadvantages of CDR

1. ***Inequitable*:** Generally women are excluded from participation in CDR justice systems. They may not be decision makers. They have no standing to appear before decision makers on their own and may require a male relative to appear for them. They do not reflect the unique needs and interests of young persons. Instead youth are treated the same as adults. They exclude the participation of

minority groups. They are not always accessible to those who are not members of the ethnic group in question.

2. ***Does not apply national or even regional laws*:** CDR systems operate on the basis of their own laws. These laws may differ significantly from those written and passed by the legislative bodies. Thus individuals may find themselves convicted of a crime that is unknown to the formal legal system or subject to a consequence that is not supported by law. Perhaps more importantly, because CDR systems are generally based upon collective responsibility for wrongs that are defined as those things which harm the community as a whole, rather than individuals, they generally do not reflect and respect the human rights provisions of the Constitution or those enshrined in international instruments.
3. ***Do not necessary provide guarantees of procedural fairness*:** An often expressed concern about CDR systems is that they can be perceived as corrupt and biased. In some CDR systems persons are held responsible for behavior, not on the basis of objectively assessed and reliable evidence but rather on the basis of a person's willingness to give the requisite oath, or upon the word of the spirit.
4. ***Decisions are not enforceable outside the local system.*** Thus, for example, a finding of guilt for homicide is not enforceable in the formal system,[8] and consequently the case may be dealt with by more than one system, with different norms, procedures, verdicts and forms of punishment leading to potential conflicts between the legal systems. A further example might be that a case awarding custody of children to a person will not be enforceable outside the clan in other parts of the country and certainly will not be enforced outside of Ethiopia.
5. ***Unpredictability*:** Creates a patchwork quilt of justice systems: There are a large number of ethnic groups extant in Ethiopia and most of them have their own unique CDR form of justice. There are significant differences between these systems. The justice received is dependent upon ethnicity and locality and not solely upon the issues or matters in dispute.

### 1.3.4 Characteristics of the formal system

The formal court system is government sanctioned and recognized in legislation. It is comprised of the three levels of federal and regional courts. Other legislatively prescribed courts form a sort of semi-formal system. These include social and *sharia*

[8] However, the formal system may take over the case and parallel proceedings in the informal system will then be discontinued. This is often the case in the Afar region.

courts, which, while recognized in legislation, do not share the other common features of formal systems, which are that:

1. *They are bound by the rule of law*.[9] They apply the law as written by the legislatures of the country and international instruments ratified by Ethiopia.
2. *Judges are appointed by the government*. They are full time judges. They are paid to perform their duties.
3. *There is a written record* kept of the proceedings taken in court.
4. *Professional staff* supports the operation of the courts.
5. They have an *operating budget* that comes out of general revenue.

### 1.3.5 Advantages of the formal system

1. Available to resolve *disputes between members of different nationalities, cultural religious and ethnic groups*.
2. Available to resolve *international disputes* or those involving foreigners or foreign interests.
3. Available to resolve complex *commercial disputes* within a clear and predictable legal framework.
4. Generally *judges have some legal training* and increasingly access to training and legal materials.
5. *Judgments are enforceable* and recognized throughout the country and outside of the country.
6. Has *standardized, written, procedures* and mechanisms which can be reviewed and scrutinized.
7. Are *becoming the dominant justice system in major urban areas*.

### 1.3.6 Disadvantages of the formal system

1. ***Accessibility*:** People often have to travel great distances to attend court. To a large extent the proceedings before courts are conducted in writing. This means that a significant portion of the population who cannot write has no capacity to personally appear before the court but must use a paid intermediary or a lawyer.

[9] *Sharia* courts are bound by Islamic law and must implement the rules of the Ethiopian Civil Procedure Code in conducting proceedings (Proclamation n° 188/1999, art 6). Social courts are an adjunct to the local administration at a wereda level. They are accountable to the wereda for their decisions and often apply local standards and rules in resolving disputes.

The language of the federal court is Amharic and thus it is not accessible to those who do not speak that language except through interpreters. *The language of the regional courts varies*, again limiting access to native speakers.

2. ***Timeliness*:** Formal courts take a long time to render justice. Cases can be before the courts for years. It is common for matters to be adjourned repeatedly.
3. ***Their legitimacy is not always accepted*:** Formal courts may be seen as not reflective of cultural values and norms. They may be seen as reflective of the interests of government or more powerful groups in society.
4. ***Reflective of individual and not community interests*.** The formal justice system is designed to resolve disputes between individuals or between individuals and the state. It does not easily accommodate disputes between clan and families or ethnic groups.

## 1.4 Customary dispute resolution in Ethiopia

The study of dispute resolution institutions in Ethiopia is still fairly limited. A few anthropologists have studied dispute settlement among specific groups such as among the Kambata (Singer 1980), the Oromo (Lewis 1988) and the Sidama (Hamer 1972, 1980). A number of senior essays in sociology and a few masters theses in anthropology provide some descriptions of institutions involved in dispute resolution among certain groups especially among Oromo (Dawit 1994, Dejene Negassa 1991, Dejene Gemechu 2002, Demie 1995, Demissie 2005, Dessalegn 1983, Getachew 1994, Ibsa 2003, Tessema 1997), but also among the Afar (Kelemework 2000), Amara (Yohanes 1997), Berta (Tewodros 2001), Gedeo (Demissie 1988), Sidama (Beyene 1997), and Wajirat (Tarekegn 2005).

Customary dispute settlement are common throughout the country and involve a number of somewhat overlapping forms including: 1) elders councils, 2) socio-political institutions, 3) religious institutions, 4) community gatherings to find thieves and thief seeking experts, 5) local associations, and 6) special forms of reconciliation.

The most common form of dispute resolution throughout the country at a local community level involve elders known as in Amharic as *shimagile*[10] who play a key

[10] Indeed, as Solomon Gebre (1992:55) notes the term *shimagile* in standard Amharic dictionaries denotes as well as age "a peace-maker, reconciler and/or mediator". Moreover, dispute resolution mediation are often termed *shimgilinna* or 'eldering' (Pankhurst 1992:73).

role in mediation. Similar terms are common in other languages such as *Jarsa biya,* or "elders of the land" in Oromo society, *Odayaal* among the Somali, *Shiyabe* among the Berta, and *Obtisbiga* among the Gumuz (Abebe *et al.* 2004, Berihun 2004:242). The extent to which the elders form regular and institutionalised "councils" varies as does the number of elders involved. For instance in Beni-Shangul among the Komo nine elders are involved or 18 in serious cases.

Socio-political institutions that governed local societies have played a key role in dispute resolution. The best known is the Oromo Gada system[11], based on age-grading, with similarities among other groups such as the *Qallu* among the Mao, and *Qolla* among the Shinasha. Indigenous political and cultural institutions were common among most groups at least until the end of the 19th century conquest of the south and subsequent expansion of state authority. Sometimes such institutions have layers starting from the local village upwards. For instance among the Shinasha there are four levels: *Burra, Nemma, Terra*, and *Falla* such that matters not solved at the lower level can be taken to the next level. Whereas the lower levels involved "judges" who are elders, the highest level, *Falla*, involved the spiritual leader known as *Qolla* or *Nihana* along with two neutral "juries" (Abebe *et al.* 2004).

Religious leaders including traditional religious leaders, the most famous of whom are the Qallu in Oromo society (Tessema 1997) and spirit mediums such as the *Wofa* institution of spiritual leaders and the *balewuqabi* or spirit medium in *zar* cults in North Shewa (Setargaw 2002) or the Abegar traditional Muslim religious leader in Wello who is also referred to as *Dem adriq* or "blood dryer", or the *Allamo* in Kafa (Yihenew 2004).[12]

Moreover, Orthodox Christian and Muslim leaders have also played an important role in dispute resolution in many parts of the country. In many Orthodox Christian areas priests and especially *Yenefs Abbat* "the soul father" or "father confessor", each family having one, play an important role and are solicited to resolve conflicts. An offender may seek forgiveness *Yiqir leegziabher* or "forgiveness in the name of God" by kneeling in front of the passing Ark of the Covenant on a holy day, or by going into

[11] First described by Asmerom (1973). For its dispute resolution role see (Dawit 1994, Waktole 1995).
[12] The *Abegars* had a *rekebot* or "court" particularly in homicide cases and finding thieves (Pankhurst 2001:100).

a Church and bringing the bell at odd hours to call for reconciliation (Solomon 1992:58-9).

Institutions or mechanisms for discovering thieves or culprits have also been common. These are known as *afersata, awch'achign* and *leba shay* and are used to determine those who committed crimes. *Afersata*[13] took the form of a communal inquest, in which all adult males were called to a meeting place and were obliged to remain until each had given testimonies swearing an oath to a group of investigators from among the community. Another example of a community gathering in a public place to find the culprit is the *Outo* which is said to have been introduced into Kafa in the 1920s (Orent 1969:116).

The *bele* institution run by *abegars* in Wello involves the community gathering after a theft or other crime and each person having to step over a stick or spear swearing innocence. The curse in case of false swearing is believed to be very powerful and culprits tend to admit. However, the power of the curse has been waning and the institution may be less powerful and lost some legitimacy and may have been tarnished through collaboration with state institutions (Pankhurst 2003).

The *leba shay* or "thief seeker" involved families of thief finders who make a boy (their son or slave) drink medicine and smoke herbs. He then goes into a kind of trance and is followed till he identifies the thief or the stolen goods by entering the house and laying on the bed in a trance or seizing the man hitting him with his knee or washing his feet at the place of the theft (Walker 1933:157-62).[14]

Local associations, notably funeral associations known as *iddir* in many parts of Ethiopia also play an important role in dispute resolution notably since they can sanction social ostracism (*imbidade)* of people who do not conform to community decisions (Pankhurst 1992, 2003:74). In Kafa the *iddir* which have been active in Kefa since the Haile Sellassie period have had an increasing role in dispute resolution

[13] In 1933 the central government issued a proclamation detailing procedural and substantive rules for conducting *afersata*s, to limit the hardships and provide safeguards against false complaints and untrue or malicious testimony (Carmichael 2003:122, Walker 1933:153-56, Mahteme Sellassie Welde Mesqal 1969:99).

[14] The institution seems to have been introduced to Shewa from Gonder by Menilek II. The practice was considered unjust by *lij Iyasu* in 1912 (Moelvar 1994:329-30). It was banned by Haile Sellassie I (Ullendorff 1976: 74-5)

notably in the post-Derg period in relation to conflicts over land and natural resources (Yinenew 2004:43-5). Likewise in the urban context Harar the *Afocha* institution has an important conflict resolution role (Kohn and Waldron 1978).

Special forms of reconciliation after disputes often involve blessing and cursing. For instance among the Gumuz, a ritual oath, called *Shirta* is an institution used among the Gumuz to resolve claims and counterclaims and bring about reconciliation through simultaneous cursing and blessing. (Berihun2004:246). When a person has been killed the main way in which peace is restored is by a claim of compensation called *Bahizikua* meaning “person (female) for bone” through which a bride is given to the clan of the deceased. The children of the woman who is given are considered to be the substitutes for the potential children of the deceased.

## 1.5. Interethnic institutions

In general, in most regions, customary dispute resolution institutions serve a particular ethnic group and do not cut across ethnic boundaries. This is not surprising in that most such institutions are built on cultural rules linked to local belief systems. In some cases institutions are even limited to a small geographic area or community in which elders play a key role, since they are well known by the litigants, such as the *yewonz lijoch* “children of a river” in parts of Amhara. In other cases, the dispute resolution institution can involve mainly one community such as the *damina* institutions among the Argobba. Yet others institutions can resolve disputes between clans within a group such as the *maro* and *makaban* among the Afar. In some cases, such as the *Shinasha* in Beni Shangul Gumuz or the Sidama in the Southern Region, there are different levels of the institution from the community up to the entire ethnic group but, the institution does not deal with disputes across ethnic boundaries.

However, there are some noteworthy exceptions. These include 1) the *abbo gereb* institution between the Tigray and Afar, and Wajirat and Afar. Here we see a clear case where a customary dispute mechanism resolves disputes, particularly regarding murder, between highlander and lowlander groups (Tarekegn 2005). 2) the *sedqo* institution between the Somali and Amhara (Tibebe 1994), and 3) the *mangima* institution between the Gumuz and highlanders (Wolde-Sellassie 2002:247-69). Bond-friendships that cut across ethnic groups can also play an important role in resolving disputes and providing safeguards in times of conflict as in the case of the

*fiqur* between the Tigray and Afar (Assefa 1995:73-6), the *michu* between Gumuz, Shinasha, Oromo, Agaw and Amara (Wolde-Sellassie 2002:273), and the *bel* between several groups in South Omo (Strecker and Lydall 1979).

## 2. Institutions involved in dispute settlement

In all six sites in which this study was carried out there are both formal, state-formed and informal, community-based customary institutions involved in dispute settlement. We shall see that in all cases there are close relations between the two and in some cases there are semi-formal institutions as well.

The formal institutions are the social courts, which are established according to proclamations by each Region. In Shashemene the Kebele Women's Association has also formed a separate court, which works closely with the Kebele Social Court. In general the Social Courts tend to involve three members, one of whom is the chairman and one a secretary. In Kolfe in accordance with the Addis Ababa Administrative Region decree one of these members is a woman. The chairman is a regular employee and the other two are part time, paid 20 birr on a daily basis. In the rural sites the social court members are not remunerated. In Dinki the Kebele Militia commander (*gant meri*), has an observer status as he may have to implement decisions. The power of the social court emanates from Proclamation 12/96. The women's association court in Shashemene has 7 members and 3 control committee members, selected by the women of the Kebele.

The social courts meet twice a week in the Kebele offices in four of the sites (on Tuesdays and Thursdays, or Fridays in Turufe), and once a week in Dinki and Yetmen, (on Saturday and Sunday respectively, and in Yetmen sometimes on holidays). They keep written records of proceedings.

The informal institutions consist of neighbourhood elders referred to in Amharic as *shimagile* "elders", or *astaraki* "reconcilers", or *astaraki shimagile*. "reconciling elders". In Korodegaga the Oromo term used is *jarsa biyya* "elders of the land", or *shengo biyya*, "Council of the land". Sometimes a *yenefs abat* "father confessor" may be involved either on his own or be called by elders to persuade a disputant for whom he is "spiritually responsible" to renounce an uncompromising position. Generally elders

are male though elderly women may be involved in some informal mediation, particularly in disputes between women, notably between mothers and daughters-in-law (Tarekegn 2005).

The elders meet on an informal basis, as the need arises, at the initiative of litigants, their relatives or friends or the Kebele officials. They tend to meet at weekends and sit under trees, in the house of the person selected to act as chair, in churchyards, or sometimes in the house of a litigant. They are often between three and seven elders, with some representing each side and sometimes some considered to be neutral. Often the first elder approached will recruit others to join him. When decisions involve some contractual agreement this is often written and kept with an elder and each of the disputants.

The semi-formal institutions are formed by the formal institutions trying to involve the informal elders in a more organised fashion. This was noted in Dinki and to some extent in Yetmen where the Kebele organised elders to deal with marital disputes.[15] There are supposed to be five elders, who in Dinki were selected each from one *got*, "hamlet".

## 2.1 The respective mandates and roles of formal and informal institutions

Although there is no clear boundary line the social courts tend to deal with land cases and disputes that are considered more serious involving injury or damages to property,[16] whereas the elders tend to deal with cases considered to be less serious. The social courts deal with civil cases generally involving not more than 500 birr in Kolfe, 1000 birr in Shashemene, and 1500 birr in Yetmen. More serious cases tend to be dealt with at the Wereda or City level. In Shashemene cases that involve divorce, beating, serious injury or theft are dealt with by the City court, and the Kebele court is not involved in fines and imprisonment.

[15] For discussions of a similar "Marriage and Divorce Committee" in a resettlement village during the Derg period see Pankhurst (1992, 1994).
[16] In his study of resource conflicts in Kafa Yihenew (2004:40) suggested that people were reluctant to use the social courts given perceived delays in settling cases and the distance given large Kebele Administrations.

The neighbourhood elders tend to deal with less serious cases, within and between households, including between spouses, siblings, parents and children, neighbours, children, and employers and employees. These may involve insults, fights, often in drinking houses or market places, as long as these do not involve serious bodily harm, minor theft, refusal to return borrowed money, disputes over boundaries etc.

In all cases, particularly in the rural sites, the Kebele Social Courts first try to send back cases that are brought to the elders, but this requires that the disputants agree to become involved in mediation. The social court will then only reconsider the case if the litigants cannot be reconciled by informal means. If the case is resolved by elders the decision should be reported in writing to the social court which will open a file and record the agreement.

## 2.2. Perceptions of common types of disputes

Informants from both formal and informal institutions were asked to mention the disputes in their areas, and, in particular, which types of disputes they thought were more common and which were rarer.

Generally it is clear that disputes between spouses and neighbours are the most commonly entertained. However, there are some differences between the formal and informal institutions, between urban and rural and between the six sites.

The Kebele courts often deal with land disputes, notably between neighbours over boundaries, fences, waste disposal and drainage, even though these cases are also entertained often first by elders or when the courts send them back to elders. Also cases that involve land renting or sale and division of property tend to be considered by the social courts.

In the urban areas common disputes related to failure to pay rent, sharing toilets and kitchens, waste disposal, fencing of boundaries, and avoiding payments to *iqqub* rotating credit associations after receiving payment were common, whereas in the rural sites common disputes were over sharecropping and land lease arrangement and transgressing boundaries.

Disputes concerning first and second wives were particular issues in Shashemene and Korodegaga. Conflicts between share-croppers and land owners were important in Turufe, Dinki and Yetmen. Site specific issues included in Korodegaga between groups of youths over who should load trucks, and in Yetmen disputes over borrowed or inherited money, and over delayed payments for farm labourers.

## 2.3. Perceptions of changes in common disputes over the past three regimes

Eliciting clear views about changes in common disputes was not easy since some respondents were either too young or did not know and others said that there were no changes. However, some suggestions were made.

A social court representative from Shashemene suggested that during the imperial period disputes were largely about resources, during the Derg they were ideological and currently marital disputes, generally brought by women, have become frequent currently.

The social court representative from the Dinki suggested that conflicts over land where frequent in imperial times, were reduced during the Derg period and have become important again now. A Dinki elder suggested that during imperial times conflicts were common between relatives, tenants and land-owners, whereas currently conflicts were many between the poor, weak and women with sharecroppers.

An elder from Korodegaga suggested that conflicts have generally been on the increase due to growing poverty. He noted that theft and conflict between groups of youths in particular were increasing.

In Yetmen a social court leader suggested that conflicts over land borders have become less significant these days, since land-holdings are clearer. An elder suggested that disputes over loans and land have increased whereas disputes due to fights, and between spouses are less frequent. However, another elder suggested that in marital disputes in imperial times a woman did not have rights to share the property upon divorce and under the Derg she could only do so if she had strong supporters or family. Nowadays women can accuse their husbands in court, chose

their own elders, divorce their husband and obtain their share of the property. An elder mentioned that disputes over drainage at times of cultivation and over grazing areas and irrigation have become more important.

## 2.4. Perceptions of changes in role of institutions over the past three regimes

In terms of relations between formal and informal institutions an informant for the Shashemene Kebele social court suggested that cooperation between informal and formal structures had increased over the three regimes.

An informant from the Turufe social court suggested that the influence of customary dispute resolution has been diminishing over the past twenty years, although the *gada* age-based institution, which had been forbidden from operating under the Derg, had resumed its role in murder cases.

In Dinki a social court leader noted that the elders tended to resolve issues during the imperial times, whereas during the Derg their role was diminished, and currently the Kebele refers cases to the elders council for mediation. Likewise an elder in Dinki noted that elders used to be respected in imperial times, that cooperation existed under the Derg, was limited at first under the EPRDF but has become more significant with the formation of a permanent elders' council.

An elder from Korodegaga suggested that elders were more respected in imperial times, that during the Derg the Kebele took over, and would pass serious matters on to the wereda, and that the Kebeles role was still very strong nowadays, so that the role of elders has decreased, and serious cases are seen by the Kebele or even the wereda courts, including matters relating to rape, abduction and serious theft.

## 2.5 Representation of women in informal institutions

As mentioned earlier women do not have an important role in mediation.[17] In the past women tended to be represented by male relatives in dispute resolution. However the evidence from the case material in this study suggests that this might be changing. In

[17] However, in some Ethiopian societies such as in Wajirat elderly women do play a key role (Tarekegn 2005).

most of the sites we were told that women can chose to represent themselves, unless they prefer to have a relative represent them. They were said to have chosen to be represented by male relatives because they are “shy” in Yetmen, or are frightened as noted in Turufe. However, in Dinki and in Yetmen, most allegedly present their own cases, although some "want male relatives to help them". In Korodegaga (male) informants suggested that women come before the elders or the court themselves, and in Yetmen an elder said that they no longer fear to make accusations in public, and the number of women bringing cases to courts in constantly increasing.

Asked about whether they thought that customary institutions were unfair, and elder in Kolfe noted that there could be some intimidations on the poor and women. However they usually accept even unfair settlements for they cannot afford to burden long litigation processes.

Likewise the Kebele Social Court chairman in Shashemene suggested that customary elders might take sides, especially in cases where they support the husband, which is why the Kebele has a women’s association court. However, the interviewed elder claimed that the elders tended to respect women’s rights.

Nonetheless, the Kebele women’s association chair expressed her views strongly as follows:

> We have handled cases where the elders became corrupt and made the wrong decision. In most cases husbands give money and beer to the elders who decide in their favour. They dominated the wife referring to culture and convince her that a wife should accept her husband’s physical violence. They tell the wife she should go to her kitchen when her husband hit her.

Elders from Dinki and Yetmen thought that the customary institutions were not biased, whereas the social court representative in Korodegaga suggested that they do not accept customary decisions on abduction and rape which are unfair. Likewise the social court representative from Turufe suggested that customary institutions violate peoples’ rights and force elders to give them cattle and property.

## 2.6 Dispute resolution processes and decisions

The social courts prefer cases to be settled by elders and then simply record the outcome. Especially if disputants come to the court without having first tried to find elders the court tends to send them to try to be reconciled by elders. Some cases are first considered by the Kebele representative and are not sent to the court if they can be solved by the chairman.

The court cases are generally initiated by a litigant who brings a written application. The plaintif presents his or her case, and the defendant is summoned in writing, and interrogated. Witnesses may also be summoned, and, if they do not appear, can be forced to attend by the Kebele militia. If the persons still does not come they may be detained for a couple of hours. Elders involved in reconciliation efforts are also often summoned. In cases which the court deals with in Kolfe a service fee ranging from 50 cents to 42.50 birr, on amounts ranging from 10 to 850 birr is charged.

The customary procedure usually involves a disputant, their relative or friend contacting an elder, who gathers several others, usually two to five others, to work with him. They tend to question the litigants separately and witnesses separately, in turn, often several times, whereas the courts have sessions involving both litigants together with their witnesses. The proceedings of elders' mediation are not written down, but outcomes involving agreements, especially in land related cases are recorded in writing and copies kept by both parties and the main elder. In Yetmen it was claimed that the litigants sign that they will abide by the decision of the elders.

Some of the reasons why litigants often prefer the customary institutions include less cost and distance to go to court, sometimes a shorter process in a more familiar environment and the fact that it will not involve imprisonment and is unlikely to involve high fines, and is less likely to escalate. Most importantly people living in face-to-face proximity are often reconciled and can continue to live together.

## 2.7 Forms of decisions, reconciliation and enforcement

The social courts have the power to impose fines but in theory not to imprison, or decide on divorce and property division. However, in Dinki, Turufe and Yetmen they do seem to have limited powers to imprison enforced by the Kebele administration through the militia. In Dinki people could be fined for up to 24 hours, in Turufe up to 15 days (or a fine of 50 birr), and Yetmen apparently up to a month.

Although fines may not be very frequent there were a number of cases recorded. In Dinki for instance a person was fined 50 birr for a boundary encroachment, and two boys were fined 80 and 50 birr each for having stabbed a donkey that entered their field and destroyed their crops. In Turufe fines were in the range of 10 to 300 birr. In Yetmen the social court fined people relating to grazing area transgressions up to 20 birr.

The cases mentioned in Turufe included 1) a land dispute which involved a claim by the plaintiff that land had been rented and by the defendant that it had been sold, and where the social court looked at the document and decided to uphold the status quo; 2) a case of a man who had provided a bull for his relative's marriage and was denied reciprocity when he got married, and where the court upheld his right to obtain a bull in return according to custom, and 3) a case where youths had beaten a lad whose mother was in conflict over land with a relative of theirs and had been imprisoned, which had not yet been settled.

In Korodegaga cases mentioned included 1) between youths over loading vegetables on trucks, 2) between farmers over water distribution in irrigation, and 3) over land which had been rented for 12 years and an ownership claim, by the sharecropper.

In Yetmen cases included a land and house inheritance dispute between a sister who had been living with her father and willed her the property and her brother who tried to evict her and whose claim was denied.

When a decision is reached by the Kebele social court or even the wereda court, local elders are often involved in the process of the property division, or in other arrangements. Elders representing each side and a neutral elder are selected, the number being three in Yetmen where the elders on either side are called *yebetezemed dagna* "judges who are relatives of the house" and the appointed elders may also be referred to as *kedagna yeweredu shimagilewoch,* literally, "elders who have come down from [are appointed by] the judges". In Yetmen if the decision of the court involves money below 500 birr this should be paid by within three days, and above 500 birr within 15 days.

The customary elders only have the ability to reconcile disputants if they agree. If they fail they may simply say "Let the truth win" or let the truth be revealed", or they may try to use the power of their curse saying: *shimagile yasatah,* meaning "May you not find elders" [to reconcile you], as mentioned by an elder in Shashemene.

The elders may ask for an apology in a simple case such as an insult, and ask the litigants to greet one another, or they may suggest compensation, which seems to be more common among elders than the social courts, particularly for cases of physical injury after fights to cover medical expenses. This may also be in the form of livestock for consumption, such as a chicken or sheep as mentioned in Yetmen.

The elders will often bless those who come to agreement, and the reconciliation may be cemented by eating and/or drinking together. The only sanctions that the elders may use apart from the curse is the threat of isolation or ostracism.[18]

## 2.8 Relations between formal and customary institutions

Despite the prevalent view that formal and customary institutions are in contradiction and operate in very different ways, the evidence from this study suggests that in fact on the ground there are close linkages and important forms of collaboration.[19] First of all in most cases disputes are not taken directly to the formal courts before having been presented to local neighbourhood elders. Moreover, even after a case is presented to a Kebele social court, generally the first step is to send it back to elders of the disputants' choice as long as they are willing to do so. If the dispute is resolved by elders the social courts simply record the verdict, which often should be submitted in writing by the elders.

In cases where the elders are unable to sort out the dispute and bring about reconciliation, they are often called as witnesses in proceedings. Moreover, when the courts reach a decision the elders are often involved in overseeing the implementation of the decision, be it a divorce or a property case. Often to bring about reconciliation elders are involved in blessings and in organising a feast at which the litigants eat and drink together. If there is a contractual agreement, the elders are often involved in making sure the agreement is honoured. One can therefore see that the elders play a key supporting role for the formal system. Conversely, the formal system may assist the elders for instance in forcing a witness to appear before them.

[18] See Pankhurst (1992).

[19] Yihenew (2004) came to the similar conclusions in his study of the relations between the social courts and the *iddir* in Kafa. He concludes (2004:46): "In practice the gulf separating formal and informal organisations in respect of tenure enforcement is not as wide as it appears in theory. IN fact, all indications are that there are considerable operational relationships between the *Kebele* Social Court and the *Idir* system".

The formal system has also tried to form semi-formal elders councils particularly with regard to marital disputes in Dinki and Yetmen. In Shashemene a special women's association court deals mainly with marital disputes and works closely with elders. However, over women's affairs there are sometimes disagreements between the formal and customary systems and there is a recognition that the customary systems are not fair in cases of abduction, rape and sometimes divorces and such cases are seen as the mandate of the formal system, although in practice the elders are often also involved.

The customary system is also not supposed to decide on matters relating to land disputes, although in practice most such cases are seen first by elders who often solve the dispute. Otherwise serious cases involving murder, theft of large amounts of property etc, go to the formal system, often beyond the *wereda* to the zone or town level. In practice though, such cases often come back to the elders for implementation of the courts' decisions, and to bring about reconciliation. In the Oromia sites the *Aba Gada* institution seems to have regained its importance in murder cases. In some cases the formal system may overturn the elders decisions particularly with regard to women's affairs, although this is probably the exception rather than the rule.

## 3. Towards a classification of disputes: Levels and types

For the purposes of attempting to categorise disputes it was initially suggested that they can be classified into the following five levels:[20] 1) intra-household, 2) inter-households, 3) inter-personal, 4) inter group within the community, and 5) inter-community.

Within the first level we can distinguish 6 sub-types: 1) marital between husband and wife, 2) between siblings, 3) inter-generation same gender, including father-son and mother-daughter, 4) inter-generation and gender including father-daughter and mother-son, 5) inter-generation and affinity, between father-in-law or mother-in-law and son-in-law or daughter-in-law, and 6) with non-relatives living in the household, including between the household head or spouse and servant or labourer.

[20] With this framework 12 researchers, one female and one male in the six sites started by listing the disputes they had come across in their earlier work in the sites in terms of the above mentioned levels and types. They also interviewed two key informants, one involved in Kebele courts and one in informal or alternative dispute resolution processes, and investigated three disputes from the point of view of both sides and a mediator or neutral person.

The empirical case material highlighted some problems with this initial classification by levels and types. First of all, levels not fully discrete.

Thus in terms of level 1: intra-household and level 2: inter-household the distinctions are not always clear.[21] Level 3: inter-personal could also be divided into whether the individuals are related by kinship or marriage, and it may also be relevant whether they are neighbours or not. There may also be the need to consider whether the persons have entered agreements such as between employer and employee, household head and labourer or servant, share-cropper and tenant, house owner and tenant etc. It was also not easy to divide between level 2: inter household and level 3 inter personal, as in some cases the dispute may be seen as involving just the household heads but often it involved spouses, children or other relatives. Similarly, between level 3: inter-personal and level 4: inter group, it was often not fully clear whether the disputes are between individuals or groups, and sometimes it seems that disputes moved from involving individuals to involving groups or vice-versa. Finally, between level 4: inter-group within the community and level 5: inter-community, it was not always clear where the boundary of communities lie.

Most of the disputes discussed in detail were in the lower levels, and marital disputes seem to be the most frequent. Very few disputes were reported between communities and in fact, as we shall see, some of these may be seen as involving people within communities rather than strictly between communities.

Level 4: inter-group within the community could also include additional sub-categories, notably between individuals and groups, disputes within institutions, and between organisations (notably government organisations, and individuals).[22]

[21] For instance some of the intra-generational disputes between siblings are within households, but others are between households that have separated or even about separation in the sense of division of property of parents. Likewise, inter generational disputes between father and son, mother and son, father and daughter, and mother and daughter are sometimes within the household but most of them involve separate households. It was also found that disputes involving generation and affinity (relations with in-laws) tended to be between the parents and their children whereas the spouses seem to aggravate the dispute, notably in cases of mothers feeling that their sons listened more to their wives. Moreover, disputes between household heads and labourers or servants may only be within the household if the employee lives in the household.

[22] In Kolfe for instance the researcher proposed considering the following sub-types within the community between 1) friends, 2) lovers, 3) employer and employee, 4) service givers and clients, 5) landlords and renters, 6) workmates (e.g. taxi drivers and *weyala* assistants), and 7) room-mates. She also proposed as additional levels between 1) the Kebele and a household, notably over housing, 2) organisations/firms and individuals, notably over land, 3) an institution and group of people, notably between Addis Ababa City Administration and clothes sellers, and between a Kebele and commercial sex workers, and 4) between members of the same association.

Although few such cases were elicited and these related mainly to the urban sites, this may call for more distinctions within the community.

A final problem is that sometimes the dispute may involve more than one level, and that the dispute may evolve and change over time, especially if it becomes more serious, involves more people and escalates.

Future attempts at categorising disputes will therefore need to focus on variations and sub-types at a higher level notably in urban areas, which would require more in-depth data from towns.

## 4. Disputes by types and reasons/causes.

The following attempt to look at the levels and types in terms of the reasons/causes for the dispute. However, this exercise is complicated by several factors. First, there are often more than one cause for disputes and we shall see that there are often inter-related causes, and incidents that spark off disputes. There are also contexts that are conducive to disputes, notably drinking in bars and sometimes interactions in marketplaces. Second, the perspectives of each of the sides of the disputes is often different and generally contradictory and that of the mediators or supposedly neutral persons may also be different or may not be as neutral as may appear at first sight. It is therefore difficult for outsider researchers to get to the bottom of the story and present it in a neutral way. In gender terms too, the researchers were either male or female, and though they tended to interview respondents of their own sex and there was an attempt to interview both sides this was not always possible and the sex of the researcher might also have introduced biases.

The following section considers the cases selected for more in-depth discussion, in which as far as possible both sides and a mediator or neutral person were interviewed. The section discusses marital cases, disputes within families and among kin, between households, between employees and employers, fights in drinking houses and markets, and disputes within associations and between communities.
The following table provides a listing of the cases considered by type, who the litigants were and the issues involved to guide the readers in the subsequent analysis of the processes involved.

**Table 1: Type of dispute, number of cases, litigants and issues**

| No | Type | no cases | litigants | Issues |
|---|---|---|---|---|
| 1. | Marital | 10 cases | husband and wife | wife beating,<br>adultery or suspected adultery<br>husband marrying additional wife,<br>husband refusing to share property,<br>husband controlling wife's income,<br>husband not consulting wife over asset sales,<br>husband favouring first wife,<br>husband changing religion,<br>husband refusing to pay for household expenses<br>wife suspecting husband of having an affair<br>wife not keeping home well,<br>wife going to her parents' house<br>suspicion of HIV/AIDS |
| 3. | Between households | 10 cases | neighbours<br>parties to a contract | over fencing between properties<br>over attempts to claim land<br>over livestock entering property<br>sharecropping agreements and control over the land<br>conflict over latrine sue and cleaning<br>over return of loans<br>accusation of spreading rumours about "evil eye"<br>stealing of livestock |
| 4. | employers and employees | 2 cases | household head and labourer<br>land owners and migrant labourers | over work of labourer and withholding of salary<br>over terms of employment on irrigated land |
| 5. | fights in drinking houses and markets | 5 cases<br>drinking houses (4)<br>market place (1) | kin<br>members of the same village<br>strangers | insults but relating to land dispute<br>insults but underlying ethnic rivalries<br>over sale of firewood |
| 6. | within associations | 2 cases | Vegetable growers association members | over division of work<br>over religion within a funeral association |
| 7. | between communities | 2 cases | Youths<br>Clans | over loading vegetables for market<br>over beating<br>over adduction of a fiancée<br>over murder |
| **Total** | | **40 cases** | | |

## 4.1 Discussion of marital dispute cases

At a local level disputes between spouses clearly take up a lot of time. Ten cases were described in depth in the six sites and several others in less detail. The issues involved included the following: wife beating, adultery or suspected adultery by husband, husband marrying an additional wife and neglecting first wife, husband refusing to share property, or taking property of first wife for subsequent wife, husband wanting to control the wife's income, husband wanting to send away wife to marry another, husband not consulting wife over sale of assets, conversion of husband, complaints that the wife does not look after the home well, that she goes to her mother's house, suspicion of HIV/AIDS.

However, it is difficult to categorize cases as they often involve several causes, which are often complexly intertwined. For instance one case in Kofle involved the conversion of the husband to Protestantism, and the wife's insistence that he reconvert to Orthodoxy, his control of the family income and refusal to pay for household expenses, his adultery and the suspicion of the wife that he may be having an affair with their daughter's friend, and her fears that he might have HIV/AIDS, and her dilemmas over whether to sleep with him.

It is also difficult to understand the dynamics since the perspectives of the husband and wife and mediators may be different or contradictory. For instance in one case in Shashemene the wife's concerns included that her husband had gone to visit his relatives in Dorze without her and she suspected he had an affair or had wife in the countryside, his beating her and her fears that he could be violent, whereas his complaints were that she controlled her own income, spent time at her mother's house neglecting him, her child and their house. The (male) mediator noted that they were both young that he was provocative and could be violent, that her mother sheltered her for too long, and that the wife aggravated matters by not returning to her house.

On the whole the problems in most cases seem to relate to the husband's behaviour, particularly wife beating, sexual affairs, additional wives, and suspicions of HIV/AIDS. Physical violence is often mentioned and adultery of the husband was very common. In cases of additional wives the cases tend to be brought by the first wife accusing the husband of neglect. Fear of HIV/AIDS was mentioned in one case in Kolfe and a

husband calling his wife to listen to a radio programme on HIV/AIDS led to a conflict as she felt he was insinuating that she was unfaithful whereas she felt that he was the one who should be suspected as he went to town regularly.

Although issues to do with violence and sexuality predominate, underlying issues seem often to relate to control over property and labour. Thus in one case in Turufe a woman objected to her husband "selling" the land and was able to get the decision reversed. Disputes between husbands and first wives over subsequent wives in Korodegaga seem to relate to him trying to take property away from the first wife or favouring a subsequent wife.

Patriarchal gender relations imply that women are generally the victims. A common scenario involves adultery by the husband, some physical violence, the wife running away, and negotiations with elders involving compensation to persuade the wife to return. Sometimes, despite apologies and compensation, the husband continues with his sexual affairs leading to more serious disputes. Cases of husbands being the victims seem rare. The women's court in Shashemene described one case where the woman was younger had inherited property and wanted to evict an older, ex-soldier husband.

Although women are generally victims, much of the case material suggests that they are becoming able to assert themselves more, especially if they have independent incomes. Women often seem to be able to insist on sharing the property on divorce. In one case in Shashemene the elders had tried to persuade the wife to leave with 1500 birr, which she refused, and the women's social court defended her. Sometimes the fear of loosing half the property is a reason for the husband agreeing to be reconciled, or in one case even getting remarried after divorce.

## 4.2 Disputes within families and among kin

Disputes between close family mainly within the households, involve cases between siblings, and disputes between parents and children. Two cases of disputes between siblings were presented, both of which related to inheritance. One of these in Kolfe was between sisters over inheritance of their deceased mother's house, after the brother they had been living with left for the US. The second, in Yetmen, was between an older sister who had been looking after her mother who willed her the

land, and her brother who refused to return the land, which he had been share-cropping from his parents. The sister's right was upheld by the elders and the social court and the produce of that year was divided between them. The case clearly shows that in Yetmen at least women have definite rights in land that they can pass on at will to a daughter.

Disputes between parents and children were presented in nine cases, out of which two were discussed in depth. Five of the cases were between mother and son, found in all four rural sites. Three of the cases related to property issues, two of which in Dinki and Turufe concerned the son share-cropping the mother's land and the mother accusing the son of not using the land productively and threatening to take it away to give to another sharecropper. In both cases elders persuaded the son to work harder and the mother not to take the land away. A case in Dinki involved responsibility over who should look after the share livestock. Two cases involved the mother not respecting or insulting the mother. One case in Turufe involved a son who wanted to bring a girl-friend as a wife, but the mother objecting since the girl had run away after being beaten by him, and he had bad behaviour drinking alcohol and not working hard. Elders persuaded the son to improve his behaviour and the parents to arrange his marriage. Although these disputes are between the mother and the son, in two cases the son's wife is involved and the mother accuses the son of listening to the wife and not respecting her, and in one case the father was also involved.

Two cases of disputes between father and son were discussed. One in Kolfe involved the son's bad behaviour, not concentrating on his education, chewing *chat* and going to *shisha* smoking houses. The father wanted to chase him out of the house and the mother was worried about her son. The other, in Korodegaga, was over irrigation land. The father and son had agreed to work together and share the produce, but the father later decided to take the land away, and the son threw the onions in anger into the Awash river, leading to the case being taken to the social court, who returned it to elders for mediation.

Only one case was discussed between a father and a daughter in Korodegaga. The father visited his daughter who was living in Nazareth with her husband with whom she was quarrelling. The father took the side of the husband and beat his daughter.

Likewise only one case was presented between a mother and daughter. This was related to the daughter eloping and her mother accusing the man of abduction but her daughter siding with her lover.

The cases between parents and children involve gender and property issues. Some of the cases between mother and son were related to insults, and the case between the father and daughter involved beating. However, mother and son disputes and one father and son dispute involved sharecropping. In most of the cases the younger generation had formed their own household and in a couple of the cases the mother was accusing the wife of influencing her son against her, whereas the father took the side of his son-in-law against his daughter. In the two cases where the son was living with his parents, the dispute involved issues of discipline, work, education, and bad habits of the son, in one case leading to the father expelling his son. Two of the cases, one of a daughter and the other of a son involved disputes over the younger generation wanting to marry or live with a partner against the wishes of their parents, and being supported by elders or the court, which may be indicative of social change in this respect.

Although most disputes between relatives are between close family members, three cases were reported that involved other kin.

One of these, in Turufe, involved a man who gave his relative a bull for his marriage and expected reciprocity when he got married and took the matter to the social court which upheld his customary right. This case is interesting in that customary rights were upheld by a social court.

The second case, in Yetmen, was sparked off by a fight in a bar between an uncle and his son on the one hand and the nephew on the other. The nephew used to plough the land of his grandmother, the mother of his uncle, who later reclaimed the land to give it to a sharecropper, denying his nephew the benefit. The conflict was resolved by elders and a father confessor, and reveals how the ambilineal kinship system still plays a role in Gojjam, but how the pressure to sharecrop is eroding customary kinship norms.

The third case also in Yetmen involved a man and his brother's son who were neighbours. The man built a house with the help of his nephew but when he wanted

to build a fence between them his nephew objected on the grounds that he had pushed into his land. His uncle also accused his nephew of pushing into land of his son on the other side and accused his nephew's wife of stealing the stones he was going to use for the fence. She retorted that her child had died due to a curse by the other family. The dispute was resolved with the help of the brother of the uncle (who is the father of the nephew) who brought five elders, who found both sides guilty of "pushing", and brokered a reconciliation involving them drinking and eating together.

## 4.3 Disputes between households

Ten cases of disputes between households were discussed in five of the sites. In most of the cases these involved neighbours and the disputes were over resources.

Conflicts over borders were mentioned in four cases. Two of these cases, one in Shashemene and the other in Yetmen, involved boundaries. In Shashemene the case was sparked off by one landowner wanting to building of a fence to which his neighbour objected. The matter was taken to the town administration and was resolved by looking at the ownership documents, and the man's right to build a fence on his land was asserted. Likewise, in Yetmen one disputant wanted to build a fence and his neighbour claimed that he was "pushing the boundary". The cases was seen by elders, then the Kebele social court who returned the matter to elders and it was decided that the fence was illegal and had to be pulled down in the presence of kebele officials.

Four cases, two in Korodegaga and one each in Turufe and Yetmen involved land issues. In one a rich man in Korodegaga with a private pump tried to incorporate the land of his ex-soldier neighbour into his. He managed to convince the Kebele officials of his case. Another case in the same site involved cattle entering and destroying the vegetables and fruits of a neighbour. The case in Turufe involved a woman trying to regain land her son had given to a sharecropper at the time of land measurement. Her son who was Eritrean had died after being deported, but the social court upheld her claim, the produce was shared and the man was imprisoned.

The case in Yetmen involved a poor woman who had entered an agreement with a man to sharecrop her land and had taken a loan of grain in advance. However, when she wanted him to sign he refused, and when she tried to assert her right he

demanded that she repay the loan which she was unable to do. Elders brokers a settlement whereby she agreed to pay back the loan with interest.

One case in Kolfe involved conflict over a latrine used by thirteen households. The dispute was sparked off when the household heads got drunk and insulted each other but involved not just the household heads but also the children. Elders who were relatives from either side and a godfather brokered a reconciliation.

Two of the disputes considered involved female-headed households. One of these in Shashemene was between neighbouring female-headed households and involved social status and a loan. One of the women had a position in the Kebele and borrowed money on credit from an NGO to help the other woman who was poor and socially ostracised as “having the evil eye”. The dispute involved the daughter in law who was suspected by the poorer woman of spreading evil rumours about her. The disputants were reconciled by a woman mediator and a promise to return the loan was made.

The second case in Korodegaga partly involved a bitter conflict over borders aggravated by cattle entering fields and eating crops. However, the dispute has a long history and goes back to when one of the women was involved in coffee trade without a licence and the husband of the other who was a security officer, claimed she had an affair with another man. The woman accused the husband and the court fined him 400 birr. When her brother came to stay with a rifle the husband had it confiscated. The conflict continued in the next generation. The son of one of the woman tried to steal her ox and slaughtered her sheep and was imprisoned first at the wereda for 15 days and then at the Zonal prison.

## 4.4 Disputes between employers and employees

Two disputes between employers and employees were discussed. One of these in Korodegaga was between a household head and a labourer who lived in the household. The employer claimed that the labourer did not work well and withheld his salary. The labourer took the matter to the social court which decided that elders should broker a reconciliation. The elders decided that the employer should pay half the salary since the labourer had not worked properly.

The second case, also in Korodegaga, was between an irrigation land-owners cooperative and three immigrant renters from Wello. There were allegations that the renters had stolen a sheep and/or were involved in a rape. With the help of the Kebele security the immigrants were beaten and imprisoned. Elders were assigned to negotiate and the case is still to be resolved.

## 4.5 Fights in drinking houses and markets

One of the most common forms of dispute found in all the sites occurred in drinking houses, generally involving joking, ridicule and insults leading to fights and physical injury. Often the alcohol brings out earlier tensions about other issues. Such fights can involve relatives such as a case in Yetmen which was really about a land dispute, or bring out inter-ethnic rivalries as in a case in Turufe between a Tigrayan and an Oromo. It can involve people who know each other but are not related as a case in Dinki, or men going to town from rural areas, as in one case described in Shashemene.

Elders often mediate and require the offender to pay compensation for medical expenses, for instance for having teeth replaced, or provide livestock as a recognition of offence. Sometimes they make the litigants sign that they will not fight again as happened in a case in Turufe, and the deal may be sealed by elders' blessings and eating and drinking together.

Fights often break out in market places. One case described in Kolfe involved two women competing over the sale of firewood. One of these claimed she had already bought the firewood from a wholesaler. However, the matter was more complicated than simply competition over resources, since it involved ethnicity since most of the firewood sellers were from Dorze and sided with the Dorze accuser and the accused was from Gonder, and locality since most of the sellers who sided with the accuser where lived in the same area. The case was seen by a policeman who sought to defend the rights of the accused whom he knew from before, and felt had been mistreated.

## 4.6 Disputes within associations

Two cases of disputes within associations were discussed. One was in Kolfe among members of a women's vegetable growers association over the division of work. The other in Shashemene was among members of an *iddir*, funeral association. A member who had converted to Protestantism challenged the rule that allowed only Orthodox members and refused to pay his membership on the grounds that this was a social not a religious institution. The *iddir* offered for his wife to remain a member since she was Orthodox but he refused. The matter was taken to the town administration and the signed document that stated that members had to be Orthodox Christians was produced. The case is still not resolved and the initiator is on a campaign to change what he sees as an outdated custom.

## 4.7 Disputes between communities

Disputes between communities were discussed in only two cases. In Korodegaga disputes between youths from neighbouring communities over who should load trucks that take produce to markets is common. In one such case four youths from another village beat a youth from Korodegaga; the case was taken to the police and the youths were imprisoned for 15 days. However, the case also involved a personal conflict in which a youth from the other community had abducted and married the fiancée of one of the youths from Korodegaga, who later was accused of continuing to meet his ex-lover at her parents' house.

In Turufe a dispute was reported between two Oromo sub-groups (*belbela)*, over a murder. One sub-group was seeking to take revenge on an enemy but later found out that they had killed the wrong man. The father-in-law had encouraged the murder not realising it was his son-in-law who was killed and later tried to commit suicide. This led to tensions between the two groups, the fleeing of murderers and hiding of their clan members and attempts to burn their houses, until elders and the *Aba Gada* religious leader intervened and negotiated compensation of 25 cattle to be provided by the murderer's clan, which was later reduced through negotiation to 15 cattle.

## 5. Conclusions

In this paper I began by suggesting that despite the prevalent views that customary dispute resolution is on the wane and likely to be replaced by the formal system, informal institutions are in fact vibrant in Ethiopia and play an important supporting role to the formal legal system in various parts of the country. Interaction between customary and formal institutions is in fact common. Formal systems often rely on the local knowledge and legitimacy of customary institutions whereas customary institutions depend on the legality of formal ones, and their relationships are often predicated on complementarity rather than competition.

Customary institutions include elders' councils, socio-political and religious institutions, community gatherings to find thieves, local associations, and customary forms of reconciliation. Although most such institutions are fairly limited in geographical scope and serve specific groups, there are a few cases of such institutions organised at a higher level or cutting across ethnic divides.

In the six sites from which the data is presented the formal institutions are social courts whereas customary institutions are informal groupings of elders. However, in a couple of the rural sites there have been attempts by the formal system to institutionalise elders' councils to deal with marital disputes, and in Shashemene Town such cases are dealt with by a women's association court. Whereas the formal institutions deal with land cases, murder, more serious cases of property loss and injury, the customary institutions tend to focus on inter-personal, family and inter-household disputes, although in practice they are also involved in all forms of disputes, including murder.

Despite prevalent views that formal and customary institutions are in contradiction and operate in very different ways, the evidence from this study suggests that in fact on the ground there are close linkages and important forms of collaboration.[23] In cases where the elders are unable to sort out the dispute and bring about reconciliation, they are often called as witnesses in proceedings. Moreover, when the courts reach a decision the elders are often involved in overseeing the

[23] Similar complementarities and synergies between the formal and informal judicial systems were noted by Yihenew (2004) in his study of natural resource-based disputes in Kafa.

implementation of the decision, be it a divorce or a property case. Often to bring about reconciliation elders are involved in blessings and in organising a feast at which the litigants eat and drink together. If there is a contractual agreement, the elders are often involved in making sure the agreement is honoured. One can therefore see that the elders play a key supporting role for the formal system. Conversely, the formal system may assist the elders for instance in forcing a witness to appear before them. The formal system has also tried to form semi-formal elders councils particularly with regard to marital disputes.

However, over women's affairs there are sometimes disagreements between the formal and customary systems and there is a recognition that the customary systems are not fair in cases of abduction, rape and sometimes divorces and such cases are seen as the mandate of the formal system, although in practice the elders are often also involved.

The customary system is also not supposed to decide on matters relating to land disputes, although in practice most such cases are seen first by elders who often solve the dispute. Otherwise serious cases involving murder, theft of large amounts of property etc, go to the formal system. In practice though, such cases often come back to the elders for implementation of the courts' decisions, and to bring about reconciliation. In some cases the formal system may overturn the elders decisions particularly with regard to women's affairs, although this is probably the exception rather than the rule.

Most disputes are at the micro level among people who know each other and live together or in close proximity, notably within households between spouses, and between parents and children, especially over property and setting up new households. Disputes between kin are less frequent, and those between social groups, within villages are much rarer – though potentially more serious.

The most common types of dispute seem to be marital cases and land disputes, often between neighbours over boundaries, and also over share-cropping arrangements. Mediators suggested that conflicts have increased in general, and that disputes which were common in imperial times, and were less frequent under the Derg, have again become common, particularly over sharecropping, notably involving women and the

poor. There was a clear consensus that women are more able to assert their rights through legal means than has previously been the case.

Although some mediators also suggested that the importance of customary institutions has declined since imperial times, there was also a view that cooperation with formal institutions has increased. Many elders were reluctant to suggest that customary institutions were biased; however, some of the social courts representatives and the women's association court chair asserted that customary institutions did not respect women's rights.

Formal and customary institutions differ in their procedures, notably since elders tend to speak to litigants separately and try to persuade them to be reconciled rather than simply trying to ascertain who was right and punish wrongdoers. Although the elders' proceedings are not generally written, unlike those of the courts, decisions by the elders, and especially contractual arrangements, tend to be written and kept by the disputants and one elder. Customary procedures are often preferred by litigants as they do not involve going to town, are in a familiar environment, do not result in imprisonment or high fines, and enable people living in proximity to be reconciled through blessings and eating and drinking together.

The classification of disputes into intra and inter household, inter-personal and intra and inter community was found to be too simple, as the levels and types are not discrete and disputes can involve several levels and types. Likewise, attempts to consider disputes by causes or reasons face problems as there are often several causes, differences in perspectives between litigants and mediators, and precipitating factors and contexts, such as bars and market places.

The most prevalent disputes were marital cases. These generally seem to reflect the patriarchal nature of society in which wives are usually the victims of husbands' violence, extra marital affairs or additional marriages, as well as their refusal to share property and income. However, the case material suggests that women are increasingly becoming able to challenge these biases, and assert rights to property, particularly in divorce cases.

Disputes between siblings were over inheritance and those between generations often involved property issues especially involving inheritance, notably share-cropping in cases where the households were separate and issues of discipline and

values in cases of children living with parents. Here again gender biases were evident in mother-son and father-daughter disputes. Disputes within households occur between siblings over inheritance, between generations over property issues, notably parents and sons over sharecropping and herding livestock with accusation that the younger generation is not working hard enough on sharecropped land or looking after livestock properly, and between parents and children living with them over discipline and values. Where the younger generation is setting up a new household dispute happen over sons wanting to bring wives and mothers accusing them of listening more to their wives, and daughters wanting to marry out. Such disputes reveal tensions between the generations over property transfers, and combinations of gender and generation power relations lead to structural tensions notably between married sons and their mothers.

Disputes between kin were often related to use of land or boundary conflicts, and reveal that kinship still matters. Likewise disputes between neighbours tended to be over resources, fences and boundaries, and, in the urban sites, over latrines, shared kitchens, waste disposal and drainage. Disputes over sharecropping arrangements seem to be particularly important in the rural sites, notably between poor women land owners and wealthy male share-croppers involving a conjunction of gender and 'class' issues.

Disputes are often sparked off in bars resulting in fighting and injury or at market places. Disputes over status, notably relating to "caste"[24] occupation, religion and conversion, and ethnicity seem to be fairly rare, although a few cases were discussed and often involved a range of issues. Likewise disputes within associations, and between communities were rare, and often also involved personal conflicts.

To conclude disputes reveal clear cleavages especially in terms of gender, generation, and wealth. Gender issues are most visible in prevalent marital disputes but are also often linked to generation and property issues. Although many of the disputes are complex, involve a range of factors, and different levels and types, the most salient disputes often relate to property, over boundaries, share-cropping land in rural areas or sharing common facilities in urban areas. The very prevalence of disputes involving gender and generation and the resolution processes show that inequalities are contested and the ability exists to question, of not always to alter the status quo.

[24] For criticisms of a simplistic view of "caste" and a more sophisticated interpretation of the status of craftworkers in the Ethiopian context see Pankhurst (1999), and Freeman and Pankhurst (2001, 2003).

## References

Abebe Mulatu, Alula Pankhurst, Dominque Francke, Getachew Assefa, Laura Bourassa, Million Habte, Stephane Balland. (2004). "Strengthening Ethiopian Justice Systems: the relative roles of formal, semi-formal and customary justice systems in Ethiopia". Interim Recommendation Report submitted to the Federal Democratic Republic of Ethiopia Ministry of Justice, December.

Berihun Mebratie, 2004). "The Past in the Present: The Dynamics of Identity and Otherness among the Gumuz of Ethiopia". Ph. D Thesis Department of Social Anthropology, Norwegian University of Science and Technology, Trondheim.

Berihun Mebratie. (1996). "Spontaneous settlement and inter-ethnic relations in Matakal, Northwest Ethiopia". MA thesis in social anthropology, Addis Ababa University.

Beyene Bada. (1997). "Indigenous Institutions and their Roles in the Sidaama Society". Unpublished BA Senior Essay in Sociology.

Carmichael, Tim. (2003). "Afärsata", p.122 in Siebert Uhlig *ed. Encyclopaedia Aethiopica.* Volume 1. A-C. ed. Wiesbaden: Harrassowitz Verlag.

Dawit Hunde. (1994). The Gada System of Government "Sera Chaffe" Oromo: An Ethnographic Study of the Oromo Traditional Legal Institution, with particular reference to The Oromos around Bishoftu (Debre- Zeit). (Unpublished B.A. Senior Essay in Sociology).

Dejene Gemechu. (2002). Some Aspects of Conflict and Conflict Resolution among Waliso Oromo of Eastern Macha, with particular emphasis on the Guma. (Unpublished M.A. Thesis in Social Anthropology).

Dejene Negassa. (1991). Judicial Role of Elders Among the Oromo of Wolliso. (Unpublished B.A. Senior Essay in Sociology).

Demie Abera. (1995). The Customary Constitution of the Oromo Society: the case of the Uulama. (Unpublished B.A. Senior Essay in Sociology).

Demissie Worassa. (1988). Gedeo Traditional Social and Legal Organization. (Unpublished B.A. Senior Essay in Sociology).

Desalegn Teresa. (1983). The Relationships between Gada and Marriage System with particular reference to Tuqur of Western Shewa. (Unpublished B.A. Senior Essay in Applied Sociology).

Freeman, Dena and Alula Pankhurst eds. (2001). *Living on the Edge: Marginalised Minorities of Craftworkers and Hunters in Southern Ethiopia.* Addis Ababa: Department of Sociology and Social Administration, Addis Ababa University

Freeman, Dena and Alula Pankhurst eds. (2003). *Peripheral People: Ethiopia's Excluded Minorities*. London: Hurst.

Gebre_Igziabher Elyas ed. R. Molvaer 1994 Prowess, Piety and Politics: The Chronicle of Abeto Iyasu and Empress Zewditu of Ethiopia (1909-1930). Köln: Rudiger Koppe Verlag.

Getachew Gonfa. (1994). Gumaa Payment Procedures and Its Role in Conflict Resolution among the Oromo of Gindaberet – Western Shewa. (Unpublished B.A. Senior Essay in Sociology).

Hamer, John. (1972). 'Dispute settlement and sanctity: an Ethiopian example' *Anthropological Quarterly* 45 (3): 232-47.

_____. (1980). 'Preference, principle and precedent: dispute settlement and changing norms in Sidamo associations' *Ethnology* 19 (1): 89-109.

Hiwot Belay. (1999). The Institution of Family Arbitration and Its Impact on Women. (Unpublished B.A. Senior Essay in Sociology).

Ibrahim Idris. (1990). Capital punishment and blood-money options of the victim's relatives to requite homicide in the traditional Ethiopian administration of justice. In Proceedings of the first national Conference of Ethiopian Studies, Addis Ababa.

Ibsa Melaku. (2003). Indigenous Mechanisms of Conflict Resolution among the Oromo: with a particular reference to the Oromo of Nadjo Area.

Kelemework Tafere. (2000). Indigenous Institutions of Conflict Resolution among the Ab'ala Afar of North-Eastern Ethiopia. (Unpublished M.A. Thesis in Social Anthropology).

Koehn, P. and S. R. Waldron. (1978). Afocha: a link between community and tradition in Harar, Ethiopia. Syracuse, N.Y.: Syracuse University, Maxwell School of Citizenship and Public Affairs (Foreign and Comparative Studies/Africa, No.31).

Lewis, Herbert, S. (1988). "Values and Procedures in Conflict Resolution among Shoan Oromo." In: Proceedings of the 8th International Conference of Ethiopian Studies, Addis Ababa 1984. (2): 673-678.

Orent, Amnon 1969. "Lineage structure and the supernatural: The Kafa of Southwest Ethiopia". PhD Dissertation, Boston University/

Pankhurst, Alula (1992). "Settling strive in a resettlement setting: symbolic sanctions" *Sociology Ethnology Bulletin* 1(2):73-79.

_____. (1994). "Negotiating tradition and change: the impact of the constitution of the people's Democratic Republic of Ethiopia on marriage and divorce in a settler village in western Ethiopia." In E. Grande ed. *Transplants Innovation and Legal Tradition in the Horn of Africa*, Torino: L'Harmattan Italia, pp. 269-302.

_____. (1999). "'Caste' in Africa: the evidence from Southwestern Ethiopia reconsidered" *Africa* 69: 4: 485-509.

_____. (2001). "Resource management institutions in post-conflict situations: lessons from Yegof State Forest, South Wello Zone, Amhara Region, Ethiopia", pp. 85-104, in A.

Pankhurst ed. *Natural Resource Management in Ethiopia.* Addis Ababa: Forum for Social Studies.

Setargew Kenaw. (2002). "Mobilisation of deities in spirit mediumship: a reflection on the synchretic aspects of zar", vol 2, pp. 990-100, in Baye Yimam *et al.* eds *Ethiopian Studies at the End of the Second Millennium.*

Singer, Norman, J. (1980). "The Relevance of Traditional Legal Systems to Modernization and Reform: a consideration of Cambata legal structure." In: Tubiana ed. Modern Ethiopian from the Rise of Menelik II up to the Present. Proceedings of the 7th International Conference of Ethiopian Studies, Nice 1977, 17: 537-556.

Solomon Gebre. (1992). "Conflict resolution in traditional Amhara society" *Sociology Ethnology Bulletin* 1(2):55-60.

Tarekegn Gebreyesus. (2005). "Change and Continuity in the Traditional Institutions and Mechanisms of Local-Governance and Conflict Resolution Among the Wejerat: An Ethnohistorical Study". MA thesis in Anthropology, Addis Ababa University.

Tesema Tolera. (1997). Some Features of the Qaalluu Institution and Its Role in Conflict Resolution among the Macha Oromo of Ginda Beret Wereda: the case of Ofa-Sarba.

Tewodros Workineh. (2001). Ethnic Relations and Conflict Management: the case of the Bertha and Resettled Amhara. (Unpublished B.A. in Political Science and International Relations).

Ullendorff, Edward. (1976). (translated and annotated). *My Life and Ethiopia's Progress 1982-1937'. The Autobiography of Haile Sellassie I.* Oxford: Oxford University Press.

Waktole Amenta. (1995). Gada Values: with particular reference to Ada'a Wereda (Eastern Shoa). (Unpublished B.A. Senior Essay in Sociology).

Walker, Charles. (1933). *The Abyssinian at Home.* London: The Sheldon Press.

Wolde Sellassie Abbute. (2002). "Gumuz and Highland resettlers : differing strategies of livelihood and ethnic relations in Metekel, Northwestern Ethiopia". Ph.D. thesis, University of Göttingen.

Yihenew Zewdie. (2004). "Room for Manoeuvre: Local organisations and resource tenure administration in Highland Kafa, Southwest Ethiopia" *Eastern Africa Social Science Research Review* 20 (2):31-58.

Yohannes Birhanu. (1997). Conflict and Conflict Resolution among The People of Chihera (Micro-Level case studies from six Kebeles in Northern Gondar). (Unpublished MA Thesis in Social Anthropology).

# EDUCATION CHOICES IN ETHIOPIA: WHAT DETERMINES WHETHER POOR HOUSEHOLDS SEND THEIR CHILDREN TO SCHOOL?[1]

Tassew Woldehanna, Alemu Mekonnen, Nicola Jones
Bekele Tefera, John Seager, Tekie Alemu, Getachew Asgedom[2]

## *Abstract*

*This paper attempts to establish a link between micro-level outcomes and macro-level policy initiatives with respect to eight-year-old children's primary school enrolment in Ethiopia. The paper uses data from a 2002 survey of 1000 rural and urban households with eight-year-old children sampled from food insecure communities in Tigray, Amhara, Oromia, SNNP and Addis Ababa Regional States. Using a probit regression model, we investigated external factors associated with child enrolment in school (such as lack of income, child labour, economic shocks, social capital and education of adults in the household). We found that household wealth, cognitive social capital, adult education and ownership of land had a positive impact on whether our eight-year-old children were attending school. Household wealth had the strongest impact followed by cognitive social capital (perceived levels of trust and reciprocity), the maximum level of education attained by female adults in the household, ownership or rental of land, and the maximum level of education attained by male adults in the household. In contrast, child enrolment was found to be negatively associated with the number of household members over the age of 15 years, birth order, ownership of livestock, economic shocks, distance to primary school, and child labour, in declining magnitude. The findings in general suggest that increasing child enrolment in primary school, which is a commitment of the Sustainable Development and Poverty Reduction Program (SDPRP) and Education Sector Development Program (ESDP), will necessitate more targeted educational policies to address regional, gender and wealth disparities, the development of education programmes for adult caregivers, as well as broader inter-sectoral policy initiatives to ensure that policies in other sectors facilitate rather than hinder children's education (particularly credit and labour markets and infrastructure-related policies).*

[1] This paper is based on research conducted by the Young Lives Ethiopia team. The research component of the Young Lives project in Ethiopia is led by the Ethiopian Development Research Institute (EDRI).
[2] Tassew Woldehanna, Alemu Mekonnen, Tekie Alemu and Getachew Asgedom are all based at the Department of Economics, Addis Ababa University, Ethiopia. Nicola Jones is based at Save the Children UK in London. Bekele Tefera is based at Save the Children UK in Addis Ababa. John Seager is part of the Human Sciences Research Council in South Africa. If you have comments or questions relating to this paper, please address them to: Tassew Woldehanna, Department of Economics, Addis Ababa University via email on wtassew@econ.aau.edu.et or tassew.woldehanna@wur.nl

## 1. Introduction

Ethiopia has one of the lowest primary school enrolment rates and one of the highest illiteracy rates in the world. Finding appropriate mechanisms through which to address this has long been an economic, social and political challenge for the government. When the current government took power in 1991, the Ethiopian education system was suffering from a lack of 'relevance, accessibility and equity' (MOE, 1994). These three problems underpin all education policy debates in the country, and are related to the policy-related weaknesses of past governments. During the imperial period (1941-74) the education system emphasised modernisation and focused on expanding secondary education, but expansion, of both primary and secondary education, was limited to urban centres. By contrast, the socialist regime (1974-90) aimed at expanding primary education to the rural areas by constructing schools in every *kebele* (the lowest administrative unit). However, the education sector was stretched to the limit with no additional available resources, and, as a result, the quality of education was compromised, rendering the education provided of limited relevance (MOE, 1994).

Although there has been a remarkable improvement in the rate of primary school enrolment during the last decade (from 35 per cent in 1997/98 to 65 per cent in 2003/04), there are still wide disparities between regions; the overall ratio of boys to girls is still high in rural areas (approximately 20 percentage points although there are marked regional variations); the urban/rural difference is still significant; many concerns about the quality of education persist and the primary completion rate is significantly lower than primary enrolment (MOFED, 2002a).

In order to solve these problems and in recognition of the instrumental role that education plays in social development and poverty reduction (MOE, 1994), the first multi-year Education Sector Development Plan (1997) initiated a range of programmes. These included increasing the number of and upgrading existing school buildings[3], expanding teacher training programmes, introduction of automatic promotion for grades 1-3, use of local languages as the teaching medium,

[3] In order to cater to the special needs of pastoral communities, there is a plan to build boarding schools and hostels in Afar, Somali, Benishangul/Gumuz, SNNPR and Oromia regions. Low cost schools and multi-grade village schools will be established in settlement areas.

development of context-appropriate primary school syllabi and textbooks[4], and the elimination of school fees. Quality assessment mechanisms have also been introduced: a Minimum Learning Competency Guideline (MLCG) and a National Education Assessment (NEA) are being developed to assess standards at each level in all subjects.

These policy efforts notwithstanding, the first Ethiopian Educational Sector Development Programme (ESDP I) midterm review report shows that while progress has been made in expanding enrolment, educational quality has deteriorated, particularly in terms of the curriculum (which sacrifices breadth for depth). For example, while gross enrolment in grades 1-8 has increased from 34.7 per cent in 1996/97 to 57.4 per cent in 2001/02, on the other side, the drop-out rate for the same grades (1-8) went from 15.7 per cent to 17.8 per cent over the same period (MOE, 2002). This has become a puzzle for the education sector in that while enrolment is growing, poor retention is off-setting the gains and resulting in a continued disparity between gross enrolment rates and primary completion rate (ibid).

Financing concerns further exacerbate efforts to address Ethiopia's educational crisis. The sector is heavily dependent on external assistance, making it vulnerable to changes in donor policy, delays in transferring funds and failure to fulfil commitments[5]. That is, although the government officially allocates 13.4 per cent of its total expenditure to education, it has been able to cover only 64 per cent of the total education budget for the period 2002/03-2004/05. For the rest, it relies on Heavily Indebted Poor Countries (HIPC) debt relief (3.6 per cent), available and expected external loans and assistance (10.3 per cent) and community contributions of 1.6 per cent (MOE, 2002). That is, the education sector budget deficit amounts to 31.4 per cent.

Given these problems, the likelihood of achieving the ESDP's goal of achieving Millennium Development Goal Number X of universal primary education by 2015 through the current formal education system does not seem high. It is therefore essential that other alternatives are explored. While much effort has been put into

[4] The ESDP stated that the Ministry of Education would aim to print and distribute a total of 37.4 million textbooks in order to attain a student-textbook ratio of one-to-one.
[5] While donors transferred only 50 per cent of what they had committed, the government has fulfilled all its budget commitments (MOE, 2001).

increasing accessibility to education from the supply side, not much emphasis has been given to the out-of-school factors that influence access to school. The objective of this paper is, therefore, to establish a link between micro-level outcomes and macro-level policy initiatives with respect to primary school enrolment and poverty reduction, and to investigate the relative importance of factors associated with child enrolment. The paper specifically deals with the relatively under-researched external (household and community-level) factors affecting child enrolment (such as lack of income, child labour, economic shocks, social capital and parents' education) as opposed to internal (school-related) factors such as improving the quality of teachers and the syllabus of primary grades. By drawing on the Young Lives' sample of 1,000 eight-year-olds from 20 sentinel sites (20 locations in 12 rural and 8 urban areas ), it will contribute a more comprehensive analysis of the determinants of child school enrolment in Ethiopia. Specifically, it will analyse the relative importance and interactive impact of economic, infrastructural, educational and household composition factors, as well as three key issues that have not been discussed in the literature to date: the relative importance of the average level of education of female compared to male adults in the household; the interactive impact of economic shocks on household livelihoods and child enrolment (which may hinder households' capacity to invest in child schooling); and social capital.

The paper is organised as follows. In section two the literature review begins with a brief overview of child primary school enrolment and the key education policies in Ethiopia. It then provides a thematic review of the key factors influencing child enrolment in the developing world and specifically in Ethiopia. The methodology of the paper is described in section three. Section four presents the descriptive statistics and the results of the univariate and multivariate analyses drawing on the livelihoods framework[6] on the determinants of child enrolment. Finally, a summary of the results and their policy implications are provided in section five.

[6] The Sustainable Livelihoods Framework is based on the assumption that individuals and households aim at sustaining their livelihoods through maintaining or increasing their assets (which can include financial, human, social and natural capital). Poverty can, thus, be seen as a situation in which an individual or a household fails to maintain their assets and becomes vulnerable to shocks. The framework emphasises the centrality of assets, rather than capital, in understanding poverty (Lockwood, 2001).

# 2. Literature review

## 2.1 School enrolment status of Ethiopian children

Although primary school enrolment has been increasing in recent years, Ethiopia still has one of the lowest enrolment rates in the developing world, even by sub-Saharan African standards, as seen in Table 2.1 below.[7] Moreover, enrolment rates decline significantly as the school grade level increases (Table 2.2).

**Table 2.1: Trend in GPER 1970-96 and NPER 1999**

| Region | 1970 | 1982 | 1993 | 1996 | 1999 | |
|---|---|---|---|---|---|---|
| | GPER | GPER | GPER | GPER | GPER | NPER |
| Developing countries | 79 | 95 | 107 | 108 | - | - |
| East Asia and Pacific | 88 | 111 | 118 | 118 | 106 | 92 |
| Latin America and Caribbean | 99 | 105 | 109 | 114 | 132 | 97 |
| Middle East and North Africa | 68 | 91 | 95 | 94 | 94 | 83 |
| South Africa | 67 | 77 | 97 | 101 | 101 | 79 |
| Sub-Saharan Africa | 50 | 74 | 68 | 74 | 79 | 54 |
| Ethiopia | 16 | 36 | 26 | 35 | 59 | 34 |

Source: Befekadu et. al., 2002; GPER: gross primary enrolment ratio; NPER: net primary enrolment ratio[8]

Available evidence also indicates that there are wide differences between rural and urban areas and between sexes (Mulat, 1997; Befekadu et al., 2002; Seyoum, 1986). In 1995/96, 91 per cent of eligible students at primary level were enrolled in urban areas, while the corresponding figure for rural areas was only 18 per cent (Mulat, 1997). The significant difference in participation rate between males and females (Table 2.2) is attributed to, among others, religious and traditional values and practices that discourage female education. These factors are more widely observed in rural areas (Mulat, 1997; Seyoum, 1986).

[7] Although enrolment rates are improving (admittedly from a low base), the level of enrolment per se does not guarantee that there will be an improvement in education unless it is matched by a sustainable quality of education. Evidence suggests that the quality of education (at all levels) was deteriorating until 2001 and the dramatic increment in enrolment since then(though still low compared to other countries) has resulted in further deterioration in output (for details see Befekadu et al., 2002: 258-96).

[8] Gross primary enrolment ratio is the total number of children in primary school as a proportion of children of official primary school age; net primary enrolment ratio is the total number of children enrolled who are of official school age for that level, as a percentage of the population of official school age for that level. GPER in excess of 100 per cent can be indicative of discrepancies in school and census data, late enrolment in school or children repeating years.

**Table 2.2: Participation in education (as percentage of relevant age groups)**

| Academic year | Primary | | | Secondary | | |
|---|---|---|---|---|---|---|
| | Males | Females | Total | Males | Females | Total |
| 1994/95 | 31.7 | 20.4 | 26.2 | 7.5 | 5.7 | 6.6 |
| 1995/96 | 36.6 | 22.7 | 30.1 | 9.3 | 7.0 | 8.1 |
| 1996/97 | 43.0 | 26.0 | 34.7 | 9.9 | 7.0 | 8.4 |
| 1997/98 | 52.0 | 31.2 | 41.8 | 10.3 | 7.4 | 8.9 |
| 1998/99 | 55.9 | 35.3 | 45.8 | 11.3 | 8.0 | 9.7 |

Source: Educational statistical abstracts (MOE, various years)

There are also considerable regional differences with regard to the growth in enrolment during the years 1995-2001, both in terms of absolute number of primary school enrolments and GPER (see Table 2.3).

**Table 2.3: Comparison of relative achievement in GPER across regions (%)**

| Region | GPER 1995 | GPER 2001 | Change 1995-2001 | Average annual growth rate 1995-2001 |
|---|---|---|---|---|
| Tigray | 43.7 | 73.9 | 69 | 9.2 |
| Afar | 8.4 | 11.5 | 37 | 5.4 |
| Amhara | 17.9 | 53.3 | 198 | 19.9 |
| Oromia | 21.2 | 57.9 | 173 | 18.2 |
| Somali | 11.6 | 10.6 | -9 | -1.5 |
| B/Gumuz | 35.4 | 88.5 | 150 | 16.5 |
| SNNP | 28.8 | 63.8 | 122 | 14.2 |
| Gambella | 53.9 | 95.8 | 78 | 10.1 |
| Harari | 53.4 | 105.3 | 97 | 12.0 |
| Addis Ababa | 84.9 | 118.3 | 39 | 5.7 |
| Dire Dawa | 41.0 | 75.7 | 85 | 10.8 |
| Regional total | 26.2 | 57.4 | 119 | 14.0 |

Source: Befekadu et al., 2002 (Complied from MoE statistics)

Given such wide variation, the national average of GPER is somewhat misleading. More specifically, in terms of percentage changes between 1995 and 2001, the regions with highest achievement were Amhara (198 per cent), Oromia (173 per cent), Benishangul Gumuz (150 per cent) and SNNP (122 per cent), where GPER in

2001 was more than twice that of 1995. In contrast, Somali (–9 per cent),[9] Afar (37 per cent) and Addis Ababa (39 per cent) are regions with low performance. In the first two cases, both regional states suffer from a lack of stability, high levels of corruption, and have large concentrations of nomadic peoples. In the latter case the comparatively low annual growth in Addis Ababa is primarily due to high initial enrolment (84.9 per cent).

The net primary enrolment rates are higher for urban areas than for rural areas in all regions as seen in Table 2.4. Although nationally, there are still more boys enrolled than girls in rural areas, gender differences across regions were surprisingly mixed. In Tigray, Amhara and Addis Ababa regions the female enrolment rate was slightly higher than that for males in rural areas, while in Afar the NPER was substantially higher for rural female children. In Amhara, Oromia, Somali, Benishangul, Gambella and Addis Ababa, female NPER was slightly higher than that of their male counterparts in urban areas, but significantly lower in rural areas in Oramia, Somali, Benishangul, SNNP, Gambella, Harari and Dire Dawa.

**Table 2.4: Net primary enrolment rate in Ethiopia 1999/2000 (by region, residence and sex)**

| Region | NPER | | | | |
|---|---|---|---|---|---|
| | Urban | | Rural | | |
| | Male | Female | Male | Female | All |
| Tigray | 75.28 | 74.62 | 22.89 | 29.71 | 33.59 |
| Afar | 70.47 | 68.67 | 5.22 | 13.89 | 17.94 |
| Amhara | 74.78 | 82.35 | 28.08 | 31.71 | 34.25 |
| Oromia | 76.12 | 77.10 | 32.17 | 22.63 | 32.44 |
| Somali | 40.15 | 43.06 | 9.30 | 3.80 | 19.06 |
| Benishangul | 83.07 | 85.82 | 54.36 | 28.78 | 44.68 |
| SNNP | 70.00 | 57.61 | 33.65 | 21.17 | 29.99 |
| Gambella | 73.95 | 79.32 | 74.39 | 60.68 | 69.62 |
| Harari | 86.40 | 83.71 | 57.58 | 38.28 | 66.57 |
| Addis Ababa | 78.41 | 79.43 | 32.08 | 35.45 | 77.89 |
| Dire Dawa | 78.52 | 59.74 | 26.61 | 10.05 | 51.76 |
| Ethiopia | 74.10 | 74.80 | 30.70 | 25.20 | 33.80 |

Source: MoFED (2002b)

[9] In the case of Somali, GPER in 2001 was lower than in 1995, falling by 9 per cent.

Although clearly more research is needed to understand these regional disparities[10], part of the variation appears to be explained by distance to school. The 1999/2000 Welfare Monitoring Survey (MOFED, 2002b) indicated that while the average distance to elementary schools for the country is three kilometres, a quarter of the population lives four or more kilometres away from primary schools. The figures are higher for rural areas than for urban areas. Regional variation, which is presented in Table 2.5, is relatively small, except for Afar and Somali where the mean distance from primary schools to household residences is 1.16 and 0.49 km respectively greater than the region with the next highest distance. At the opposite end of the scale are the urban regions, like Addis Ababa, Harari and Dire Dawa, with a mean distance of around one kilometre. However, compared to 1995/96, there has been a marked improvement. The average distance to a primary school in 1995/96 for the whole country was 3.8 km, while for rural areas the figure was 4.3 km and a quarter of the total Ethiopian population was living six or more kilometres away from primary schools.

**Table 2.5: Mean distance to reach public schools in 1999/2000 by region**

| Region | Primary school | Secondary school |
|---|---|---|
| Tigray | 3.44 | 20.89 |
| Afar | 4.60 | 29.41 |
| Amhara | 3.23 | 22.69 |
| Oromia | 3.16 | 20.46 |
| Somali | 3.93 | 20.95 |
| Benishangul | 3.13 | 20.92 |
| SNNP | 2.63 | 15.10 |
| Gambella | 2.43 | 12.03 |
| Harari | 0.93 | 5.05 |
| Addis Ababa | 0.86 | 1.93 |
| Dire Dawa | 1.14 | 7.64 |
| Ethiopia | 3.00 | 19.25 |
| Rural | 3.8 | 21.9 |
| Urban | 0.73 | 3.47 |

Source: MOFED 2002b

[10] Forthcoming work by Young Lives based on 2005 fieldwork will attempt to analyse some of the factors involved.

## 2.2 Determinants of child school enrolment

The literature on access to child schooling in developing countries has placed varying emphases on (a) economic factors, including the level of household income, vulnerability to household economic shocks and the use of child labour, (b) the accessibility of schools in terms of time and cost of travel as well as safety (especially for girl children), (c) the relative importance of parental education, (d) household composition, as well as perceived usefulness of schooling, whereby parents are often willing to make enormous sacrifices for schooling they feel will give their children a better future. Each of these is now discussed.

**Economic factors**

The decision whether or not to send a child to school depends on the direct and indirect costs involved for the household (see Mulat, 1997; Cockburn, 2001; Pal, 2001; Duraisamy, 2000; Tietjen, 1998). Indirect costs include loss of unpaid farm labour and household chores when children go to school. For example, Tietjen (1998) indicated that in rural Ethiopia, girls not in school work on average 14-16 hours a day, mainly engaged in household tasks such as fetching water, boiling coffee, preparing meals, winnowing and transporting grains, while boys are engaged in activities such as ploughing, herding cattle, cutting grass and feeding cattle. Therefore, much of the housework (for girls) and farm work (for boys) will be lost if they are sent to school (Befekadu et al., 2002).

The direct costs include clothing (the social expectation, according to Tietjen, for children attending school is to have higher quality clothing), book rentals and school fees. In relation to these direct costs, Mulat (1997) and Duraisamy (2000) indicated that parents in rural areas are very sensitive to small charges for schooling which results in a more than proportionate school drop-out rate.

Education can also be seen as a consumer good (i.e, valued for its own sake) and as an investment good (being one component of human capital) that will provide future financial returns. In this vein, Tietjen's (1998) findings show that parents believe child schooling results in the betterment of children's lives – and indirectly their own lives – through the skills and knowledge children accumulate, and a better chance of higher earning capacity. Therefore, economic considerations will influence the parents'

decision regarding their children's enrolment (for example, Mulat, 1997; Tietjen, 1998; Duraisamy, 2000; Cockburn, 2001). Based on a sample of rural Ethiopian communities, Tietjen (1998) found that parents' primary reason for educating children was 'to secure skills that would lead to employment or opportunities for a good job' – a job that not only improves the livelihood of the child but also assists the parents (or the family) economically. Most of the parents interviewed thought their children's education would serve as security in their old age. In light of this, parents overwhelmingly favour boys' education, for the reason that the return on investment in their sons' education is more tangible because the son remains at home when he marries, while a daughter moves far away, implying that the investment in her education cannot be retained by her parents. In a nutshell, authors of this school of thought argue that parents consider the net benefit they gain from children's enrolment by looking at the trade-offs between earning income in the future and losing income now. For this reason the quality of education is very important.

However, for very poor countries we also need to consider the so-called poverty hypothesis. While wealthy households can afford to send their children to school since they can buy clothes, pay school fees, and feed their children, if people are poor they might simply be unable to afford to send their children to school. Shapiro and Tambashe (2001) found that increased economic wellbeing translates into greater investment in children's education for both females and males in Kinshasa, Congo. However, this poverty hypothesis may only work in poor areas or rural areas where income is the most limiting factor for decisions. In a multi-country comparison, Ersado (2003) found a discrepancy between urban and rural areas in the poverty hypothesis of child schooling, finding that while poverty drives schooling decisions in rural areas it does not appear to significantly influence schooling in urban areas.

In this context, child labour is a key concern. Many studies worldwide indicate that child labour, as a factor that reduces child schooling, emerges from the poorest households (Basu and Van, 1998). However, other studies have shown that children of land-rich/livestock-rich people are more likely to be working, instead of being in school, than children of land-poor/livestock-poor households, indicating that asset ownership and child schooling could be negatively or positively related, depending on the household's economic circumstances. This phenomenon is called the wealth paradox (Bhalotra and Heady, 2003). The reason for the wealth paradox has been investigated in several studies. Ranjan (1999, 2001), Jafarey and Lahiri (2002), for

example, showed theoretically that credit market imperfections could result in child labour and low enrolment of children in school. Labour market imperfections could also promote child labour and its negative impact on child schooling (Bhalotra and Heady, 2003).

Ownership of production assets such as land and livestock can also affect child schooling in various ways. It can have a positive effect on schooling because larger asset holding may allow households to forgo the income that child work brings. However, in the absence of a perfect labour market, land and livestock ownership can also have the opposite effect on child schooling and child labour. Owners of land and livestock who are able to hire productive labour may have an incentive to employ their children instead of sending them to school. Similarly, if households do not have access to credit or if they cannot use their assets as collateral to access credit to employ labour, they are more likely to use their children's labour instead. In the Ethiopian context, Cockburn (2001) found that while land quality increases the relative probability of children's enrolment, ownership of small livestock reduces the probability of school attendance among younger boys. This is because child labour is traditionally more important for cattle rearing than for crop production activities. It could also be because cattle farmers are credit constrained and hired labour cannot be used as a substitute for family (child) labour. In the same vein, distance to the nearest source of water reduces school attendance among girls (see Cockburn, 2001: 18-30 for details), presumably because it is largely girls who traditionally fetch water for the household.

In sum, we have to consider both the income effect (income contribution of the asset itself) and the productivity effect (if access to the asset raises the returns from child work). The income effect tends to increase child enrolment (and reduce child work) while the productivity effect tends to reduce child enrolment (and increase child labour). This relationship, however, may be disrupted by economic shocks such as crop failures, drought and illness, which can act against parental willingness to enrol and keep children in school (Tietjen, 1998). In such cases, children are often required to work and supplement the household income and shortfalls in production. If food shortages (resulting from the shocks) become acute, children might be forced to migrate with parents in search of work and food (Tietjen, 1998), leading to discontinuity of schooling or unwillingness to enrol children at all.

**Accessibility of schools**

The demand for education is also likely to be influenced by the distance between the household and the school, as those living farther away from primary school may face higher opportunity (time) and direct (transport) costs. A number of studies have found that the distance to primary school negatively affects the demand for school, with a stronger negative impact for rural children and females (World Bank, 1996; Befekadu et al., 2002; Mulat, 1997). This problem is aggravated in rural Ethiopia due to the scattered pattern of settlements. Access to secondary schools is also very limited in rural Ethiopia (secondary education is mainly an urban phenomenon) discouraging child enrolment in rural primary schools in the first place (Befekadu et al., 2002). Some studies indicate that girls face an additional problem of security on their way to school, especially in terms of risk of rape and abduction (Tansel, 1997).

**Parental education**

It has been repeatedly demonstrated that a strong predictor of children's education is parents' educational achievement (Tietjen, 1998; Cockburn, 2001; Duraisamy, 2000; Mulat, 1997; and Pal, 2001). For instance, with a sample size of 540 households, Tietjen found in rural Ethiopia that the simple correlation coefficient between parents' combined educational level and household primary enrolment ratio was found to be positive and significant at 1 per cent, but very low in magnitude (0.11). He admits that the correlation coefficient reported in many other studies is 0.3 or higher but the low correlation in his study could be due to the generally limited level of parental education in rural Ethiopia. Duraisamy (2000) from a study in India, Pal (2001) in Peru and Cockburn (2001) in Ethiopia, arrived at similar conclusions. Ersado (2003) found that, in both urban and rural areas in Ethiopia, adults' educational level is an essential factor in education, making a significant contribution to improvement in the likelihood that children stay at school. Furthermore, Duraisamy (2000) and Mulat (1997) reported that mother's education (as compared to father's education) exerts a much stronger effect of increasing children's enrolment. The relatively low correlation between parents' educational status and school enrolment reported by Tietjen (ibid), suggests that other factors may be working in the Ethiopian context and warrant further investigation.

**Household composition**

Schooling of children can be affected by the size and composition of the family. Rosati and Rossi (2003) found in Pakistan and Nicaragua that an additional child in the household negatively affects the enrolment rate of children in school. In the Ethiopian context, Mulat (1997) argued that having more children within a family *increases* the probability of enrolment, assuming other factors are held constant, implying that the probability of going to school declines for households with fewer children. This counter-intuitive finding is partly explained by some of the complex associations between family structure and schooling outlined below. Shapiro and Tambashe (2001) found that family structure (as measured by the number of children in the household in different age groups) and a child's relationship to the head of the household also had a significant influence on investment in children's education. Cockburn (2001), using Ethiopian data, found that there are schooling biases in favour of the firstborn child, that is, the likelihood of attending school tends to increase with the presence of younger siblings, suggesting a birth order effect. He also suggested that children of the head of the household are more likely to attend school than boys or girls who are more distant relatives or unrelated to the head of the household. Overall, a number of studies indicate that children are more likely to be enrolled in school in female-headed households than in male-headed households (Mulat, 1997; Duraisamy, 2000; Cockburn, 2001), which may be because they believe educating their children is a means of reducing old-age poverty.

**The importance of school quality**

Schooling is generally associated with earnings, both in the developed and in the developing world. Generally this relationship reflects a causal impact of schooling on productivity and therefore on earnings. Most estimates of schooling, however, merely depict it as 'quantity' in terms of years of schooling. However, if there are substantial variations in the 'quality of schooling', failure to control for it in earnings functions estimates may cause biases in the estimated returns to schooling.

Behrman and Birdshall (1983) raise several questions about the adequacy of the standard approach in understanding the schooling-earnings relation in order to provide a basis for policy. The standard argument is that there are high returns to

expanding primary schooling in developing countries. Quality of schooling has not been ignored, but the trade-off between further expansion and the possibly more efficient use of resources to improve quality has not been emphasised. Using data for Brazil, Behrman and Birdshall estimate a much lower social return to expanding primary years of schooling once quality is taken into account and indicate that 'deepening' schooling by increasing quality has a higher social rate of return than 'broadening' schooling by increasing quantity. If these results can be generalised for other countries, the conventional wisdom on schooling investments in developing countries may cause substantial over-investment of resources in schooling with the wrong composition of investments being undertaken.

Along the same lines, many studies of the determinants of economic growth rates across countries use a measure of schooling quantity, such as mean secondary school enrolment rates, to proxy for the rate of human capital accumulation. This approach ignores the contribution of schooling quality. Neri (2001) finds that differences in schooling quality across countries are probably more important than differences in schooling quantity in explaining variations in economic growth rates.

To show the impact of school quality on earnings capacity and educational outcomes, two studies analysing the quality of schools for black children during apartheid in South Africa show that the lack of resource allocation to improve educational inputs (primarily measured through pupil-teacher ratios) negatively impacted on enrolment, educational achievement and test scores for numeracy (Case and Deaton, 1999). Additionally, given that during apartheid blacks faced extremely limited residential and school choices, and that black schools' funding and staffing decisions were made rather arbitrarily, the findings show that the quality of schools in a given district had a large and significant effect on the rate of return to schooling for black men from that district (Case and Yogo, 1999).

Card and Krueger (1992) use a composite index - the pupil/teacher ratio, average term length, and relative teacher pay - to estimate the effects of school quality on the rate of return to education for men born between 1920 and 1949 in the United States. Using earnings data from the 1980 census, the authors find that men who were educated in states with higher-quality schools had a higher return to additional years of schooling. Rates of return were also higher for individuals from states with better-educated teachers and with a higher fraction of female teachers. Similarly, Lee and

Barro (1997), find that that more school resources - especially smaller class sizes, higher teacher salaries and greater school length - enhance educational outcomes.

## 3. Methods

### 3.1 The study population

This paper uses data from a 2002 survey of eight-year-old children in the Young Lives' study of childhood poverty in Ethiopia. This is part of a larger international study involving Ethiopia and Peru, Vietnam and India. In Ethiopia, the survey of eight-year-olds covers 1,001 children aged 7.5 to 8.5 years (mean age 8 years) of whom 51 per cent are males and 48 per cent females.

The data were collected from 20 sentinel sites in five regions, namely, Addis Ababa, Oromia, SNNP, Amhara and Tigray. These regions were chosen partly for logistic reasons (very remote or inaccessible areas being excluded) but also because they contain the majority of the Ethiopian population (96 per cent). Within regions, sentinel sites targeted poor areas based on the government's food insecurity designation. Three out of four sentinel sites in each region are in high food deficit *woredas* (districts) and one is from a lower food deficit *woreda*. Consequently, the sentinel sites over-sampled the poor but included a degree of variation for comparative purposes. The sentinel sites were distributed over the five regions in such a way that Amhara, Oromia and Tigray had 20 per cent of the sample each while SNNP had 25 per cent and Addis Ababa 15 per cent. Forty per cent of the children were from urban areas and the remaining 60 per cent from rural areas.

### 3.2 Analysis

Both descriptive and multivariate analyses were used to explore the correlations between children's enrolment in school and household wealth index, parents' education, social capital, economic shocks and ownership of land, among other factors. Data were initially captured using a Microsoft Access database and analysis conducted using Stata version 8 and SPSS 12.0. The descriptive method of analysis includes cross tabulation between pairs of variables (the probability of a child being enrolled in primary school and its potential determinants) and conducting Pearson's

chi-squared test ($\chi^2$) to test the null hypothesis that the pairs of variables are independent of each other. The multivariate analysis used a probit model to examine factors influencing whether a child is enrolled in primary school or not.

# 4. Results

## 4.1 Descriptive statistics

Descriptive statistics of the relevant variables for this study are presented in Tables 4.1 and 4.2.[11] The highest educational grade completed by the eight-year-old children was four. Although many of the children had not been in school long enough to complete any grades (33 per cent), a significant number had already completed grade one (21 per cent) and two (9.6 per cent), with a few having completed grade three or four (2.3 per cent). This result was consistent with the 28 per cent who reported children starting school before the child was seven years old (the official school entry age). About 3 per cent of the eight-year-old children worked for money or goods, according to their caregivers instead of attending school.

**Table 4.1: Descriptive statistics of dichotomous variables**

| | Per cent |
|---|---|
| Male children | 51 |
| From Amhara | 20 |
| From Oromia | 20 |
| From SNNP | 25 |
| From Tigray | 20 |
| From Addis Ababa | 15 |
| From urban areas | 40 |
| Children involved in paid work (caregiver's response) | 4 |
| Children involved in paid work (child's response ) | 9 |
| Households in the sample whose welfare has decreased due to considerable economic change(s) in the last three years | 78 |
| Households in the sample which own or rent land | 41 |
| Male heads of household | 76 |
| Households in the sample which own livestock | 70 |
| Children involved in household chores (caregiver's response) | 67 |

*Number of observations is 1,000.*

[11] For full details of the household and child characteristics see the Young Lives Preliminary Country Report for Ethiopia (Alemu et al., 2003) or www.younglives.org.

**Table 4.2: Descriptive statistics of continuous variables**

| | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| Highest grade completed by child | 0 | 4 | 0.48 | 0.77 |
| Household size | 2 | 16 | 6.42 | 2.16 |
| Years of schooling of mother | 0 | 13 | 2.05 | 1.07 |
| Years of schooling of father | 0 | 16 | 2.83 | 4.02 |
| Wealth index* | 0.01 | 0.77 | 0.17 | 0.16 |
| Social support (number of individuals and groups from which the caregiver receives any kind of support)* | 0 | 12 | 2.42 | 2.64 |
| Average number of bad events over the last three years* | 0 | 11 | 2.33 | 1.94 |
| Cognitive social capital (caregiver's perceptions of the local community)* | 0 | 4 | 3.49 | 0.79 |
| Absolute structural social capital (based on the number of groups caregiver is a member of)* | 0 | 7 | 1.60 | 1.21 |
| Citizenship (based on whether or not the caregiver has worked with others in the community to address a common issue)* | 0 | 2 | 0.80 | 0.84 |
| Hours the child works on household chores | 1 | 12 | 1.54 | 1.99 |
| Mean distance from community to primary school (in km) | 0.5 | 9.17 | 2.52 | 2.87 |

*Number of observations is 1,000. * For definitions of wealth index, social capital and economic shocks see the Young Lives Preliminary Country Report (Alemu et al., 2003). See also Tables A8 and A9 in the appendix for the definition of wealth index and social capital, respectively.*

## 4.2 Univariate analysis of factors related to children's enrolment in school

This sub-section presents results of cross tabulations of whether the child was currently enrolled in school against those variables that are expected to be correlated with enrolment, based on the literature. The summary of cross tabulation analysis is presented in Tables 4.3 and 4.4. The following variables have a statistically significant association with school enrolment of eight-year-old children (at the 1 per cent level or less): location (urban/rural), poverty status (wealth index), years of mother's schooling, ownership of land, absolute household size, paid and unpaid child labour, number of economic shocks, and absolute structural social capital. Contrary to what is reported in the findings of other studies, female-headed households were slightly less likely to enrol their child in school but this was not significant at the 5 per cent level ($p = 0.066$). Cognitive social capital and citizenship were not statistically correlated with enrolment of the child. The distance to primary schools had a significant negative relationship with enrolment. In our sample, there

was a small difference between enrolment rates for boys and girls but this was not statistically significant (Table 4.3).

**Table 4.3: Pearson's chi-square test for the determinants of child enrolment in school**

| Variable | Sign of relationship | Pearson's $\chi^2$ test statistics | Degrees of freedom | Prob>$\chi^2$ (P-Value) |
|---|---|---|---|---|
| Location (1 if urban and 0 if rural) | (+) | 7.61 | 1 | 0.000*** |
| Wealth index (three categories) | (+) | 147.03 | 2 | 0.000*** |
| Years of mother's schooling | (+) | 56.8 | 14 | 0.000*** |
| Years of father's schooling | (+) | 31.9 | 15 | 0.007*** |
| Cognitive social capital | (+) | 1.76 | 4 | 0.780 |
| Citizenship | (+) | 0.19 | 2 | 0.912 |
| Ownership of land | (-) | 76.82 | 1 | 0.000*** |
| Ownership of livestock | (-) | 29.30 | 1 | 0.000*** |
| Household size | (-) | 22.00 | 12 | 0.000*** |
| Did the child do paid work? (caregiver's response) | (-) | 15.52 | | 0.000*** |
| Hours child spends on household chores (caregiver's response) | (-) | 51.73 | 12 | 0.000*** |
| Number of economic shocks | (-) | 62.65 | 9 | 0.000*** |
| Absolute structural social capital | (-) | 27.41 | 7 | 0.000*** |
| Social support received | (-) | 21.69 | 12 | 0.041** |
| Sex of head of household (1 if female) | (-) | 3.30 | 1 | 0.066* |
| Cognitive social capital | (+) | 1.76 | 4 | 0.780 |
| Citizenship | (+) | 0.19 | 2 | 0.912 |
| Sex of child (1 if male) | (-) | 1.65 | 1 | 0.194 |
| Did the child do paid work? (child's response) | (-) | 0.57 | 1 | 0.452 |
| Region | | 60.14 | 4 | 0.000*** |

- *significant at 10%; ** significant at 5%; *** significant at 1%; P-value is the lowest significance level at which the null hypothesis is rejected.*

**Table 4.4: Children enrolled in school by sex of child**

| Sex | Not in school | In school |
|---|---|---|
| Female | 31.22 | 68.78 |
| Male | 35.10 | 64.90 |

Pearson $\chi^2$ (1) = 1.6907 p = 0.194

The validity of the identified relationships is limited, based on simple cross tabulations, since there is no control over the effects of other associated (confounding) factors. Multivariate techniques were used to control for potential confounders and produce a more complete picture.

## 4.3 Multivariate analysis of factors related to children's enrolment in school

To assess the determinants of a child being sent to school, two versions of a probit model were estimated. Guided by the literature and the results of the univariate analysis, these models were used to test the hypothesis that human capital, including parents' education, financial capital, including economic shocks and child labour[12], physical capital, measured by access to schools (proxied by distance), and social capital, are correlated with a child's likelihood of enrolment[13]. Confounding factors such as the sex of the child and the head of the household, region, and household size (disaggregated by age) were included as explanatory variables. The detailed results of the estimations are presented in Tables A1 to A6, in Appendix A.[14]

Results from the probit model of a child being in school (a dichotomous variable with a value 1 when a child is in school and 0 if she/he is not) are extracted and presented in Table 4.5

[12] Child labour is potentially an endogenous variable. It could jointly determine whether or not a child goes to school. This type of endogeneity problem required instrumental variables estimation method. However, given the cross sectional nature of the data, it has been very difficult to find good instruments to correct for the endogeneity of child labour.

[13] Please note that we recognise that a livelihoods framework does not fully capture the complexities for child enrolment, especially with regard to child labour and accessibility of schools.

[14] We used the following order of estimation in the probit model. First a model with all explanatory variables is estimated. Then we conducted a likelihood ratio test to see if the coefficients of some of the variables whose *t*-values are less than one are jointly zero. The null hypothesis that the coefficients are jointly zero cannot be rejected. Hence we run a restricted model with variables whose t-values are greater than or equal to 1 in the first model. A test for multicollinearity was conducted. We did not find a serious problem of multicollinearity (see Appendix 1). Belsley, Kuh and Welsch (1980) suggest that condition number in excess of a value 20 is indicative of multicollinearity; and according to Gujarati (1995) we should not worry about multicollinearity if the mean variable inflation factor is less than two. To account for heteroscedasticity, we use robust estimation method in which the standard errors are corrected for heteroscedasticty of unknown form. Our interpretation of the result is based on the restricted model.

**Table 4.5: Determinants of a child being in school (estimated using a probit model)**

| Explanatory variables | Marginal effect | Quasi-elasticity[+] |
|---|---|---|
| Dummy for male child | -0.035 | -0.018 |
| | (1.16) | |
| Dummy for Amhara Region | 0.146*** | 0.029 |
| | (3.58) | |
| Dummy for SNNP Region | -0.078* | -0.019 |
| | (1.79) | |
| Dummy for urban residence | 0.123* | 0.049 |
| | (1.94) | |
| Wealth index consumer durable | 1.075*** | 0.188 |
| | (5.07) | |
| HH Size b/n the age of 5 and 15 | -0.026* | -0.042 |
| | (1.82) | |
| HH Size above the age of 15 | -0.030** | -0.087 |
| | (2.40) | |
| Maximum grades completed by male members of a HH | 0.012** | 0.061 |
| | (2.48) | |
| Maximum grades completed by female members of a HH | 0.017*** | 0.073 |
| | (3.13) | |
| Number of events that decreases the HH welfare | -0.020** | -0.048 |
| | (2.49) | |
| Cognitive social capital | 0.046** | 0.160 |
| | (2.38) | |
| Absolute structural social capital | -0.029** | -0.046 |
| | (2.19) | |
| Dummy for HH owns or rents land | 0.175*** | 0.104 |
| | (3.12) | |
| Dummy for the ownership of livestock | -0.072* | -0.051 |
| | (1.83) | |
| Dummy for a child being involved in paid work | -0.113** | -0.010 |
| | (2.11) | |
| Number of hours a child spent on HH chores | -0.015** | -0.023 |
| | (1.97) | |
| Mean distance (km) to public and private primary schools1 | -0.018*** | -0.046 |
| | (2.61) | |

*Robust t statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%*

See Tables A1 and A2 for details of the estimated results; [+] Quasi-elasticity measures a change in the probability of a child being enrolled in primary school when a given explanatory variable changes by one per cent.

**Human capital**

Parents' education is potentially an important determinant of child school attendance since it is assumed that educated parents are more able to recognise the long-term benefits of education and thereby try to help their children to have a better education. Equally importantly, educated parents may derive more satisfaction from educated children than illiterate parents.

The gender of the parent may also play an important role. Al-Samarrai and Peasgood (1998), for example, argue that in the Tanzanian context mothers may have stronger preference than fathers for sending their children to school, and in particular on the enrolment of girls (Glick and Sahn, 2000). As their own education increases, mothers' bargaining power within the household to follow through on these preferences also improves (Al-Samarrai and Peasgood, 1998).

To explore these issues, the highest school grade completed by male and female members of a household and the highest grade completed by the mother and father were used as explanatory variables in a probit regression model (see details in Appendix A, Table A1 and A2). Controlling for other factors, we found that both the maximum level of education of male and female members of a household have a statistically significant, positive effect on the probability of a child being in school.

When we ran separate regressions for male and female children, we found that mother's education had a positive, but not statistically significant effect on the enrolment of male children only, while the effect of father's education was not significant for either sex. The same result was observed regarding the effect of the maximum level of education of female and male household members, with the aggregate educational level of female members having a positive and insignificant effect on the school enrolment of male children.

In terms of urban/rural differences, we found that the influence of a mother's education had a positive and statistically significant effect on the probability of a child being in school only in urban areas. However, the effect of the maximum educational level of male and female members on child school enrolment was statistically insignificant in both rural and urban areas.

There were marked regional differences in the impact of maximum schooling of male and female members on the probability of a child being in school. The maximum education level of female members had a significant positive effect in all regions except in Amhara while only in the Tigray region did the maximum education level of male members show a significant positive effect on child school enrolment.

Household composition, disaggregated by sex, did not show any significant effects on enrolment. However, household composition disaggregated by age had a differential impact on child enrolment. The greater the number of children in the household between the ages of 5 and 15 and the greater the number of household members above 15 years old had a negative and significant effect on child enrolment. This result suggests that parents who have many school-age children cannot afford to send them all to school because more young children means more competition for resources. Our finding about adult members is more puzzling: in theory one would expect that more adult members would result in greater income and remittances to pay for school costs but this was not the case in our sentinel sites. One possible explanation for this puzzling result could be that the adult members are not generating enough income to help children because of lack of employment opportunities and small farm sizes.

The effect of birth order (which is highly correlated with household size with an order of 0.72 correlation coefficient) was also found to be statistically significant and negatively correlated with the probability of a child being enrolled, indicating that the chance of a child being sent to school is less when there are more children/members above the age of the index child.

**Financial capital**

We found that the wealth of a household (as measured by the Young Lives' wealth index)[15] had a positive and statistically significant association with the probability of a child being enrolled in primary school. The ownership of land, which is not included in our wealth index, also had a positive effect on the probability of a child being sent to school, reinforcing the conclusion that wealth, or at least a lower level of absolute poverty, is an important factor for increasing child school enrolment. However,

[15] See Alemu et al., 2003.

ownership of livestock was found to be negatively associated with child enrolment, probably because children's labour[16] is normally used for herding cattle. This result lends support to the idea of the wealth paradox observed in Pakistan and Ghana (Bhalotra and Heady, 2003). That is, if households cannot get credit and hire labour, or if hired labour cannot be a substitute for family labour, the ownership of a livestock asset can result in increased demand for child labour. Given that many people do not have access to credit in Ethiopia (Woldehanna, 2000), it is not surprising to see such a paradox demonstrated here.

The effect of wealth on child enrolment in school is positive and significant for both male and female children, but only in rural areas. Wealth as measured by consumer durables (proxied by the Young Lives' wealth index) is not the main determinant of child enrolment in urban areas (similar to the result observed by Ersado, 2003). The regional difference in the wealth effect on child enrolment is worth noting. Wealth has a significant and positive effect on child enrolment in Amhara, Oromia, Tigray and SNNP, but not in Addis Ababa, where access to public schooling is largely not determined by wealth because public schools are not far from many of the residents' home.

The probability of a child being enrolled is negatively related to their being involved in paid farm and non-farm work and in household chores. The effects are statistically significant for both paid work and household chores. The effect of livestock ownership on child enrolment in school is negative in the Amhara region indicating that children in Amhara are less likely to go to school because they are involved in livestock herding. Although requiring further research, this is possibly because there are more livestock per household but restricted access to grazing and thus children are required to follow the cattle. In Addis Ababa, the probability of children's enrolment declines when children are more involved in household chores.

The effect of unpaid child labour (household chores) on school enrolment is negative and statistically significant for male children only, while the effect of livestock ownership is negative and statistically significant on female children only. This result seems surprising given the fact that female children are more involved in household chores than male children and male children are more involved in livestock herding

[16] While child labour should strictly be regarded as an element of human or social capital in this context, its use is so intimately related to wealth that it is discussed here.

than female children in Ethiopia. More research is clearly needed to unpack this seeming paradox.

The involvement of children in paid work and household chores has a more significant negative effect in rural areas than in urban areas. Children's labour is in greater demand in rural areas for farm work, off-farm work (i.e, farm-related but not on family-owned land), livestock herding and household chores, and linked to the time-consuming nature of fuel wood collection, fetching water, food preparation and farm work in rural areas, which increases the demand for children to do household chores.

The more shocks a household faces, the lower the probability that the household sends its child to school. This result is statistically highly significant. The effect is more pronounced for rural areas and in the case of male children. This is perhaps because male children are more likely to be required to generate income during economic shocks than female children and shocks are more prevalent in rural areas than in urban areas. Of all the regions, the effect of economic shocks on children's enrolment is most pronounced in Tigray where there is a relatively more frequent drought.

**Physical capital**

For children not attending school, along with the burden of education-related costs and the need for children's labour to supplement the household economy, distance was found to be one of the most common explanatory factors. In the multivariate analysis the greater the distance from the household, the lower the probability that parents send their children to primary school. This effect is more pronounced and statistically significant for girls and rural areas. Anecdotal evidence indicates that there is greater concern for girls' safety while travelling to and from school since they are vulnerable to physical and sexual violence. In urban areas distance to schools was not found to be a determining factor for children's enrolment.

**Social capital**

There has been relatively little discussion in the literature about the impact of social capital on education and educational outcomes. We hypothesise that social capital

(i.e, the formal and informal relationships among individuals and communities and the relationship of trust and tolerance involved) may help to improve child schooling in two possible ways. First, it may involve the communication of information and the raising of awareness about the importance of child schooling. When a market is constrained by information flow between economic agents, social capital may help in facilitating communication between them. Civil associations and networks of interpersonal social relations facilitate information flows and thereby help to reduce information asymmetries. In doing so, social capital could help to solve the problem of limited communication. Second, social capital might have a complementary effect on government efforts to build schools and encourage enrolment. More specifically, in communities with stronger social capital we could hypothesise that communities might pressure local, regional and national government to invest more resources in schools and schooling.

Cognitive social capital (reflecting caregiver's perception of the local community in terms of trust, self-esteem, 'belongingness', perception of people's co-operation and being used by others) has a positive and significant effect on the probability of a child being enrolled. In contrast, absolute structural social capital (as defined by citizens' participation in community groups) had a negative and significant influence on child enrolment. This result might not be surprising, as the most frequent form of structural social capital in our sample was membership of religious groups, which given their conservative tendencies in the Ethiopian context, could be related to resistance to modern education (see further discussion in section 5). Citizenship (defined as 'whether or not the caregiver has worked with others in the community to address a common issue' (Alemu et al., 2003)) and social support (defined as 'whether or not the caregiver received support in the year before the survey period (2002)' (Alemu et al., 2003)) were found to be positively associated with child enrolment, but none of these variables was statistically significant at the 5 or 10 per cent level.

## 4.4 Interaction effects

According to livelihoods theory, ownership of household assets of various kinds may reduce households' overall vulnerability to natural and human-made disasters (DFID, 1999; Lockwood, 2001). To test this hypothesis, we used the interaction of asset variables (such as cognitive social capital, absolute structural social capital, ownership of livestock and land) with a variable for shocks in our regression analysis. However, none of these interacting variables had a statistically significant correlation

with child school enrolment, perhaps because the social capital people own is so traditional that it does not contribute much to the acquisition of economic assets (livestock) and to reducing vulnerability to area-wide shocks.

### 4.5 Relative magnitude of the impacts

The relative importance of variables is assessed using quasi-elasticity estimates as shown in the last column of Table 4.5. The most important factors for child enrolment were wealth, cognitive social capital, ownership of land, adult household size, females' education, males' education, and ownership of livestock. This result is contrary to a previous study that indicated that adult education has a weak correlation with child schooling (Tietjen, 2001). Maximum male adult education has less effect than that of the female members in terms of both magnitude and statistical significance. Table A3 also indicated that mother's education has a stronger effect than father's education on child enrolment in primary schooling although neither of them is statistically significant. Among the social capital variables, cognitive social capital has the strongest effect on child schooling.

## 5. Summary of results and policy implications

### **5**.1 Summary of results

The paper has examined the external factors that impact on school enrolment by poor children.[17] The multivariate analysis robustly indicated that wealth/levels of asset holding, cognitive social capital, the level of adult female education and ownership of land had a positive impact on whether eight-year-old children were enrolled at school. In terms of the relative impact of these variables, the household's wealth level was the most important factor, followed by cognitive social capital (levels of trust and reciprocity), the maximum level of education attained by female adults in the household, ownership or rental of land, and the maximum level of education attained by male adults in the household, in declining magnitude. By contrast, child enrolment was found to be negatively associated with the following variables, in declining

[17] As with all cross-sectional studies, causality cannot be attributed to the associations found in this paper. In addition, the over sampling of poor respondents for the Young Lives' study means that these results can not be generalised to the population of Ethiopia as a whole but are indicative of the situation of poor children.

magnitude: the number of household members over the age of 15 years, ownership of livestock, the number of events/shocks that decreased household welfare, the mean distance to primary schools, absolute structural social capital (i.e, the number of community groups of which the caregiver is a member), the number of children aged between 5 and 15 years in the household, the number of hours per day the child spends on household chores and whether or not the child is involved in paid work.

### 5.2.1 Implications for education policy

Our findings suggest that increasing child enrolment in school - a key policy goal of the SDPRP and the ESDP - will necessitate more targeted educational policies, especially in order to address significant disparities between boys and girls and among children in different regions of Ethiopia.

First, because distance is one of the major factors that affects enrolment, especially for rural children and girls, policy initiatives are needed that improve the proximity of schools in remote parts of the country and simultaneously address safety issues for girl children. While the most obvious policy option is to build more schools and develop a standard for equitable distribution of schools in a region or a *Woreda* on the basis of acceptable distance (considering the topographic constraints) children could travel to school[18], cost constraints represent a significant obstacle. That is, while the programme cost for ESDP II is 15.1 billion Birr, the actual budget fixed for the programme was only 11.5 billion Birr, and the budget shortfall was *expected* to be covered by reducing unit costs (MOE, 2002). Another more realistic option is to develop lower-cost alternative education programmes in under-provisioned areas, which following the successful pilots by NGOs in several regions of the country are now being rolled out by the Ministry of Education.

Indeed such alternative education programmes not only address educational infrastructural shortcomings, but also help to address another issue that arose from our findings, namely that of finding a balance between the demands for children's labour (paid or unpaid) and school enrolment. Yet while the ESDP and SDPRP recognised non-formal education programmes as a policy priority, budget

commitments remain low (MOE, 2002). The exceptions are the Amhara and Oromia regions where such programmes have been introduced with reasonable coverage (personal communication with the head of Amhara Region Bureau of Education)[19]. If the government is to achieve the educational Millennium Development Goal of universal primary education by 2015, it should consider expansion of ABEs to all the regions, *Woreda* and communities, with special emphasis on marginalised areas.

Given the strong positive association between female adult education and child enrolment, girls' education clearly has multi-purpose effects and investing in girls' education today at all costs (apart from education being a right on its own) is an investment in ensuring educated future mothers. In addition, our findings underscore the importance of (re)introducing adult literacy programmes, especially for women. While the government has a number of adult and non-formal education programmes –programmes for out-of-school children aged 7-14, literacy programmes for young people and adults over the age of 15, and basic skills training for young people and adults – there are no specific programmes targeting female adult education. The dearth of such programmes needs to be addressed, given the strong positive association found here between adult female education and child enrolment. The case for investing in formal female education is further strengthened by the positive association between maternal education and child health and nutritional wellbeing (Christiaensen and Alderman, 2004).

However, while female adult education has a generally positive impact on child schooling, we found a more significant impact on boys' schooling than on girls'. As discussed earlier there are several possible reasons: in the short term, girls are needed to help with household chores and childcare work, and thus mothers are likely to be less supportive of education for girls as they depend on daughters' unpaid labour. In the longer term, investing in boys' education will reap direct benefits when they reach adulthood and are expected to support the family through paid

[18] For example, the 2002 Health Sector Development Program mandates that there should be a health clinic in a 10 km radius of every village.

[19] NGOs such as Save the Children UK, the Save the Children Alliance members (Sweden, Norway, Denmark and USA), Action Aid and others have piloted Alternative Basic Education (ABE) in different parts of the country and have tried to influence regional governments to institutionalise it. It is cheaper to expand non-formal education than the formal First Cycle schools and, being more flexible, ABE may be better able to accommodate children's needs in poor communities. Currently concerned NGOs and the Ministry of Education are working to ensure that these ABE programmes integrate with the formal system so a child could continue in the formal system after attending ABE.

employment. Daughters by contrast marry into another family and the fruits of their labours benefit another family.

This suggests then that it is not sufficient to simply rely on the argument that more educated mothers lead to greater school enrolment, but given the differential gender impact, focused government policy initiatives to boost girls' enrolment and attendance are called for. While there is an expressed commitment on the part of the government in the Education and Training Policy, SDPRP, Population Policy and Social Welfare Policy, to enhance girls' education in the country, a collaborative and inter-sectoral approach needs to be developed in order to give the urgent issue of improving girls' education the importance it deserves. Possible measures could include advocacy campaigns to encourage greater sharing of household tasks among all family members; the introduction of technology to save burdensome household tasks; the enforcement of the family law (which prohibits early marriage, i.e, under 18 years of age); and empowerment programmes for women (including adult literacy classes), which could potentially have a spill-over impact on the aggregate wealth of the household and children's educational attainment.

### 5.2.2 Implications for inter-sectoral policy

Given that our findings demonstrated that child enrolment is shaped by a number of external household livelihoods and community variables, achieving universal primary education is clearly also going to necessitate broader inter-sectoral policy initiatives. This section therefore discusses the economic and social policy implications of our findings.

Not surprisingly, we found that children from wealthier households (using household durable assets as a proxy for income) have a better chance of going to school than children from asset-poor households. We may therefore assume that policies geared towards wealth creation opportunities for poor households should raise the chances of child enrolment. Yet because children in poor households play a major role in augmenting household income, the returns from child work will also need to be substituted from another source such as increased parental income. Therefore policies directed towards increasing the income and assets of poor households should consider the impact that it will have on human development in terms of child schooling.

One of the central pillars of the Ethiopian PRSP, however, is the so-called Agricultural Development-Led Industrialisation Strategy, which being based on labour-intensive agricultural activity, is likely to increase the demand for child labour (MOFED, 2002b). Premised on the argument that in a capital-deficit country, such as Ethiopia, the alternative route to growth is the use of abundantly available labour (MOI, 2002), ADLI overlooks the role of children in the household economy. That is, adding extra activities to the household, without a change in technology or the capacity to use hired adult labour, increases the likelihood of children's greater involvement in agriculture and/or household reproductive responsibilities (such as childcare or domestic work) to compensate for the involvement of women or older siblings in non-domestic labour at the expense of their (the children's) right to education and the future of the country[20] (ILO Convention 138).

Several specific policy initiatives could help mitigate these problems. First, the introduction of more time-efficient methods of keeping animals would help reduce the time children spend in tending livestock. There are a number of possibilities including:

- preparing a sufficiently sizeable package of forage packages so as to reduce children's daily burden of taking animals to grazing areas;
- developing a shift system so children can balance school and work;
- reducing the number of cattle kept by households and encouraging a shift in focus from quantity to quality as is the case in the Harari region.
- providing enclosures for common grazing land where either pooled community labour (as is the case in Guraghe in the south of Ethiopia) or hired adult labour could be used to keep animals from different households and thereby release children to go to school. Such a strategy could be integrated within the agricultural extension system.

The ADLI strategy also envisages growth in household income will lead to improved standards of living and in turn rising demand for social services, including education (MOI, 2002). However, without simultaneous investment by parents and the public in children's education (human capital) now, growth will be unsustainable, if not impossible.

[20] The effect on girls would be stronger if mothers were engaged in day-long income generating activities away from the home because girls would have to take over their mothers' domestic role at home: providing care for younger children, fetching water, cleaning the house, cooking meals, etc. In these circumstances girls would lose their chance of going to school or be withdrawn, if they were in school, because they would have to replace their mothers in caring for younger siblings.

To ensure long-term benefits for children, a balance has to be created between work and education where working hours are minimised while at the same time maximising opportunities for other activities such as education and leisure. One good example is the recently launched joint donor-government conditional safety net initiative in food insecure areas. This safety net will cover food insecure households, and will involve food or cash transfers on the condition that the children are sent to school.

In addition to such food security measures, given the important negative impact of household economic shocks in our research, we would also underline the importance of developing policies and strategies that build up a household's resilience to events such as crop failure, reduced availability of food or a loss of livestock. Important here will be measures to reduce a household's dependence on rain and a single source of income, creating safety nets to mitigate the effects of shocks and making services (including markets and road infrastructure) accessible.

Lastly, our findings about social capital, suggest that the involvement of the broader community in promoting child education could be potentially important, but still requires further research to fully understand the underlying mechanisms. Our initial hypothesis, however, is that the main local organisations of which most caregivers are members, such as funeral societies, religious groups, and community groups, currently have a negative impact on schooling as they are more likely to reinforce conservative social ties, beliefs and values (see Table A7). In other words, the assumption that absolute structural social capital facilitates information exchange among members has not been supported by our data. Yet, rather than concluding that group membership will not be able to play a positive future role in facilitating school enrolment, it could be argued that such groups lack the necessary information and awareness about educational services as they are mutually disadvantaged. The policy implication therefore would be to take advantage of the relatively large membership of religious and traditional community organisations to facilitate information sharing. Initiatives should be promoted to make information accessible to local groups and organisations about the importance of education and the availability of formal and non-formal educational services through community radio, civil society organisations, such as NGOs, and through government consultations, especially *Woreda* administrations.

## References


Alemu, T, G Asgedom, J Liebenberg, A Mekonnen, J Seager, B. Tefera and T Woldehanna. (2003). *Young Lives Preliminary Country Report: Ethiopia*, London, Young Lives

Al-Samarrai, S and T Peasgood. (1998). 'Educational attainment and household characteristics in Tanzania', *Economics of Education Review*, 17(4), 395-417

Basu, K and P H Van. (1998). 'The economics of child labor', *American Economic Review*, 88(3), 412-27

Befekadu, D, N Berhanu and T Getahun. (2002). *Annual Report on the Ethiopian Economy*, Addis Ababa, United Printers

Behrman, J and N Birdshall. (1983).The Quality of Schooling: Quantity alone is misleading, *The American Economic Review*, 73(5), December

Belsley, D, E Kuh and R Welsh. (1980). *Regression Diagnostics*, New York, John Wiley and Sons

Bhalotra, S and C Heady. (2003). 'Child farm labour: The wealth paradox', *The World Bank Economic Review*, 17, 197-227

Camillo, F and M Rossi. (2003). 'Children's Working Hours and School Enrollment: Evidence from Pakistan and Nicaragua'. *The World Bank Economic Review* 17(2), 283-295

Card, D and A Krueger. (1992). 'Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States', *Journal of Political Economy*, 100(1), 1-40, Chicago, University of Chicago Press

Case, A and A Deaton. (1999). 'School Inputs and Educational Outcomes In South Africa', *The Quarterly Journal of Economics*, 114(3), 1047-1084, MIT Press

Case, A and M Yogo. (1999). *Does School Quality Matter? Returns to Education and the Characteristics of Schools in South Africa*, NBER Working Papers 7399, National Bureau of Economic Research, Inc

Christiaensen, L and H Alderman. (2004). 'Child malnutrition in Ethiopia: Can maternal knowledge augment the role of income?', *Economic Development and Cultural Change*, 52(2), 287-312

Cockburn, J. (2001). *Child Labour Versus Education: Poverty constraint or income opportunity?* Centre for the Study for African Economies (CSAE), Oxford, Oxford University

CSA. (2004). 'Ethiopia Child Labour Survey', *Statistical Bulletin* 262

Department for International Development (DFID) (1999) Sustainable Livelihoods and Poverty Elimination. Background briefing, 9 November, 1999. Retrieved from URL www.livelihoods.org/info/docs/de99bbfg.htm

Duraisamy, M. (2000). *Child Schooling and Child Work in India*, Indian Institute of Technology, http://fmwww.bc.edu/RePEc/es2000/0837.pdf

Ersado, L. (2003). *Child Labor and School Decisions in Urban and Rural Areas: Cross-country evidence*, IFPRI Discussion Paper 145

Glick, P and D E Sahn. (2000), 'Schooling of girls and boys in a West African country: The effect of parental education, income and household structure', *Economics of Education Review,* 19(1), 63-87

Greene, W H. (1997). *Econometric Analysis*, 4th edition, London, Prentice-Hall International (UK) Limited

Gujarati, D N. (1995). *Basic Econometrics*, 3rd Edition. New York, NY, McGraw Hill, Inc.

Jafarey, S and S Lahiri. (2002). 'Will trade sanctions reduce child labour? The role of credit markets', *Journal of Development Economics*, 68, 137-56

Lee, J W and R Barro. (1997). *Schooling Quality in a Cross Section of Countries*, NBER Working Papers 6198, National Bureau of Economic Research, Inc

Lockwood, M. (2001). *Childhood poverty: A conceptual framework and research agenda*, non-published memo

Ministry of Education (MOE). (1994). *Education and Training Policy*, Federal Democratic Republic of Ethiopia, Addis Ababa, Ministry of Education

Ministry of Education (MOE). (2001). *Midterm Review of the Education Sector Programme Phase I*, Addis Ababa, Ministry of Education

Ministry of Education (MOE). (2002). *Education Sector Development Programme II* (ESDP II), Addis Ababa, Ministry of Education

Ministry of Finance and Economic Development (MOFED). (2002a). *Ethiopia: Sustainable Development and Poverty Reduction Strategy*, Addis Ababa

Ministry of Finance and Economic Development (MOFED). (2002b). *Poverty Profile of Ethiopia*, March, Addis Ababa

Ministry of Information. (2002). *Rural Development Policies and Strategies*, Addis Ababa, Government of Federal Democratic Republic of Ethiopia, Ministry of Information

Mulat, D. (1997). *Demand for Education and Returns to Investment in Education in Ethiopia*. Proceedings of the Seventh Annual Conference on the Ethiopian Economy on Human Resources Development held on 28-30 November 1997, Ethiopia, Nazareth

Neri, F. (2001). *Schooling Quality and Economic Growth*, Economics Working Papers wp 01-06, University of Wollongong, School of Economics and Information Systems

Pal, S. (2001). *Child Schooling in Peru: Further Evidence from Sequential Analysis of School Progression*. http://econwpa.wustl.edu:80/eps/lab/papers/0309/0309001.pdf

Ranjan, P. (1999). 'An economic analysis of child labor', *Economics Letters*, 64, 99-105

Ranjan, P. (2001). 'Credit constraints and the phenomenon of child labour', *Journal of Development Economics*, 64, 81-102

Roberts, J. (2003). *Poverty Reduction Outcomes in Education and Health Public Expenditure and Aid*, Working Paper 210, London, Overseas Development Institute

Rosati, F C and M Rossi. (2003). *Children's Working Hours and School Enrollment: Evidence from Pakistan and Nicaragua (July 2003)*, CEIS Tor Vergata - Research Paper Series No. 25, http://ssrn.com/abstract=428520

Seyoum, T. (1986).'The education of women in Ethiopia. A missing piece in the development puzzle', *The Ethiopian Journal of Education*, X(2):5-19.

Shapiro, D and B O Tambashe. (2001). 'Gender, poverty, family structure, and investments in children's education in Kinshasa, Congo', *Economics of Education Review*, 20, 359-75

Tansel, A. (1997). 'School attainment, parental education and gender in Côte d'Ivoire and Ghana', *Economic Development and Cultural Change*, 45(4), 825-56

Tietjen, K. (1998). *The Demand for Primary Education in Rural Ethiopia*, USAID, Health and Human Resource Analysis for Africa Technical Paper No. 87

Woldehanna, T. (2000), *Economic Analysis and Policy Implications of Farm and Off-Farm Employment: A case study in the Tigray region of northern Ethiopia*, Mansholt Studies 18

World Bank. (1996). Beyond Poverty: How supply factors influence girls' education in Guinea: Issues and Strategies, Report No. 14488-GUI, Washington, World Bank

# Appendix

### Output of probit models estimations

**Table A1: Determinants of a child being in school: probit model (dep. var. = if the child is in school)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Probit regression of full model | Marginal effect for Probit regression of full model | Probit regression restricted model | Marginal effect for Probit regression of restricted model |
| Dummy for male child | -0.109 | -0.036 | -0.106 | -0.035 |
| | (1.19) | (1.19) | (1.16) | (1.16) |
| Dummy for Amhara Region | 0.497* | 0.148* | 0.487*** | 0.146*** |
| | (1.89) | (1.89) | (3.58) | (3.58) |
| Dummy for Oromia Region | -0.030 | -0.010 | | |
| | (0.14) | (0.14) | | |
| Dummy for SNNP Region | -0.296 | -0.102 | -0.227* | -0.078* |
| | (1.37) | (1.37) | (1.79) | (1.79) |
| Dummy for Tigray Region | -0.128 | -0.043 | | |
| | (0.53) | (0.53) | | |
| Dummy for urban residence | 0.380* | 0.123* | 0.382* | 0.123* |
| | (1.89) | (1.89) | (1.94) | (1.94) |
| Wealth index consumer durable | 3.205*** | 1.062*** | 3.244*** | 1.075*** |
| | (4.86) | (4.86) | (5.07) | (5.07) |
| HH size below 5 yrs old | 0.027 | 0.009 | | |
| | (0.46) | (0.46) | | |
| HH size b/n the age of 5 and 15 | -0.083* | -0.028* | -0.077* | -0.026* |
| | (1.92) | (1.92) | (1.82) | (1.82) |
| HH size above the age of 15 | -0.099** | -0.033** | -0.092** | -0.030** |
| | (2.47) | (2.47) | (2.40) | (2.40) |
| Maximum grades completed by male members of a HH | 0.035** | 0.012** | 0.037** | 0.012** |
| | (2.32) | (2.32) | (2.48) | (2.48) |
| Maximum grades completed by female members of a HH | 0.053*** | 0.018*** | 0.052*** | 0.017*** |
| | (3.17) | (3.17) | (3.13) | (3.13) |
| Dummy for male HH head | 0.064 | 0.022 | | |
| | (0.49) | (0.49) | | |
| Number of events that decreases the HH welfare | -0.056** | -0.019** | -0.062** | -0.020** |
| | (2.25) | (2.25) | (2.49) | (2.49) |
| Cognitive social capital | 0.141** | 0.047** | 0.138** | 0.046** |
| | (2.43) | (2.43) | (2.38) | (2.38) |
| Absolute structural social capital | -0.058 | -0.019 | -0.087** | -0.029** |
| | (1.21) | (1.21) | (2.19) | (2.19) |
| No. of organisations from which one gets social support | -0.032 | -0.011 | | |
| | (1.21) | (1.21) | | |
| Citizenship | 0.102 | 0.034 | | |
| | (0.97) | (0.97) | | |
| Dummy for HH owns or rents land | 0.544*** | 0.184*** | 0.517*** | 0.175*** |
| | (3.16) | (3.16) | (3.12) | (3.12) |
| Dummy for the ownership of livestock | -0.237* | -0.076* | -0.223* | -0.072* |
| | (1.91) | (1.91) | (1.83) | (1.83) |
| Dummy for a child being involved in paid work | -0.303** | -0.107** | -0.318** | -0.113** |
| | (1.97) | (1.97) | (2.11) | (2.11) |
| Number of hours a child spent on HH chores | -0.044** | -0.015** | -0.045** | -0.015** |
| | (1.97) | (1.97) | (1.97) | (1.97) |
| Mean distance (km) to public and private primary schools | -0.062** | -0.021** | -0.055*** | -0.018*** |
| | (2.38) | (2.38) | (2.61) | (2.61) |
| Constant | -0.244 | | -0.229 | |
| | (0.71) | | (0.74) | |
| Observations | 1000 | 1000 | 1000 | 1000 |
| Pseudo $R^2$ | 0.215 | | 0.213 | |
| Condition number | 14.7 | | 11.9 | |
| Test of restriction | | | $\chi2(5) = 1.75$ Prob>$\chi2(5) = 0.88$ | |

*Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.*

A full model means a model run with all potential variables included; and restricted model means a model run without variables for which the t-values are less than one in the full model. Marginal effect measures a change in the probability of a child being enrolled in primary school when a given explanatory variable changes by one unit.

**Table A2: Determinants of a child being in school: probit model (dep. var. = if the child is in school) with mothers' and fathers' schooling as explanatory variables**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Probit regression of full model | Marginal effect for Probit regression of full model | Probit regression of restricted model | Marginal effect Probit regression of restricted model |
| Dummy for male child | -0.100 | -0.033 | -0.090 | -0.030 |
| | (1.10) | (1.10) | (0.99) | (0.99) |
| Dummy for Amhara Region | 0.533** | 0.159** | 0.552*** | 0.164*** |
| | (2.04) | (2.04) | (3.86) | (3.86) |
| Dummy for Oromia Region | -0.021 | -0.007 | | |
| | (0.10) | (0.10) | | |
| Dummy for SNNP Region | -0.261 | -0.090 | -0.222* | -0.077* |
| | (1.20) | (1.20) | (1.72) | (1.72) |
| Dummy for Tigray Region | -0.117 | -0.040 | | |
| | (0.49) | (0.49) | | |
| Dummy for urban residence | 0.448** | 0.145** | 0.441** | 0.143** |
| | (2.24) | (2.24) | (2.24) | (2.24) |
| Wealth index consumer durable | 3.614*** | 1.208*** | 3.570*** | 1.195*** |
| | (5.41) | (5.41) | (5.61) | (5.61) |
| HH size below 5 yrs old | 0.021 | 0.007 | | |
| | (0.38) | (0.38) | | |
| HH size b/n the age of 5 and 15 | -0.036 | -0.012 | | |
| | (0.86) | (0.86) | | |
| HH size above the age of 15 | -0.032 | -0.011 | | |
| | (0.82) | (0.82) | | |
| Grades completed by the father of a child | 0.006 | 0.002 | | |
| | (0.32) | (0.32) | | |
| Grades completed by the mother of a child | 0.025 | 0.008 | 0.025 | 0.008 |
| | (1.21) | (1.21) | (1.27) | (1.27) |
| Dummy for male HH head | 0.076 | 0.026 | | |
| | (0.55) | (0.55) | | |
| Number of events that decreases the HH welfare | -0.056** | -0.019** | -0.055** | -0.019** |
| | (2.27) | (2.27) | (2.24) | (2.24) |

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Probit regression of full model | Marginal effect for Probit regression of full model | Probit regression of restricted model | Marginal effect Probit regression of restricted model |
| Cognitive social capital | 0.133** | 0.045** | 0.130** | 0.043** |
| | (2.32) | (2.32) | (2.25) | (2.25) |
| Absolute structural social capital | -0.050 | -0.017 | -0.048 | -0.016 |
| | (1.06) | (1.06) | (1.03) | (1.03) |
| No. of organisations from which one gets social support | -0.030 | -0.010 | -0.026 | -0.009 |
| | (1.14) | (1.14) | (1.05) | (1.05) |
| Citizenship | 0.101 | 0.034 | | |
| | (0.97) | (0.97) | | |
| Dummy for HH owns or rents land | 0.528*** | 0.180*** | 0.511*** | 0.174*** |
| | (3.10) | (3.10) | (3.11) | (3.11) |
| Dummy for the ownership of livestock | -0.247** | -0.080** | -0.217* | -0.071* |
| | (2.02) | (2.02) | (1.79) | (1.79) |
| Dummy for a child being involved in paid work | -0.285* | -0.101* | -0.273* | -0.097* |
| | (1.88) | (1.88) | (1.82) | (1.82) |
| Number of hours a child spent on HH chores | -0.050** | -0.017** | -0.052** | -0.017** |
| | (2.25) | (2.25) | (2.34) | (2.34) |
| Mean distance (km) to public and private primary schools | -0.065** | -0.022** | -0.069*** | -0.023*** |
| | (2.52) | (2.52) | (3.04) | (3.04) |
| Birth order | | | -0.054** | -0.018** |
| | | | (2.05) | (2.05) |
| Constant | -0.274 | | -0.151 | |
| | (0.80) | | (0.49) | |
| Observations | 1000 | 1000 | 1000 | 1000 |
| Pseudo $R^2$ | 0.213 | | 0.203 | |
| Condition number | 14.7 | | 11.9 | |
| Test of restriction | | $\chi^2(8) = 3.52$<br>$Prob>\chi^2(8) = 0.897$ | | |

*Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.*

A full model means a model run with all potential variables included; and restricted model means a model run without variables for which the t-values are less than one in the full model. Marginal effect measures a change in the probability of a child being enrolled in primary school when a given explanatory variable changes by one unit.

**Table A3: Determinants of a child being enrolled in school by rural/urban residence (probit)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Urban** | **Rural** | **Urban** | **Rural** |
| Dummy for male child | 0.036 | -0.149 | -0.015 | -0.128 |
| | (0.18) | (1.35) | (0.08) | (1.17) |
| Dummy for Amhara Region | 0.746 | | 0.715 | |
| | (1.46) | | (1.41) | |
| Dummy for SNNP Region | -0.952*** | -0.573** | -0.857*** | -0.534** |
| | (3.84) | (2.52) | (3.64) | (2.35) |
| Wealth index consumer durable | 1.252 | 5.465*** | 2.040** | 5.833*** |
| | (1.39) | (5.66) | (2.28) | (5.98) |
| HH size below 5 yrs old | 0.120 | -0.017 | 0.104 | -0.020 |
| | (0.83) | (0.25) | (0.74) | (0.30) |
| HH size b/n the age of 5 and 15 | -0.061 | -0.071 | 0.015 | -0.039 |
| | (0.72) | (1.35) | (0.19) | (0.77) |
| HH size above the age of 15 | -0.050 | -0.123** | 0.063 | -0.080 |
| | (0.66) | (2.27) | (0.84) | (1.54) |
| Maximum grades completed by male members of a HH | 0.050 | 0.028 | | |
| | (1.59) | (1.50) | | |
| Maximum grades completed by female members of a HH | 0.100*** | 0.032 | | |
| | (3.10) | (1.46) | | |
| Dummy for male HH head | 0.234 | 0.070 | 0.243 | 0.107 |
| | (0.99) | (0.38) | (0.88) | (0.58) |
| Number of events that decreases the HH welfare | 0.118* | -0.063** | 0.105 | -0.062** |
| | (1.73) | (2.11) | (1.55) | (2.08) |
| Cognitive social capital | 0.030 | 0.154** | -0.001 | 0.152** |
| | (0.24) | (2.02) | (0.01) | (2.00) |
| Absolute structural social capital | -0.013 | -0.063 | -0.007 | -0.054 |
| | (0.11) | (1.09) | (0.06) | (0.93) |
| No. of organisations from which one gets social support | -0.054 | -0.042 | -0.032 | -0.044 |
| | (0.70) | (1.39) | (0.42) | (1.45) |
| Citizenship | -0.043 | 0.141 | -0.030 | 0.137 |
| | (0.18) | (1.11) | (0.13) | (1.08) |
| Dummy for HH owns or rents land | 0.138 | 0.477** | 0.069 | 0.483** |
| | (0.32) | (2.22) | (0.17) | (2.25) |
| Dummy for the ownership of livestock | -0.514** | -0.121 | -0.534** | -0.115 |
| | (2.32) | (0.70) | (2.49) | (0.67) |
| Dummy for a child being involved in paid work | 0.019 | -0.302* | 0.196 | -0.288 |
| | (0.03) | (1.72) | (0.33) | (1.64) |
| Number of hours a child spent on HH chores | -0.020 | -0.054** | -0.060 | -0.056** |
| | (0.28) | (2.12) | (0.86) | (2.20) |
| Mean distance (km) to public and private primary schools | 0.048 | -0.057** | 0.060 | -0.060** |
| | (0.40) | (2.12) | (0.53) | (2.22) |
| Dummy for Oromia Region | | -0.662*** | | -0.680*** |
| | | (3.41) | | (3.58) |
| Dummy for Tigray Region | | -0.916*** | | -0.959*** |
| | | (4.38) | | (4.51) |
| Grades completed by the father of a child | | | 0.002 | -0.018 |
| | | | (0.05) | (0.74) |
| Grades completed by the mother of a child | | | 0.042 | 0.032 |
| | | | (1.34) | (0.98) |
| Constant | 0.232 | 0.275 | 0.378 | 0.236 |
| | (0.39) | (0.67) | (0.66) | (0.57) |
| Observations | 350 | 600 | 350 | 600 |
| Pseudo R2 | 0.226 | 0.113 | 0.181 | 0.107 |

*Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. For the urban model, +50 observations from Oromia dropped because it perfectly predicts the model (all children are enrolled in urban Oromia). Dummy for Tigray dropped because of perfect multicollinearity. For the rural model, dummy for Amhara Region dropped because of perfect multicollinearity.*
A full model means a model run with all potential variables included; and restricted model means a model run without variables for which the t-values are less than one in the full model. Marginal effect measures a change in the probability of a child being enrolled in primary school when a given explanatory variable changes by one unit.

**Table A4:. Determinants of a child being enrolled in school by sex of child (probit model)**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | **Male children** | **Female children** | **Male children** | **Female children** |
| Dummy for Amhara Region | 0.440 | 0.806** | 0.449 | 0.648* |
| | (1.23) | (2.12) | (1.24) | (1.68) |
| Dummy for Oromia Region | 0.141 | -0.151 | 0.146 | -0.237 |
| | (0.45) | (0.45) | (0.46) | (0.69) |
| Dummy for SNNP Region | 0.172 | -0.674** | 0.138 | -0.756** |
| | (0.59) | (2.19) | (0.47) | (2.37) |
| Dummy for Tigray Region | 0.012 | -0.217 | 0.079 | -0.325 |
| | (0.04) | (0.59) | (0.23) | (0.86) |
| Dummy for urban residence | 0.637** | 0.313 | 0.587** | 0.226 |
| | (2.14) | (0.99) | (1.96) | (0.71) |
| Wealth index consumer durable | 4.436*** | 3.051*** | 3.775*** | 2.749*** |
| | (4.90) | (3.33) | (4.25) | (2.95) |
| HH size below 5 yrs old | -0.046 | 0.064 | -0.063 | 0.083 |
| | (0.56) | (0.76) | (0.76) | (0.97) |
| HH size b/n the age of 5 and 15 | -0.087 | -0.013 | -0.115* | -0.094 |
| | (1.49) | (0.21) | (1.90) | (1.47) |
| HH size above the age of 15 | -0.102* | 0.031 | -0.134** | -0.091 |
| | (1.81) | (0.53) | (2.28) | (1.48) |
| Grades completed by the father of a child | -0.024 | 0.048 | | |
| | (0.98) | (1.60) | | |
| Grades completed by the mother of a child | 0.007 | 0.048 | | |
| | (0.23) | (1.35) | | |
| Dummy for male HH head | 0.407* | -0.202 | 0.301 | -0.080 |
| | (1.95) | (1.00) | (1.51) | (0.41) |
| Number of events that decreases the HH welfare | -0.062* | -0.054 | -0.061* | -0.056 |
| | (1.69) | (1.41) | (1.68) | (1.43) |
| Cognitive social capital | 0.113 | 0.161* | 0.111 | 0.167* |
| | (1.33) | (1.78) | (1.31) | (1.78) |
| Absolute structural social capital | -0.166** | 0.053 | -0.190*** | 0.064 |
| | (2.37) | (0.74) | (2.69) | (0.88) |
| No. of organisations from which one gets social support | 0.018 | -0.078* | 0.017 | -0.079* |
| | (0.48) | (1.92) | (0.46) | (1.92) |
| Citizenship | -0.039 | 0.323** | -0.018 | 0.292* |
| | (0.27) | (1.98) | (0.13) | (1.78) |
| Dummy for HH owns or rents land | 0.515** | 0.607** | 0.501** | 0.675** |
| | (2.03) | (2.27) | (1.97) | (2.52) |
| Dummy for the ownership of livestock | -0.150 | -0.380** | -0.122 | -0.404** |
| | (0.87) | (1.99) | (0.71) | (2.08) |
| Dummy for a child being involved in paid work | -0.201 | -0.312 | -0.207 | -0.362 |
| | (0.93) | (1.19) | (0.96) | (1.37) |
| Number of hours a child spent on HH chores | -0.060* | -0.032 | -0.053 | -0.027 |
| | (1.79) | (0.93) | (1.59) | (0.78) |
| Mean distance (km) to public and private primary schools | -0.027 | -0.111*** | -0.028 | -0.107*** |
| | (0.78) | (2.89) | (0.80) | (2.78) |
| Maximum grades completed by male members of a HH | | | 0.030 | 0.044* |
| | | | (1.40) | (1.88) |
| Maximum grades completed by female members of a HH | | | 0.034 | 0.091*** |
| | | | (1.44) | (3.26) |
| Constant | -0.453 | -0.324 | -0.408 | -0.196 |
| | (0.87) | (0.61) | (0.78) | (0.36) |
| Observations | 510 | 490 | 510 | 490 |
| Pseudo R2 | 0.215 | 0.231 | 0.221 | 0.247 |

*Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.*

**Table A5: Determinants of a child being enrolled in school by region (probit)**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | **Amhara** | **Oromia** | **SNNP** | **Tigray** | **Addis Ababa** |
| Dummy for male child | -0.546** | -0.166 | 0.141 | -0.367 | -0.271 |
| | (2.17) | (0.73) | (0.79) | (1.55) | (0.66) |
| Dummy for urban residence | 1.227** | | -6.418*** | -0.109 | |
| | (2.15) | | (10.00) | (0.21) | |
| Wealth index consumer durable | 5.330*** | 4.720*** | 3.507*** | 7.544*** | 1.376 |
| | (2.73) | (3.02) | (2.85) | (3.71) | (0.77) |
| HH size below 5 yrs old | 0.109 | -0.244* | 0.282** | -0.113 | -0.039 |
| | (0.67) | (1.82) | (2.44) | (0.76) | (0.14) |
| HH size b/n the age of 5 and 15 | 0.059 | -0.224* | 0.088 | -0.371*** | -0.468** |
| | (0.55) | (1.86) | (1.17) | (2.81) | (2.39) |
| HH size above the age of 15 | 0.008 | -0.138 | -0.014 | -0.212* | -0.245* |
| | (0.06) | (1.40) | (0.17) | (1.73) | (1.74) |
| Maximum grades completed by male members of a HH | 0.063 | -0.002 | -0.018 | 0.147*** | 0.082 |
| | (1.30) | (0.07) | (0.60) | (3.27) | (1.15) |
| Maximum grades completed by female members of a HH | -0.029 | 0.139*** | 0.064** | 0.103** | 0.165** |
| | (0.62) | (2.90) | (1.99) | (2.15) | (1.98) |
| Dummy for male HH head | -0.114 | 0.748* | 0.253 | -0.005 | -0.103 |
| | (0.33) | (1.85) | (0.84) | (0.01) | (0.19) |
| Number of events that decreases the HH welfare | -0.026 | -0.081 | -0.049 | -0.136** | 0.315 |
| | (0.36) | (1.51) | (0.83) | (2.05) | (1.52) |
| Cognitive social capital | 0.058 | 0.246 | -0.023 | -0.177 | 0.024 |
| | (0.36) | (1.58) | (0.18) | (0.98) | (0.09) |
| Absolute structural social capital | 0.455*** | 0.009 | -0.403*** | 0.037 | 0.001 |
| | (2.69) | (0.07) | (3.62) | (0.36) | (0.01) |
| No. of organisations from which one gets social support | -0.043 | -0.056 | 0.004 | -0.072 | -0.327* |
| | (0.50) | (0.74) | (0.07) | (1.01) | (1.88) |
| Citizenship | 0.107 | 0.065 | 0.200 | 0.186 | 0.713 |
| | (0.39) | (0.26) | (0.96) | (0.55) | (1.40) |
| Dummy for HH owns or rents land | 0.990** | 0.421 | -6.098*** | -0.437 | |
| | (2.19) | (1.35) | (9.26) | (0.87) | |
| Dummy for the ownership of livestock | -1.033*** | 0.361 | -0.084 | 0.068 | -0.792 |
| | (2.90) | (1.21) | (0.30) | (0.19) | (1.55) |
| Dummy for a child being involved in paid work | -0.258 | -0.438 | -0.209 | | |
| | (0.78) | (1.37) | (0.66) | | |
| Number of hours a child spent on HH chores | -0.112 | -0.024 | -0.031 | -0.025 | 0.734* |
| | (1.58) | (0.45) | (0.49) | (0.57) | (1.84) |
| Mean distance (km) to public and private primary schools | 0.085 | -0.263*** | + | -0.193** | |
| | (1.56) | (2.99) | | (2.51) | |
| Constant | -0.845 | -0.581 | 6.114 | 2.192** | 1.068 |
| | (0.95) | (0.80) | (.) | (2.01) | (0.75) |
| Observations | 200 | 200 | 249 | 200 | 148 |
| Pseudo R2 | 0.256 | 0.336 | 0.190 | 0.376 | 0.318 |

*+ Mean distance (km) to public and private primary schools1 for SNNP dropped because of perfect multicollinearity. The same is for urban residence dummy for Oromia, dummy for child work for Tigray, residence dummy and mean distance to primary school for Addis Ababa.*

*Robust z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.*

**Table A6. Determinants of a child being enrolled in school by region (probit)**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Amhara | Oromia | SNNP | Tigray | AA |
| Dummy for male child | -0.516** | -0.159 | 0.114 | -0.196 | -0.217 |
| | (2.08) | (0.71) | (0.63) | (0.88) | (0.59) |
| Dummy for urban residence | 1.317** | | -6.595*** | 0.135 | |
| | (2.32) | | (10.33) | (0.27) | |
| Wealth index consumer durable | 5.237** | 5.321*** | 3.656*** | 7.717*** | 2.502 |
| | (2.56) | (3.43) | (3.01) | (4.02) | (1.40) |
| HH size below 5 yrs old | 0.019 | -0.194 | 0.299*** | -0.239* | -0.075 |
| | (0.12) | (1.49) | (2.58) | (1.72) | (0.29) |
| HH size b/n the age of 5 and 15 | 0.084 | -0.136 | 0.108 | -0.174 | -0.353** |
| | (0.83) | (1.21) | (1.46) | (1.50) | (2.06) |
| HH size above the age of 15 | 0.073 | -0.067 | 0.026 | -0.020 | -0.071 |
| | (0.66) | (0.72) | (0.29) | (0.19) | (0.61) |
| Grades completed by the father of a child | 0.073 | -0.005 | -0.057 | 0.023 | 0.003 |
| | (1.08) | (0.12) | (1.64) | (0.27) | (0.05) |
| Grades completed by the mother of a child | 0.077 | 0.074 | 0.071* | 0.093 | 0.009 |
| | (1.03) | (1.24) | (1.73) | (0.85) | (0.16) |
| Dummy for male HH head | -0.171 | 0.640 | 0.410 | 0.157 | 0.033 |
| | (0.49) | (1.62) | (1.24) | (0.49) | (0.06) |
| Number of events that decreases the HH welfare | -0.028 | -0.087* | -0.051 | -0.114* | 0.241 |
| | (0.39) | (1.66) | (0.87) | (1.83) | (1.29) |
| Cognitive social capital | 0.042 | 0.258* | -0.040 | -0.086 | -0.068 |
| | (0.25) | (1.69) | (0.31) | (0.53) | (0.30) |
| Absolute structural social capital | 0.455*** | 0.013 | -0.415*** | 0.013 | 0.056 |
| | (2.62) | (0.10) | (3.63) | (0.13) | (0.27) |
| No. of organisations from which one gets social support | -0.061 | -0.045 | -0.003 | -0.065 | -0.211 |
| | (0.70) | (0.61) | (0.06) | (0.95) | (1.33) |
| Citizenship | 0.044 | 0.071 | 0.185 | 0.169 | 0.543 |
| | (0.16) | (0.29) | (0.89) | (0.52) | (1.26) |
| Dummy for HH owns or rents land | 1.076** | 0.268 | -6.281*** | -0.390 | |
| | (2.36) | (0.90) | (9.54) | (0.82) | |
| Dummy for the ownership of livestock | -.1032*** | 0.374 | -0.065 | 0.024 | -0.665 |
| | (2.89) | (1.29) | (0.23) | (0.07) | (1.49) |
| Dummy for a child being involved in paid work | -0.306 | -0.483 | -0.153 | | |
| | (0.91) | (1.49) | (0.48) | | |
| Number of hours a child spent on HH chores | -0.102 | -0.035 | -0.044 | -0.042 | 0.406 |
| | (1.43) | (0.68) | (0.71) | (1.01) | (1.19) |
| Mean distance (km) to public and private primary schools | 0.094* | -0.246*** | | -0.192*** | |
| | (1.71) | (2.87) | | (2.68) | |
| Constant | -0.973 | -0.654 | 6.316 | 1.596 | 1.529 |
| | (1.08) | (0.92) | (.) | (1.59) | (1.25) |
| Observations | 200 | 200 | 249 | 200 | 148 |

*Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.*

**Table A7: Components of absolute structural social capital**

| Group type | Percentage of caregivers who are members of the group |
|---|---|
| Trade union | 4.1 |
| Community association | 16.5 |
| Women's group | 26.4 |
| Political group | 2.3 |
| Religious group | 37.8 |
| Credit group | 9.9 |
| Funeral group | 62.3 |
| Sports group | 0.5 |

**Table A8: Construction of wealth index**

| Components of index and score | Contributing variables |
|---|---|
| H = Housing quality (/4) | Rooms/person, wall, roof, floor durability. |
| CD = Consumer Durables (/11) | Radio, fridge, bicycle, TV, motorbike/scooter, motor vehicle, mobile phone, landline phone, modern bed, table or chair and sofa. |
| S = Services (/4) | Electricity, water, sanitation, cooking fuel. |
| Wealth Index = (H+CD+S)/3 | Range = 0.0 – 1.0 |

Table B. Definition of social capital YL uses

Four types of social capital were measured, namely, absolute structural social capital, social support, cognitive social capital and citizenship each of which are described below. *Absolute structural social capital (ASSC)* is defined based on the number of groups to which the caregiver belongs. Absolute structural social capital is categorised as high if the number of groups to which the caregiver belongs is three or more; as medium if the number of groups is one to two and zero if the caregiver is not a member of any group. *Social support (SS)* type of social capital is based on whether or not the caregiver has received support (emotional, economic or other) from either groups or individuals, in the year before the survey. It is considered high if a caregiver gets help from five or more groups and medium if the caregiver gets help from one to four groups. *Cognitive social capital (CSC)* is based on the caregiver's perceptions of the local community. The index of cognitive social capital is a combination of the responses to the questions on whether the caregiver feels she/he is part of the community, whether she/he feels people in general can be trusted, whether she/he feels people would try and take advantage of her/him if they could, and whether she/he feels people generally get along with each other. If the caregiver's response is positive for at least three of these they have high cognitive social capital, medium if they give only one or two positive answers and if all questions are answered negatively, we categorised them as having no cognitive social capital. *Citizenship (CIT)* is based on whether or not the caregiver has worked with others in the community to address a common issue. The citizenship index looks at the questions about joining together to address common issues and/or talks with the local authority on problems of the community. This index is a dichotomous (0 or 1) variable. The index is given a value '1' if the caregiver either joins together with others

to address common issues or talks with the local authority about problems in the community. Otherwise ‘0’ is given.

# DESTITUTION AND SOCIAL EXCLUSIONS OF DEMOBILZED SOLDIERS IN ETHIOPIA: EVIDENCE FROM KOLFE COMMUNITY IN ADDIS ABABA

Yisak Tafere[1]

*Abstract*

*The 1991 demobilization program in Ethiopia has affected the lives of many ex-servicemen. A large number of ex-soldiers have failed to adapt to their pre-army family setting and instead opted to settle elsewhere in the urban areas. Due to loose family tie, inability to conform to civilian values, lack of necessary skills, and insufficient transitional support by the government, many former army members failed to achieve economic and social reintegration. Those who came from other areas to settle in the neighbourhood of Kolfe have no access to any resources and live in the streets. Most of them, including those who live with their family, remain extremely poor and excluded from the domains of civilian lives of a complex city.*

[1] MA in Social Anthropology, Addis Ababa University, and a Research Officer with WeD-Ethiopia.

## I. Introduction

Following the fall of the Derg regime in 1991, the Ethiopian Peoples Revolutionary Democratic Front (EPRDF)-led provisional government demobilized nearly half a million former military personnel who were serving in the former regime. Within two weeks in power it established an institution named Commission for the Rehabilitation of Members of the Former Army and Disabled War Veterans (CRMFADWV) responsible for demobilizing and reintegrating the ex-soldiers.

After going through stages of disarmaments, repatriations and orientations the ex-combatants were registered for different institutional supports. Though 65% of the ex-soldiers were recruited into the army from the rural areas, a large number of them preferred to settle in the urban areas after demobilisation (Inter Africa Group, 1994). Only 169,628 returned to their rural origins, whereas 156,710 preferred to settle in the urban areas. Some 70,162 who served for less than 18 months in the army were directly released without any orientation to their respective communities (CRMFADWV, 1995). Among the urban returnees, more than 40,000 settled in Addis Ababa. This number did not include those ex-combatants who went back home unregistered and others who might have moved from the other rural areas subsequently. Their number, hence, could significantly be higher than the reported one.

The government has provided a total stipend of birr 350 for seven months and other successive supports for the urban returnees. Moreover, integration programs included free health care, certification of military skills into civilians, returning to former employment (most non-combat occupations), and provision of skill training, micro-credits and other employment opportunities.

The Commission has extended its support for about five years (1991-96). The main objective was to help ex-soldiers start civilian life. One of the emerging questions is: “Have the ex-soldiers become civilians? Or at least, do they live as civilians?”
Different studies have been conducted at different times. Most of them were carried out at the earlier stages of the programs, and tried to reveal the different stages of the process. But there is little investigation as to the present situation of the demobilized soldiers.

The purpose of this paper is, therefore, to try to explore the current statuses of demobilized soldiers in relation to their overall reintegration with the civilians. It attempts to disclose the challenges the ex-soldiers have been facing and what has been missing to achieve lasting integration. This might help to know how different people resort to destitution and face exclusions. Practically, it may clue policy makers to properly address people being affected by demobilization, who I believe are neglected, in their poverty reduction strategies.

The paper is a part of an in-depth research carried out by the University of Bath (UK) on Poverty, Inequality and Quality of Life of WeD[2] (Well-being in Developing Countries). It is based on one of the WeD research sites of Kolfe[3] area, Addis Ababa. The urban site of Kolfe was selected for this paper for two reasons. First, demobilized soldiers largely flow into urban areas in large numbers when they fail to integrate in their rural locality. Second, Kolfe is a neighbourhood surrounded by the military training camp of Tatek which enabled many military trainees to create ties with the civilians in the area. As a result, there are several demobilized soldiers living in Kolfe. It is, therefore, to examine how ex-combatants living in a part of complex urban setting face destitution and exclusions.

The study was conducted from July 2004 to May 2005. It was based on WeD qualitative research tools involving in-depth interviews of peoples' lives (old, adult, young, child), quality of life, migration, poverty dynamics, institutions and people' participations, and of course a monthly recorded household diaries for a year. It revolves around the WeD research theme, which tries to explore what resources people have, do and feel in their lives. It attempts to find out how ex-soldiers relate themselves to the wider scope of larger civilian community.

Different categories of people were approached in the community. The elite, the rich, middle class, poor and the destitute were interviewed to find out their economic and social statuses.

Among the thirty individuals interviewed in this regard, some 12 people were ex-combatants who live in the community since their demobilization. Many households

[2] WeD runs research projects in Bangladesh, Ethiopia, Peru and Thailand.
[3] The other sites are Yetmen and Dinki in Amhara Region, and Korodegaga, Turufe Kecheme and Shashemene in Oromia Region.

included in the research are directly or indirectly affected by demobilisation, but this paper focuses only on the lives of those ex-soldiers themselves. Different aspects of their lives were investigated intensively and repeatedly using different techniques. The depth of investigation would in some extent help understand the overall lives of demobilized soldiers in Ethiopia.

The paper is organized in the following way. In this introductory part it tries to highlight the background to demobilization and reintegration program in the country. Part two briefly introduces demobilisation, reintegration and social capital formation. Part three discusses the lives, magnitude of reintegration and factors determining successful reintegration of demobilized soldiers settled within the Kolfe locality. The last part of the paper provides concluding remarks and some lessons drawn from the research.

## 2. Reintegration and social capital formation

### 2.1 Demobilization and reintegration

The first step in post-conflict reconstruction of any county is undoubtedly the return of people who were directly involved in conflict into peaceful civilian life. As an integral part of transition from war to peace, this requires demobilization. Demobilisation is the process by which the armed forces (government and opposition or factional forces such as guerrilla armies) are either downsized or completely disbanded (Inter Africa Group, 1994:3). Demobilization involves repatriation, assembly, disarmament, and discharging of former combatants with some assistance packages.

The ultimate objective of demobilization is the reintegration of demobilized soldiers into civilian society. It involves economic, social/cultural and political integration. Economic reintegration implies the financial independence of an ex-combatant's household through productive and gainful employment. Social/political reintegration is broadly defined as the acceptance of an ex-combatant and his/her family by the host community and its leaders (Colletta, 1996:18).

Eventual reintegration depends on the magnitude of social cohesion achieved between the ex-soldiers and the receiving communities. Ex-combatants might be

conceived as conveyers of violence, crime and sexually transmitted diseases including HIV/AIDS. They may be viewed also as undisciplined and captives of different addictions such as alcoholism. As a result, they lose trust from the receiving community and consequently the support network or the social capital necessary for their access to public resources, and social networks may remain limited.

## 2.2 Social capital formation

Social capital formation is important in attaining social reintegration. Oyen (2002:9) describes that an individual acquires social capital through participating in informal networks, registered organizations, associations of different kinds of social movements, and it represents the sum of these experiences. Through membership in different organizations and networks individuals can develop joint interests and shared norms, which emerge and individuals might have the opportunity to capture rights and benefits. Moreover, social capital could be created within a social structure, by fulfilling reciprocity or mutual aid.

Individuals who cannot manage to participate or be members of a network find it difficult to survive. In other words, the absence of social capital means being excluded from certain important networks. Exclusions might have different dimensions. Some people might not be allowed to participate in activities, which are open to certain sections of the community. They cannot participate or be members either, because they belong to a different group which needs some adjustment or does not have the resources which help them to integrate. According to Oyen (2002:13) in any network a member is expected to contribute something, whether it is material or non-material resource.

There are different groups of people who fail to access networks or face social exclusions. Among others, ex-soldiers have the challenges of accomplishing reintegration into civilian life. In other words, they lack the means to create social capital or are unable to have access to existing networks. Generally, their socialization in the military norms and values, negative labelling by the civilian community and inadequate transformation supports might potentially contribute to their reintegration challenges and to certain extent their exclusions.

The following topic tries to investigate the situation of the demobilized soldiers in the Kolfe community and their specific challenges in their attempt to achieve reintegration.

## 3. Lives of the demobilized soldiers at Kolfe community

### 3.1 War and demobilization experiences

There are different reasons for people to become soldiers. In Africa (Lamouse-Smith 1994:7) individuals join the army expecting rewards such as political lordship, raw power, trained contempt for 'dozy civilians', confiscation of civilian property with impunity, flashy lifestyle, upward social mobility and acquisition of privileged elite status and regular financial income etc.

In Ethiopia (Yisak 2002: 49-50) prior family attachment to the military, interest to serve a nation, as job opportunity and at the other extreme, forced conscription can be additional reasons for becoming a soldier. The ex-soldiers joined the army either following their fathers, attracted by the military life style or forcefully conscripted. Of course, the pushing factors are more significant than the attractions. Lack of family support to continue education or lack of job led the young people to link themselves with army lives. One of my informants recounts his story of joining the military.

***Case 1:*** **Joining the army for survival**

When I was three, my mother died leaving her three children behind. Sooner, my father married other wife and had three more children. But he died after some years. Following his death, the family of my stepmother took the land and other resources. I had no option but join the army at the age of 16 in 1984.

(Demobilized soldier Wolde, age 37*).*

Many of those studied reported that they joined the military at earlier age, some of them at 15. The majority of them trace their pre-army life in the rural areas where they were engaged in agricultural activities and had low level of education.

Once they joined the army the ex-soldiers were involved in different activities. These included combat, radio operation, military security, political work, security guards, military and musical trainers. Some have gone through multi-occupations. All gained the skills in the army through training. Their military services range from 2 to 15 years. They rank from ordinary soldier to a major.

When the Derg government lost power in 1991, the army was left with apprehensions. Many had to run to urban areas, join rural families or flee to neighbouring countries. When a program of demobilization was set up they were called on to different rehabilitation centres and repatriated from the Sudan where many had taken refuge during the war. They were assisted in their transportations and given some re-orientations in different centres (previously used for military training) in the country. After completing rehabilitation programs, which involved some orientations, they were set to begin the civilian life. The government and different donors covered transportation costs and travel expenses.

Despite its immediate peace return, almost all of the informants disapproved demobilization. Very few, partially being first experience in Ethiopia, expected that they would be demobilized. They considered themselves as national defence force and should have to continue serving the country.

As explained above most ex-soldiers rushed to urban areas, largely to Addis Ababa, following demobilization. Many of them settled in and some came later to the Kolfe area, western part of Addis Ababa. Only four had to join their families there. Others had their origin in rural or far areas. Kolfe area is very near to the former military Training Camp of *Tatek* and Police Training (commonly known as *Fetino Derash*) centre. That helped some soldiers have partners or friends when they were in the army and eased their return to the locality.

The other reason for the attraction of more ex-soldiers into the area is that it is suitable for people of different backgrounds to live in. Community members in the neighbourhood are multi-ethnic, multi-occupational, and with different economic statuses. Individuals ranging from the richest to the poorest live side by side.
Four of the ex-soldiers are pensioned (early age pension as demobilisation package); other four are extremely poor and the rest are engaged in casual daily labour. Half of them have neither partner nor children. Others who are married have an average of

four children. Except one, none of their spouses has income-generating job. But four of them get remittance from their older children (see table 1).

The ideal place for easy reintegration of ex-soldiers is settling back home. All who returned to the Kolfe area where their families are living found it easier to start non-military life. At least they get the shelter from their parents or spouses with whom they had prior contacts.

But a significant number of them were obliged to come to the Kolfe neighbourhood due to the fact they were not welcomed by their respective original places. These include poor economic situation of families, unavailability of resources to start a living and lack of the required skills. Most importantly ex-soldiers' military lifestyle became difficult to be welcomed by the receiving family. Half of the ex-soldiers interviewed had rural origin and have their families there. But they opted to come to the area. The following case substantiates this as recounted by one of the informants.

***Case 2*: Family rejection**

When the Derg government was defeated in 1991, I was demobilized and told to go home without proper support. I directly went back home in the rural area to join my former wife. Unfortunately, I found her married to another man and refused to accept me. To add insult to injury, she told my 16 years old son that I was not his father. She did so because I have nothing to give her that I used to when I was in the army.

As my parents are dead, I tried to live with my sisters and brothers. After my stay for few weeks they began to insult me. They said that I was a criminal, murderer and war loser. Eventually, they told me that they couldn't tolerate my addictions (drinks and smoking).

Then I came to Addis Ababa and began daily labour and live by renting cheaper rooms on daily basis. But as there was little job opportunity and income, I resorted to street life since 2003. I live in the plastic tent near the St. Philip church.

(Demobilized soldier Getu, age 41).

There are more similar cases including neglect by family members because of difficulty to cope with civilian discipline in the household. One informants, born in Addis Ababa, failed to live with his family because he cannot communicate properly.

He said, 'what they say is tasteless for me and they do not accept what I say. They feel unhappy whenever I get drunk and smoke. It is the way I used to live in the army. It takes time to change the life style. But my family members are not helpful. The only option I had was just to leave my family's house and resort to the street life.

***Case 3:*** **How a family failed to fit into rural life**

I married my wife in 1989 when she was working as a cook in the nearby Tatek Military Centre where I used to work as military trainer. When I was demobilized I started living with her and our son in a room given by her mother at Kolfe area. When life became very difficult due to lack of job and income I took my family to my home in the countryside and lived for three years. As my parents are dead, my brothers took the land. Though I cannot farm, for I left agricultural activities at earlier age, I got assistance from my relatives.

But through time my son and wife found it difficult to live in the rural area. There was no school and necessary facilities for my children which were available in urban areas. Then I came back in 1998 to Kolfe and began living in the house of my mother-in-law. By engaging my wife and myself in daily labour we have two more children who are now attending school. I regret that my older son began school very late because I had to stay in the rural area.

(Demobilized soldier Wolde, age 37)

Reintegration challenges are not confined to the demobilized soldiers only. Taking a newly formed family to original place is also very hard. The new family may not adapt to the situation and the receiving family may not manage to narrow the living and cultural differences. One case is worth mentioning.

Settling in rural areas is more difficult for both the ex-soldiers and their families alike. Specially, those who joined the army at earlier ages develop more urban way of living in the army which makes adapting to rural settings difficult. This was true in the case of one demobilized soldier who joined the military at the age of 16 and whose new family members are fully from urban background (see case 3).

**Table 1: Situation of the Ex-soldiers**

| No | Name of ex-soldier | Age | Army occupation | Place of birth | Reason to settle in Kolfe | Family status | Economic status in the army | Current Economic status | Community Participation/ Exclusion |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Worku | 40 | Radio operator, combat | Bahrdar | Family refusing him | Single | Good | Destitute, street life | No ID, no Iddirs, no housing |
| 2 | Anbesa | 42 | Combat | Arisi | Wife refused him | Divorced | Very good | Destitute, street life | No housing, no Iddir, no ID, |
| 3 | Getu | 41 | Combat | Ambo | Found wife married to other | Divorce, one child | Very good | Destitute, street life | No housing, no Iddir, no ID |
| 4 | Wolde | 37 | Combat, trainer | Bale | To live with mother in law (with family) | Married, three children | Very good | Daily labourer | Dependent on mother in law to access housing, Iddir |
| 5 | Meselegn | 31 | Administration | Kolfe | Place of origin | Single | Very good | Daily worker, rent 2 rooms of parents | Parents housing, but no Iddir |
| 6 | Fekede | 57 | Combat, command, political, health service | Kolfe | Own family and house | Married, 6 children | good | Pensioned, Rich (family business) | Full community participation |
| 7 | Teshale | 36 | Administration | Wollega | Join family | Married, 4 children | good | Legal agent, poor | Full participation |
| 8 | Haile | 43 | Combat, trainer | Piaza, Addis Ababa | Unable to fit into family values | Single | Very good | Destitute | No housing, no Iddirs, |
| 9 | Yigeremu | 59 | Combat, music trainer | Sebeta, Oromia | Join family | Married, 6 children | Very good | Pensioned, remittance, can manage | Full community participation (leader of an Iddir) |
| 10 | Eshete | 65 | Combat, command | Kolfe | Join family | Married, 8 children | Very good | Pensioned, remittance, | Full community participation |
| 11 | Esatu | 42 | Military security | Kolfe | Join family | Single | Very good | Daily labourer, poor | Access through family |
| 12 | Dessie | 67 | Military security, radio operator | Oromia | Family house | Married, 7 children | Good | Pensioned, get remittance, Middle wealth | Full participation |

Owing to the poor demobilization support and inability of families to help them for reasons described above, most of the ex-soldiers are living in a very difficult economic condition (see table 1). In other words, the majority are not engaged in gainful employment. They do not have shelter or are living as dependents on others. Hence, they haven't achieved economic reintegration. And the trend shows, their situation is deteriorating as time goes.

One case, which reveals the road to destitution, explains the whole situation of the poorest ex-soldiers.

***Case 4*: Road to destitution**

I was born of a trading family and had the opportunity to live well. I joined the army in 1981 and continued to have good life and was able to finish my high school education. After demobilisation, I went to Diredawa (Eastern Ethiopia) where my sister lives and engaged myself in small business for about 7 years. But due to poor security situation in trade area I had to move to Awassa and Shashemene (Southern Ethiopia) where I was engaged in daily labour. I was able to feed myself for some time. Later there was little job and income. Then I had to come to Addis Ababa and continue to be engaged in daily labour and live in small rooms paying birr 1 per day. Life started to be very hard. No job, no income! Eventually, failing to get money for food and shelter, I resorted to street life. Since the last two years, I live near the church in a plastic tent. I get food from people who visit the church. When I get sick I cannot get medication. I do not have clothing and any belongings. I am living a miserable life. Only God is on my side.

(Demobilized soldier Worku, age 40).

Of course, reintegration goes beyond the economic one and should reach the level of social reintegration. As described above, some family members are reluctant to accept their demobilized children for economic reasons and more importantly for their inability to fit themselves into the civilian family living norms. Four respondents revealed that they are victims of such integration problems and opted to live far from their relatives. What does their integration in the new situation look like?

## 3.2 Destitution and social exclusions

Social exclusion could be viewed as a chronic scarcity of opportunities and access to basic services, labour markets and credit, physical conditions and adequate infrastructure. Social exclusions denote not only the weakening of social ties that bind individuals to their families and communities, but also exclusion from some of the most basic rights of citizenship.

As social exclusion so rigorously restricts access to the services and jobs needed for a minimal standard of living, there is a high link between poverty and social exclusion. Even when they are not the majority of the poor, the excluded typically constitute the poorest. For ex-soldiers, or any displaced persons for that matter, one of the important factors that enhance social reintegration is their economic status. Social interactions and participations require resources.

Most people in the community of Kolfe are members of local institutions and religious organizations. *Iddir, Mahiber, Equb,* and *Senbete* are the most common local institutions in which people are members. All entail resources and ability to reciprocate. Besides, some are open only for certain groups of people. For instance, *Iddirs* might base themselves on ethnic affiliation, gender, religion, area of origin, wealth or occupations.

However, a considerable number of demobilized combatants in the sample did not participate in any of the above institutions (see tale 1). They are not members of even *Iddirs* whose members include the poorest civilians. They are fully excluded from membership and have little opportunity of forming social capital, which are important in gaining access to resources and social relations. For instance, *Iddir* membership is used as a guarantee to have access to micro-credits in the community. *Equb* helps members borrow money and start business. Besides, such memberships help members develop common values and means of social control.

As the destitute ex-soldiers do not have much to offer in terms of material resources to the civilian networks, they are not welcomed for membership. As many of them migrated to the area after proving their inability to fit into the life of their families, they are considered as outsiders. The options of having membership using different networks (ethnicity, place of origin, religious group, occupation) are not open for

them. They are excluded and their relationships are confined within their fellow ex-soldiers whose interactions do not help much to transform into civilian lives. On the contrary, such continued relationships within themselves, rather maintained their military values and led them to be considered as a separate group by the community.

Moreover, some ex-soldiers who have no shelter and/or not registered in the Kebele administration are excluded from political participations. Basically, demobilized soldiers who used to serve in the army as political party members were deprived of political participation in the first years of the new government (Yisak 2002: 128). Though such barring was waved, some ex-combatants continued to be excluded. They do not have identity (ID) cards as they live on the streets and have no permanent residence. Such exclusions mean a lot in their life. Kebele registrations and ID cards are the first and important steps to have other memberships. They are preconditions for securing jobs, getting medical services for free and other services. One of the informants revealed that he was not able to get free medical care at the local health centre for he could not produce a letter from the Kebele administration which grants a letter that entitles free medication for the poor. He had to travel to the centre of the city and find out an NGO, which provides free medication for the poor.

On the contrary, some ex-soldiers who have better resources and family connections have access to membership. Their social capital has been formed or expanded either by their ability to afford what is required to be a member or have it indirectly through their family members. Membership of close relatives serves the non-members as well. For instance, a poor ex-soldier secured a Kebele Identity Card useful to gain daily labour and other services (including benefiting from Iddir) as dependent family member through his mother-in-law.

In general, many of the ex-soldiers lack the resources, the opportunities and established networks to enhance their reintegration. Social capital formation is hard for they do not have networks in the community which is grouped into ethnic and religious affiliation, neighbourhood, origin of place, friendship, wealth and occupation and, of course, family. They cannot be members for the networks are open for certain groups. Or even if some are open for anybody (for instance, neighbourhood-based community institutions) ex-soldiers cannot afford to offer contribution without which membership is not possible. Therefore, failing to create or be a member of existing

networks led them to their extreme exclusions. Exclusions mean, in return, failing to reintegrate into the civilian life.

The issue is then why do most demobilized soldiers fail to integrate in the community? What is missing? The following section will try to uncover this within the wider context of post-demobilisation reintegration challenges in Ethiopia.

## 3.3 Factors determining reintegration

*Place of resettlement*

Post-war reintegration process begins with resettlement. And the best place to live is home. Returning back to original place helps have access to resources to start a living. Families can be very useful as entry point for returned children economically and socially. It is easier to enter into networks that have been already in use by family members. In Kolfe community, though very few, those ex-soldiers who returned to their family found it easier to achieve integration.

But though family can be helpful there are cases this would not work. If the returned ex-soldiers have lost the living norm of the receiving community, cohesion would be difficult. Ex-soldiers who joined the army at earlier age can miss the cultural norms of their families and necessary skill to make a living. On the other hand, scarce resources and civilians' intolerance of dealing with military values carried by the demobilized soldiers adds to the difficulty. Four of the destitute ex-soldiers in the Kolfe community resorted to second resettlement places because they failed to adjust to family values and occupations. Either they found their farmland taken by kin members, wives remarried, parents died, and family members not ready to accept them, or they themselves were unable to adjust to the civilian family life.

*Transfer of military skills*

Demobilization involves not only the shift of resources from military to civilian development, but also the transfer of human capabilities in the same way. Human resource utilization during demobilisation and reintegration refers to the effective deployment of existing skills, qualifications and competencies of ex-combatants for the maximum achievement of individual, social, organizational or national goals and objectives of demobilisation (Kingma, 2002:52). This may include capabilities such as punctuality, respect for authority, self-reliance, attitude towards hard work and ability

to make decisions. There are also skills including radio operation, management, carpentry, purchasing, etc, which are gained in the army.

Some of the demobilized soldiers in the area use their military-gained capabilities and skills for the service of the community and their own. For instance, three of them are in the leadership of Iddirs as well as musical bands, and mobilize the community for different activities. These skills helped them easily integrate with the community.

On the contrary, others who have skills, which are very useful for the civilian employment, are not utilized. Very skilled persons in modern musical and radio operations are not helped to transfer them to their daily life. Some reorientations and skill certifications would have been useful. Application of existing skills is an important step in utilizing human resources in the peacetime lives. This would ease social interaction with those civilians who are engaged in similar occupations.

*Psychosocial support*

Integration implies the cohesion between the ex-soldiers and their family members and the receiving community. There are many obstacles that should be tackled before this could be achieved. Ex-soldiers have developed experiences in the military that would help them live as soldiers, not as civilians. Respecting chain of command, little space for egalitarian discussions, lower value for civilian rights and values, expositions to some addictions, etc are some examples that can be mentioned.

The receiving communities, on the other hand, may have different views towards the demobilized soldiers. They may consider them as people who come to compete for the scarce resources, bring evil practices like sexual violence, murder, robbery, sex-related diseases, addictions and others. In some cases, receiving community members may feel that the ex-soldiers are in some respect causes for their miseries and dissatisfactions. Some of the informants in the sample said that the civilians including their relatives and families believe that soldiers were causes of economic and security problems in the country. Ending the war as losers also undermined the public sympathy in some respects. It has not been very difficult for ex-soldiers, wherever they go, to hear that they do not deserve any support in a country where many people are living in a poor economic situation.

Hence, the gap between traumatized ex-soldiers and peaceful receiving community should be filled in through special programs. Ex-soldiers should be exposed to anti-dotal arrangement to come to terms with their military life. Nhema (2004:133) writes that unless sufficient tangible support for trauma-healing and reconciling program is provided when soldiers are demobilized, they will carry the heaviest burdens and pay the greatest price in terms of lack of social adjustment and inability to rejoin civilian society, far into the future. Some professional social workers, psychologists, psychiatrists and consultants should be available for those who badly need their assistance.

Unfortunately, ex-soldiers under discussion in particular, and demobilized soldiers in the country in general, were not supported in this respect. Only political orientations (some call it political indoctrination) were given in the rehabilitation centres before they were discharged into their communities. The commission, which handled the program in Ethiopia, did not have staff who received specialized training (World Bank 1995: 46). As a consequence the gap still prevails and many of the ex-soldiers at Kolfe community raised it as the important missing package in their reintegration. They lack any institution, which would help them mix with the community, including their families.

## 4. Concluding remarks

This paper has tried to highlight the reintegration challenges of ex-soldiers based on the evidence from the lives of ex-combatants in the Kolfe community of the capital. Though it might be difficult to have hard conclusions based on such narrow sample, the depth of the research can help to have certain clues on the challenges of demobilized soldiers in their attempt to live as civilians.

The following conclusions can be drawn and some remarks forwarded that might be useful for those who plan to engage in similar programs. It would equally help for reintegrating people who are displaced internally or returned refugees.

First, one of the ultimate objectives of demobilisation is paving the way for sustainable development. In economic terms, it transfers human and material resources from being wasted in conflict into development. But such program should put the human factor, the ex-soldiers, at the centre. Demobilized soldiers can be a powerful force in the overall post-conflict reconstruction if they are helped to have the means to do so. They have to be prime beneficiaries of the resources spent on demobilisation programs. Ex-soldiers and their families should be involved in the

post-conflict development efforts rather than left aside to add to the already increasing number of poor population. Otherwise, ex-soldiers would remain one of the poorest sections of the society in the country which will have multiple consequences.

Second, the central challenge in the post-war reintegration of ex-soldiers is their inability to create or have access to social capital. They need help in settling in the place of origin or their preference, their military skills transferred into civilian, provided with skill training, credits and psychosocial counselling. This needs a multi-faceted approach involving economic support, social reorientation, psychological counselling, basic health care, and career counselling. Such assistance should involve not only the ex-soldiers but also their dependent families. As social integration implies ongoing supportive programmes often lasting several years of training, support, counselling and select integration (Cilliers 1995:5), it should reach the level where demobilized soldiers are able more or less to do, or feel as civilians. This would signify their acceptance by the receiving community, which is an indicator of success of integration. Otherwise, failing to address the multiple social exclusions the ex-soldiers face will undoubtedly relapse any effort of bringing them to civilian lives.

Third, the other objective of demobilization is to ensure security. Theoretically, reducing the number of people with arms would create secured situation. But failed reintegration would end up bringing insecurity. Poorly integrated ex-soldiers would revert to armed conflicts that would affect the micro-security and perhaps the macro-security of a country. In this connection, Nhema (2004:133) warns that to ignore the special needs of ex-fighters emerging from war are sure techniques to slip back rapidly into renewed warfare. Untreated, neglected and excluded, war-traumatized ex-combatants may readily take up arms when the conditions around them seem ripe or their perceived needs are inadequately or too slowly met.

This was evident from the respondents some of whom have rejoined warring groups for some time after demobilisation. When there is no peaceful living option, there is no guarantee that they could not resort to what they know, that is, taking up arms if the situations are created. The magnitude of reintegration, therefore, should also be measured in terms of its return to peace and security.

Finally, though the heaviest burden of reintegration lies on the ex-combatants and their families, supports from the government and communities are crucial. At the same time, such reintegration support should have some limits in size and time. Otherwise, it would create dependency and sometimes dissatisfactions by the civilian community considering the demobilized as a privileged section of the society.

## References

Cilliers, Jakkie. (1995). *Demobilization and Reintegration of Former Combatants in Africa.* The Institute for Defence Policy, South Africa.

Colletta, Nat (ed). (1996). *The Transition from War to Peace in Sub-Saharan Africa*. Washington D.C, the World Bank.

CRMFADWV. (1995). *Rehabilitation*. Addis Ababa, Ethiopia.

Inter Africa Group/NGO Networking Service. (1994). *Demobilization and Reintegration Issues in the Horn of Africa.* Issue Note 2. Addis Ababa.

Kingma, Kees. (2002). *Demobilization in Sub-Saharan Africa: The Development and Security Impacts.* Bonn: Bonn International Centre for Conversion.

Lamouse-Smith, Willie. (1994). *Demilitarising and Democratising Africa's Military.* University of Maryland Baltimore County, African American Studies.

Nhema, Alfred. 2004). (ed.). *The Quest for Peace in Africa: Transformations, Democracy and Public Policy*. OSSREA, Addis Ababa.

Oyen, Else. (2002). *Social capital formation: a poverty reduction strategy?* In *Social Capital and Poverty Reduction: Which role for the civil society organizations and the state?* Paris: France.

World Bank. *(*1995). *From Emergency to Development: The Demobilization and Reintegration of Ex-Combatants in Ethiopia.* Draft Paper.

Yisak Tafere. (2002). *Socio-Economic Reintegration of Ex-Soldiers in Ethiopia: A case of two (one male & one female) Cooperative in Addis Ababa.* MA thesis. Addis Ababa University.

# INTEGRATED SOLID WASTE MANAGEMENT IN ADDIS ABABA[1]

Alebel Bayrau[2] and Dawit Walelign

## 1. Introduction

### 1.1 Problem statement

Increasing amount of solid waste is being generated as a result of rapid rate of urbanization and economic growth. This, in turn, presents greater difficulties for disposal. The problem is more acute in developing countries where the pace of urban population growth as well as urbanization is faster. Efficient management of urban waste is required, but urban governments in many developing countries are constrained by limited finance and inadequate service (R. Gerlagh et al, 1999).

Solid waste management (SWM) is one of the critical concerns facing the developing countries because of the social, economic and environmental implications if not properly managed. The basic aim of managing waste is to limit its volume as well as its adverse effects. In a number of developing countries, solid waste is a mixture of different materials with different characteristics including hazardous materials. Beeds and Bloom (1995) suggest that developing countries have poor waste management; only 30 - 50 % of the waste is collected and properly managed. The rest is either burned or left to decompose in open space or dumped in unregulated landfills, which is environmentally damaging.

Inadequate municipal solid waste collection and disposal service creates a range of environmental problems in developing countries. The lower coverage rate of solid waste collection service results in the accumulation of waste on open lands, in drains

[1] The authors would like to thank the Regional and Local Development Study of the Addis Ababa University and the Institute of Social Study of the Netherlands for funding the research.
[2] Contact address: alebel_b@yahoo.com or bayrau@uni-hohenheim.de

and in the living area of many people, causing a nuisance and stinking pools, environmental pollution through leaches from piles (water and soil pollution) and burning of waste (air pollution), clogging of drains, and the possible spread of diseases. Unattended piles of waste are a breeding place for insects and rats. The situation is exacerbated in slums where households cannot make use of garbage collection containers. Lack of the most basic solid waste services in crowded, low-income neighborhoods is a major contributor to the high morbidity and mortality among the urban poor. Hence, the adverse effect of inadequate solid waste service on productivity and economic development of the city would be significant.

## 1.2 Study objectives and hypotheses

### 1.2.1 Study objectives

The main objective of the study is to define the SWM problem in Addis Ababa and propose ways of improving the same, with special emphasis on participatory approach by involving the community and the private sector in the system.

The specific objectives of the study include:

- Examine the major reasons of inadequate SWM system in Addis Ababa.
- Estimate household's willingness to pay for improved SWM and identify factors determining willingness to pay
- Identify key areas where the community and the private sectors can effectively be involved and participate in SWM
- Identify measures that can be taken to integrate the activities of various agents with that of the municipality in waste management process.

### 1.2.2 Hypotheses

The following specific hypotheses will be tested by the study:

- Individual users are willing to pay for solid waste collection and disposal and solve the problem at community level.
- Education positively affects the willingness to pay for improved solid waste management in Addis Ababa

- Environmental factors are the major determinants of households' willingness to pay for improved SWM service.
- the non-existence of a legal and institutional framework as well as the public awareness constrain the effective participation of the private sector and community based organization in SWM despite their willingness to be involved.

## 1.3 Limitations of the study

This study was mainly intended to define the problem of current SWM and determine the willingness of the community to pay for improved solid waste service. In evaluating the status of SWM certain issues, however, were not conclusively tackled due to limited time and absence of adequate information. This relates, in particular, to the issue of conducting cost benefit analysis on solid waste services.

In the analysis of the demand side information on SWM obtained from households, this study has used one of the most popular methods of economic valuation in developed countries: a contingent valuation method. There are biases in its application, but it is a first step towards valuation of environmental quality and will allow for making decisions of investment with more and better information in developing cities such as Addis Ababa.

Furthermore, time and financial constraints precluded the possibility of a more rigorous approach for data collection. Therefore, the sample survey carried out for this study is limited in both size and coverage. The sample size was limited to 494 households and all waste generators were not covered by the primary survey. In this sense, the data generated for the study should be used with care.

## 1.4 Organization of the study

The paper is organized as follows. Section two discusses the various concepts that are used in the analysis of SWM. It also outlines the methods for valuing environmental goods or public goods such as SWM. Section three discusses the nature of the data and the sampling method to carry out the survey. It also describes the structure of the questionnaire, field procedure, specification of the willingness to pay model and the definition of the variables evaluated in the regression analysis.

Section four presents the evaluation of the status of SWM in Addis Ababa. Section five provides the results of the contingent valuation survey. Finally, conclusion and recommendations are contained in Section six.

## 2. Solid waste management: Concepts and economic valuation

### 2.1 Concepts in solid waste management

Waste generally is defined as a material that is thrown away as useless. Solid waste is that type of waste which is non-liquid and is believed to comprise organic as well as non organic materials. Solid waste can be grouped into municipal and hazardous. Municipal solid waste is defined as a material for which the primary generator abandons it within urban areas and requires no compensation upon abandonment. In addition, it qualifies as an urban waste if it is generally perceived by the society as being within the responsibility of the municipality to collect and dispose of (Cointreau, 1982). It contains paper, glass, metals, and various household items. It also includes street sweepings and refuses from commercial, institutional, and industrial establishments.

Hazardous waste, on the other hand, is that type of waste that has potential, even when of limited amount, to cause a substantial high adverse effect on public health and on the environment at large. It includes toxic chemical and flammable, radioactive, or biological substances. These wastes can be in the form of sludge, liquid, gas, or solid (Munasinghe, 1995).

Broadly, solid waste stream, i.e., the material flow stream of waste from generation to ultimate disposal comprises generation, collection /transportation, processing and disposal. Accordingly, SWM encompasses the full range of activities for these streams, from the generation of used materials to their disposal (Beede and Bloom, 1995). Resource recovery includes all activities of waste segregation, collection, and processing which are carried out taking into consideration the economic viability of the material. Re-use and recycling provide an opportunity to capture some of the values from the waste (Cointreau, *et. al.,* 1984). Reuse involves reutilization of material in its end use form without the necessity of reprocessing while recycling

involves processing waste through remanufacture and conversion of parts in order to recover an original raw matter (Beukering, 1994).

In developing countries, SWM has traditionally focused on organizational and technical concerns. This approach neglects the many activities and actors that waste management comprise. Gerlagh et al. (1999) proposed a new paradigm of SWM that extends the technical model to tackle a range of problems associated with waste management in order to achieve socially and environmentally sound waste management. This includes a range of active issues and processes such as the type of waste generated, the number of stakeholders and economic activities involved, and the various economic, social and environmental aspects of SWM and may include legitimizations of the informal system, public participation and possible partial privatizations.

Beurkering (1994) also noted that the classical approach to SWM, which considers it a responsibility of municipal body, ignores several socio-economic aspects of most existing solid waste systems, thereby contributing to the problems of inefficiency and ineffectiveness of the system. It does not recognize the fact that solid waste separation, re-use, and recycling by the informal sector may be part of the solution to the improved management. Venkateswaran (1994) pointed out that the constraints and inefficiency experienced in SWM are mainly due to an undue emphasis on technology, while ignoring social, ecological, and economic characteristics aspects of SWM.

Various concepts have been developed over the years to provide the basis for improving the solid waste conditions in developing countries. Among them, integrated SWM provides a framework which has been very successful in various countries. Integrated SWM is a very broad concept. Figure 2.1 shows the overall framework, although it is not intended to be an exhaustive list of categories. More generally, integrated SWM implies that decisions on waste handling should take into account environmental, economic and social and institutional dimensions (R. Gerlagh, et al., 1999). Economic aspect may include the costs and benefits of the implementation, the available budget for the management, and the spin-off effects for other sectors in the economy. The environment dimensions may consist of local problems (i.e. increased risk of epidemic and ground water pollution), regional problems (i.e. resources depletion and acid rain), and global problems (i.e. global warming and ozone depletion). Social dimension may include employment effects for both formal and informal sector, impact on human health and ethical issues such as the use of

child labor. Finally, the institutional aspects of integrated SWM aims to develop a system which effectively involves the main sectors.

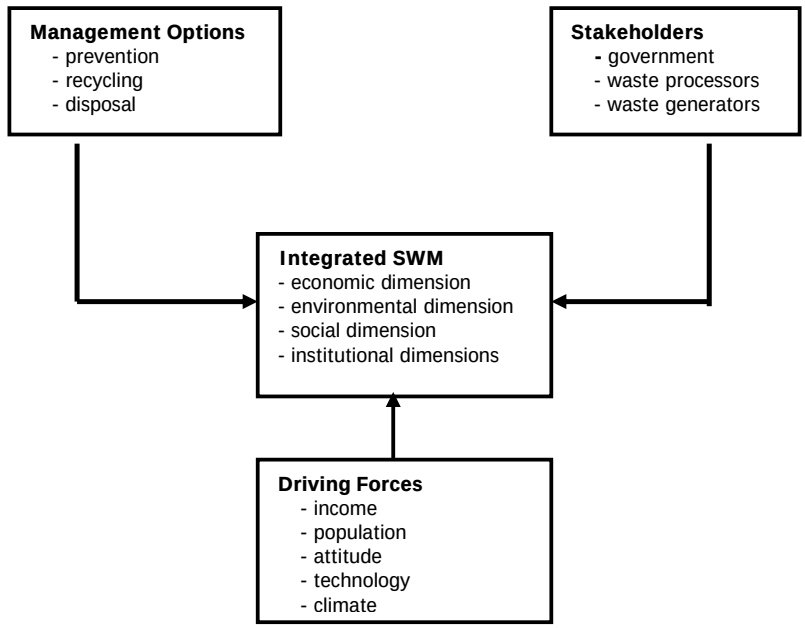
The integrative aspect lies in the trade-off between these four dimensions. For instance, in certain situations, although recycling may be preferred from an environmental perspective, the economic costs involved or the presence of institutional complications may prevent waste recycling from being promoted and implemented in integrated SWM. The actual integration can take place at various levels (Lardinios and Klundert 1997):

- The use of a range of different collection and treatment options. These include prevention, recycling, energy recovery, and sound land filling of solid waste.
- The involvement and participation of all the stakeholders. These may include waste processors such as formal and informal recyclers, waste generators such as households, industry, and agriculture, and government institutions such as waste managers and urban planners.

In practice, it is difficult to include all these aspects at the same time, since the factors affecting solid waste management are constantly changing. For example, income and population growth contribute significantly to the amount of waste which has to be managed. Similarly, differences in educational background and environmental awareness results in varying attitudes of waste generators. Finally, technological progress in the field of waste management is rapid, so certain technologies may outdate more rapidly.

These problems are more severe in developing countries where limited municipal budget for waste management exacerbates the difficulties of integration. Given the limited financial capacity of local authorities in developing countries, the mainstream policy is that costs should be recouped from user charge, not from public means, which constitutes a strong prerequisite for the financial sustainability of solid waste management. Therefore, in order to tackle the existing solid waste problems effectively, it is important to establish a full cost recovery by introducing a fee system from those who receive waste services. Hence, it is of great importance to explore the willingness to pay of the residents for improved solid waste collection and disposal services.

**Figure 2.1: Framework for analyzing the concept of Integrated SWM**




Note: This framework for analyzing SWM is adopted from Gerlagh, et al., 1999.

## 2.2 Economic valuation of solid waste management

The rapid pace of population growth and urbanization create a range of environmental problems for urban areas. Urban areas import natural resources which are transformed into finished goods and services, and in the end are returned to the environment in the form of waste and emissions. This leads to local, regional and global environmental problems, such as resource depletion, deterioration of air, water and soil quality, noise nuisance, lack of green space, waste generation, and many others (Stanners and Bourdeau, 1995). These environmental problems also have socio-economic consequences. Poor environmental quality of cities can deprive citizens of a good quality of life as it affects their health and consequently, adversely affect productivity and economic development (Geenhuizen and Van Nijkamp, 1995).

Improper solid waste handling causes pollution and Environmental quality deterioration. However, market is incapable of controlling this problem because the environment has the characteristics of public good. Thus, the non-existence of an explicit market for this good makes it difficult to fix a price to prevent its deterioration. Environmental quality is essentially a public good because it is an open access resource, which means that there will be a higher rate of use than is required to reach social efficiency.

Another other problem related to solid waste management is that the market does not push the generators of waste to pay all the costs of disposal. Some of these costs can be transferred to other individuals without compensation to the injured parties. Good examples of these externalities include air pollutants caused by incinerators and the pollution of underground water. Solid waste considered by generators as a negative by product and external to their activities and is not viewed as a possible source of income. Generally, they discard their solid waste through dissolution, dispersion, or emptying it into rubbish dumps, not taking into account the cost to the society. Because of the incompleteness of the market, these externalities do not appear in the price system and thus affects the benefits of third parties with no compensation whatsoever.

The markets are incapable of sending the correct signals in the case of public goods, because they are a type of market failure. Environmental quality is a particular type of public good and, therefore, its unregulated use is not optimal. The lack of markets for environmental quality and solid waste makes it difficult to determine a price that reflects its value to society. Thus, an alternative method must be used to determine the value of non-marketed goods.,

Different techniques have been proposed and applied to estimate the value of non-marketed commodities. The methods can be categorized as direct and indirect methods. The most common direct method is the contingent valuation method (CVM). CVM is a survey-based preference technique that provides respondents the opportunity to make an economic decision concerning the relevant non-marketed decisions. Values of goods are then inferred from the induced economic decisions. The basic indirect methods to non-market valuation rely on observed economic behavior rather than consumer's stated preferences and are known as hedonic (e.g. property value and wage models) and the household production function approach

(e.g. travel cost and averting behavior). These basic approaches to non-market valuation have been in use since the 1960's[3]. Of these basic approaches, CVM is the most frequently used non-marketed valuation technique for environmental goods. This is partly because the method is flexible in terms of valuing a wide variety of non-marketed goods, including those not currently provided. Perhaps more importantly, it enables empirically to measure total values, which include passive use values (Richard et al, 1996). CVM was employed and is described below.

The CVM involves a construction of a hypothetical market, i.e., one that does not actually exist, and asking individuals whether they would be willing to pay towards the improvement or conservation of environmental goods, or accept compensation for deterioration of environmental good. In short, it employs survey techniques to ask people about the value they would place on hypothetical changes in some environmental resources or non-marketed goods, in this case solid waste services. The willingness to pay of an individual depends on several factors such as income, attitude toward the environment, level of information, special extension of the environmental resource, frequency and intensity of use. The willingness to pay reflects the preference of the individual and is somewhat limited by income level[4].

## 3. Methodology

### 3.1. Data source, collection and field procedure

**Data Collection and Sampling Design:** Both supply side and demand side information was collected to analyses SWM system in Addis Ababa. Supply side information was obtained from documents of Addis Ababa Health Bureau, other relevant secondary sources, and interviews with officials involved in the provision and planning of solid waste services. Field observation was also carried out in order to supplement the available statistics. Interviews were also conducted with three private enterprises involved in waste collection. The contingent valuation technique was employed to elicit willingness to pay, where respondents are interviewed and directly questioned about how much they are willing to pay for improved service**.** We believe that we ensure homogeneity in our sample.

[3] See Johansson (1993) or Freeman (1993) for overviews of the theoretical and empirical issues involved.
[4] . Readers can read more on CVM in Mitchell and Carson (1989).

Number of households included in the survey from each income group was determined based on the CSA (1995/96) household, consumption and expenditure survey. A total of 500 households are included in our sample. Of the total sample size included in our survey, 160 households were drawn from low-income areas, 256 households were drawn from middle-income areas and 84 households were drawn from high-income areas. This corresponds to 0.1% of the households in the city.[5]

**Questionnaire Design:** The questionnaire was designed to include existing solid waste management service, valuation questions and socio-economic information.

In eliciting a respondent's willingness to pay an iterative bidding procedure with follow-up was used. Initially, the respondent asked whether he would accept the service offered at a given monthly fee. If he was willing to pay that amount, the figure was increased. If not, a smaller amount was given until the respondent accepted it. A maximum of three iterations were employed, i.e., a three-bounded process was conducted, where the next value put to the respondent depending on the answers to the proceeding valuation questions. This bidding process ended with an open-ended question seeking the respondent's maximum willingness to pay for the service. A personal interview was carried out, as it is the best way to get truthful answers. Furthermore, in designing the questionnaire an attempt has been made to minimize or eliminate biases including strategic bias, starting point bias, payment vehicle bias, compliance bias, and interview bias[6].

**Field Procedure:** Two surveys were carried out in Addis Ababa; the first was a pilot survey with a sample size of 30 households, and the second was the main survey with a sample size of 494 households. The main survey was preceded by a pilot survey. Initially, a pilot survey was carried out and then the results of which were fed into the iterative bidding questionnaire of the main survey, to set the starting points of the valuation process[7].

[5] The number of households was calculated using population projection for 2002 and the average family size of 5.1 (CSA-1994). The total number of households is expected to be 518,824.
[6] See Michell and Carson (1989) for details discussion of bias issues.
[7] Readers can ask for more detail techniques on sampling, questionnaire design and field procedure at alebel_b@yahoo.com or bayrau@uni-hohenheim.de

## 3.2. Model specification

With the aim of identifying the true willingness of the community to pay for an improved SWM and its determinants, the following econometric model is specified**.** In view of the sensitivity of maximum likelihood and least square methods to the assumption of normality, and problem of heteroskedaciticity for the former method, the method used by this study is a simple modification of least absolute deviation, LAD[8], estimation, which yields a consistent estimator independently on the functional form of the distribution of the residuals. This estimation method is Censored LAD, CLAD, which is robust against heteroskedacity of the error terms and which requires only weaker assumption about their distribution. Accordingly, following Powel (1986) we specified the more general formulation of the Censored LAD (CLAD) estimation is given as follow.

$$Q_\theta\left[\max\left\{0, X'_i\beta\right\}\middle| X\right] = X_i\beta + Q_\theta\left[U\middle| X_i, U_i > -X_i\beta\right]$$
$$= X\beta$$

Where, Y = 0.5 i.e. a LAD estimator corresponding to median regression or it can also be 75 or 25 percentile. X is Vector of explanatory variables including socio-economic, demographic characteristics of the households and the characteristics of the service under study. The variables are defined in the appendix. $\beta$ = Vectors of regression coefficients

Fitting our dependent (median WTP of a respondent) and the explanatory variables into the above model, we will estimate the above model using bootstrap estimation using STATA software.

[8] Let Y = X + , to get the consistent estimate, if we minimize the sum of the absolute value of the error, instead of the sum of the square of the error terms as in OLS, the estimator obtained in this way is least absolute deviation (LAD) i.e. estimates obtained by minimizing: min/Y, -X/ or min (Y, -X) sgn (Y, -X), where sgn takes value of 1,0, -I as the argument is positive, zero or negative.

# 4. Analysis of the current solid waste management in Addis Ababa[9]

This section presents the current solid waste situation in Addis Ababa including solid waste generated, its components, transportation disposal, and the likes as well as the different stakeholders involved in solid waste management in the city using a wide rang of secondary data. The concept of integrated SWM was taken as a framework for the analysis.

## 4.1. Solid waste streams

*Solid waste generation*

Although there is a dearth of precise and reliable data on the amount of waste generated in Addis Ababa, it is roughly estimated that the city produces 1841.67 $m^3$ of solid waste per day. It is also estimated that the per capita waste generated averages 0.22 KG per day, but this varied for different income groups: 0.17 KG, 0.28 KG and 0.38 KG per day for low, middle and high income groups (Luiseberge, 1995). This may reflect that there exists a positive relationship between income levels and waste generated at household level.

Solid waste may be categorized according to its source: (1) domestic solid waste; (2) commercial and industrial solid waste which is not hazardous; and (3) street sweepings. The waste produced in Addis Ababa varies significantly across different areas within urban centers such as between residential, commercial/market and industrial areas (Table 4.1).

As observed in the above table, households are the major contributors of solid waste in the city accounting about 76% of the total while commercial establishments and industries together contribute about 14% of the total waste collected. The waste collected from the streets accounts for 6% of the total. In developing countries like Ethiopia where industrialization is at its lowest stage, it is not surprising to find that households generate a significant amount of the solid waste. The picture is different

[9] Some of the data used in this section may be old since some improvements have been observed in the SWM of the city after the study has been conducted.

in developed countries i.e. only 25 – 30 % of the overall waste stream is from residential areas (World Bank, 1999).

**Table 4.1: Source of solid waste generation in Addis Ababa (Kilograms per day)**

| Sources | Volume | Percentage |
|---|---|---|
| Domestic waste | 355,680 | 76 |
| Commercial establishments | 42,120 | 9 |
| Industries | 23,400 | 5 |
| Street sweeping | 28,080 | 6 |
| Hotels | 14,040 | 3 |
| Hospitals | 4,680 | 1 |
| | 468,000 | 100 |

Sources: Addis Ababa Health Bureau (1997)

*Solid waste composition*

Solid waste generated from high and low income countries and across different areas with in urban centers can be expected to have considerable differences especially in terms of composition. As economic prosperity increases, the amount of solid waste produced consists mainly of waste materials such as paper, glass, metals and plastic. In the cities in South, on the other hand, waste densities and moisture contents are much higher, which require different technology and management systems (Cointreau et al, 1984). Generally, the waste densities range between 250 – 500 kg/$m^3$ for developing countries while it ranges between 100 – 150 kg/$m^3$ for developed countries. As in most developing cities, the waste generated in Addis Ababa is of high density. The waste density based on income level is 285, 296 and 271 kg/$m^3$ for low, middle and high income groups respectively (Luisberger, 1995).

As shown in the table below, the cities' solid waste consists to a large extent of organic fines and other combustible matters (80 % of the total waste). Despite most of these materials convert easily to make compost to be used as natural fertilizers, it is hardly practiced. Comparatively the percentage of recyclables is lower (13 % of the total waste). Waste pickers involved in collection of reusable materials (like paper, glass, plastic, iron and steel rods and pieces tin, etc.) which can be considered as a means to reduce waste generated both at household and the city levels in general. These recyclers however are not recognized in the waste management system of the municipality. There is, thus, a need to formalize these activities as legal. Moreover, as

is the case in most developing countries, the industries in the city may reuse the recovered materials to make new ones, but there is no coordination between the industries and the collectors.

**Table 4.2: Source of solid waste generation in Addis Ababa (Kilograms per day)**

| Sources | Volume | Percentage |
|---|---|---|
| Vegetable | 13,572 | 2.9 |
| Paper | 15,771.6 | 3.37 |
| Rubber | 1,310.4 | 0.28 |
| Wood | 10,717.2 | 2.29 |
| Bone | 7,581.6 | 1.62 |
| Plastics | 9,266.4 | 1.98 |
| Textiles | 6,598.8 | 1.41 |
| Ferrous metals | 5,428.8 | 1.16 |
| Aluminum | 93.6 | 0.02 |
| Glass | 3,744 | 0.8 |
| Combustible (Leaves, grasses) | 105,908.4 | 22.63 |
| Non combustible | 13,852.8 | 2.96 |
| All fines | 274,154.4 | 58.58 |
| Total | 468, 000 | 100 |

Sources: Addis Ababa Health Bureau (1997)

*Solid waste collection and transportation*

The municipality service for the collection of refuse comprises mainly three ways: door-to- door, block and communal collections using side loader trucks, closed compacting type truck and container lift truck.

**Door-to- door collection**: In this collection system, households living along accessible streets dump their solid waste in the trucks at a specific time in the day. It mainly serves in accessible areas devoid of the 8$m^3$ containers normally installed at streets sides. The Health Bureau claims that the trucks pass 2-3 times per week through these neighborhoods. In practice, however it is much less than that. The beneficiaries of this system are made aware of the incoming of the trucks by truck's klaxon and manual local bellowing. The system covers less than 15% of the total

amount of waste collected in the city (De stoop, 1998). The user of this service makes no payment to the service they receive.

**Block collection:** Large refuse containers of $8m^3$ size made available by the municipality to the clients upon request. These clients dump their waste in the containers and call the zonal solid waste management team office for collection and disposal when the containers are full. The users of this service are charged 11 Birr/$8m^3$ which only covers half of the total cost incurred by the municipality to dispose a $m^3$ of solid waste. This collection system is mainly designed to serve factories, commercial and industrial establishments and apartments rented by housing enterprises. There are about 100 containers serving the block system in the city. Even though this is a service for which the clients will pay, the municipality is not always capable of emptying the full containers promptly. The block collection and door-to-door services together cover 36% of the total solid waste collected (Zelleke, 2002).

**Communal collection system:** In this collection system, $8m^3$ and $1.1m^3$ refuse containers are placed at accessible sites in the city. Residents are expected to carry and dump their waste in the containers near by their areas. Currently there are some 512 large skips and 1200 small skips are distributed in the city. The dispersion of containers depends on the population density and economic activity of the neighborhoods. The number of containers for refuse disposal placed in each Kebele is not more than 2 to3, which forces beneficences to walk a distance half kilometer on average to get the nearest skip. This system comprises 57% of the total amount of solid waste collected (Zelleke, 2002).

The communal collection system serves the community at large, without any direct charge. It is assumed that containers get filled within three years and the municipality is servicing them every 2–3 days. In places where containers are filled fast, the intention is to have a servicing once or even twice a day.

In addition to the above-mentioned collection systems, streets (about 200 kms) are cleared by organized system of daily laborers, and sweepings are dumped in the collection containers. This service employs 252 street sweepers and 21 Street sweeping supervisors. It accounts some 9% of the total solid waste collected. In most of the cases, it is normal to see roads and drainage lines littered with refuse. The

street sweepers have the responsibility of cleaning garbage littered around specific communal containers every morning.

The currently available trucks for waste collection and transportation are about 68 trucks including 28 8$m^3$ container lifter trucks; 10 1.1$m^3$ container emptier trucks; 16 side-loaders; 10 compactor trucks; 4 route-packer trucks and 10 cesspool emptier trucks.

According to the Health Bureau (1997), solid waste collection service coverage is estimated at 65% of the total generated in the city. This figure seems exaggerated when we look at other studies (see for example Assefa, 1997), which indicate that the collection coverage rate for solid waste system is between 50 - 60%. The remaining waste that is unattended is dumped along streets, in drainage lines and in open fields that is extremely hazardous to both the environment and public health.

**Recycling, reuse and composting:** Recycling is an activity where discarded material are sorted and brought into use in one form or another. Of the total generated waste in Addis Ababa, only 13% constituted recyclable materials. One of the reasons for this is that most of the materials are reused especially at household level, which is the largest solid waste generator in the city. It is a common practice especially by the low and middle income to separate and reuse materials like bottles, plastic jars, tin containers etc. as household utensils (De Stoop, 1998).

Recycling by the public sector is not a common practice in the country. There are a number of factories that can potentially use waste materials as input for the production like bottle factory, paper mill etc, but there is no institutional mechanism that connects waste pickers and the factories and facilitate the situation. Solid waste recycling is thus mainly done by informal sector. There is a network for informal recycling where papers, metals, iron etc. are recycled to produce paper bags, metal buckets and agricultural tools (like hoe) etc. The informal sector is also involved in the recovery and resale of most of the recyclables and is highly labor intensive. Notwithstanding their significant contribution to waste recovery and recycling process, their role in waste management is not recognized by the municipality.
Despite the fact that a large quantity of the waste generated (about 70%) being appropriate for composting, it is hardly practiced. Large scale compose schemes undertaken by the public sector has failed because of high running cost and

transportation cost. This implies low sale cost required to make the product affordable for users. Small-scale programs that involve local government, youths, and NGOs, however, have been successful in a number of developing countries (like Cameroon, Cambodia). Hence, small-scale schemes could be tried in Addis Ababa.

**Final disposal:** The final destination of solid waste collected through the above-described system is disposal. Waste collected by the municipality is brought to a single unsanitary landfill at ***Repi***. All types of waste from all over the city is dumped at this landfill site without any effort of segregation. The site area covers about 10 hectares. When it was first identified some 35 years back it was far from residents' settlement. The present situation shows the site is surrounded by settlements which put most people at a risk of health problems. Moreover, the site has become full to its capacity and can no longer serve the growing amount of refuse generated in the city.

Although there is no study undertaken to estimate quantitatively the health and environmental problems caused by the Repi landfill site, it can be assumed that the site causes underground water pollution through leaches, deterioration of air and soil quality and nuisances. There is, thus, an urgent need to find alternative landfill sites along some of the outlets of the city. Already two new sites, one in the East and the other in the Western part of the city, are identified but the preparations have not been started on the ground yet.

## 4.2 Stakeholders in SWM

Different studies indicate that the traditional approach to service provision, i.e., by the public sector has failed to be adequate and satisfactory. They emphasized the need to create partnership with different agents. One of the services that need to be provided in partnership with other stakeholders is solid waste management. The participation of other actors is of most important as they offer a means of enhancing efficiency and lowering cost. Different stakeholders are involved in SWM in varying activities in the city. These are the public sector (municipality), NGOs and CBOs, formal and informal private sectors.

**Public sector:** The public sector is the main agent involved in SWM system of Addis Ababa. The Addis Ababa City Government (AACG), Environmental Protection Bureau, and Health Bureau and The Addis Ababa city Cleanness and Beautification

office are among the main public bodies involved in the SWM of the city. These public bodies have got their own distinct duties and responsibilities ranging from policy making to direct implementation of the activities of SWM in the city.

**Non-governmental organizations and community based organizations:** NGOs are strong partners of the government in development endeavors of the city and the country at large. Most NGOs are involved in urban sanitation projects; solid waste component is limited to few projects. Moreover, the activities undertaken by some NGOs are limited to distribution of dustbins to households and communal containers to Kebeles; and construction of concrete pads as container stand, which are mostly not utilized. At present NGOs like ENDA Ethiopia and Women Aid Ethiopia are actively involved in promotion of recycling, composting and waste to energy scheme. CBOs (commonly called 'Eder' and 'Mahber) are not actually involved in SWM system. However, recently individual-initiated projects such as Gash Abera Molla project are gaining recognition. The main components of the project are cleaning and beautifying of the city.

**Private sector:** Even though there is no established framework for the involvement of the private sector, both formal and informal private ones, are already engaged in the city's SWM in varying degree. Available information during the study indicates that there are at least thirteen formally registered private small scale enterprises that are mainly engaged in primary household waste collection and street cleaning specially in commercial areas.

Although the private waste collectors' contribution to SWM is encouraging, their activities are constrained by a number of factors:1) lack of integration among themselves and with the municipality bogy which resulted in duplication of functions; 2) no guide line to involve the private sector; 3) lack of accountability due to absence of rules and regulations; and 4) inability to give adequate and efficient services due to limited finances capacity. It is hence paramount on part he of the government to address these problems. More specifically, measures have to be taken to privatize the collection and transportation of waste service.

Involving the private sector in management of waste has proved to be more effective and efficient than the direct provision by the public sector. There are four ways of getting the involvement of the private sector in SWM (Levine, 1994):

**Open competition**: Private Firms compete for customers in an area but with limitation on the number of competitors;

**Franchising**: Local government grants private firm exclusive rights to serve an area with or without price regulation;

**Concessions**: A private firm finances and owns the service delivery system for a definite period sufficient enough to depreciate investments; and

**Contracts**: made between local government and private firms for a definite period of time.

Contracting for solid waste service as a way of lowering cost holds preference for developing cities such as Addis Ababa. This also would allow for the division of the city into smaller portions and to be contracted to private firms and significant efficiencies may be achieved because of contestability of market principles whereby the government monopoly over service delivery is competed against. Franchising in which households, not government, pay a single authorized company is arranged, offers no saving and by comparison it costs more than municipal collection. The extra cost does not also reflect superior quality or reliability.

On the other hand, open competition is often plagued by inefficiency or illegal rivalry. This system may be even more expensive than the municipal one. Private competitors may have higher costs because: they could be too small to be efficient; solid waste management service may be a small part of household budgets and so boring a purchase, that consumers bother to inform themselves about the options to switch suppliers in response to price; competitive firms must bill each customer while both municipal solid waste management department and contractors obtain their resources from general revenue, thus saving several steps of paper work; and finally, a network of local monopolies may be held together by convention or collusion.

With regard to contract specification and overall supervision, the private sector is accountable to the local government. The day-to-day and week-to-week performance of the private firm should be monitored, evaluated, and recorded by the office to be established by the local government. The contractors need to be selected based on a fair and sincere system of bid competition so that they could show a better performance than either the public monopolies or other private participation methods.

The ideal arrangement and approach to private contracting at first may be a hybrid of public and private service i.e. contracting, for instance, for the collection of solid waste from some areas of the city, while retaining public service to the remaining parts.

Monitoring by the local government ensures quality of service provided by private hands.

On the other hand, the cost accountability those private contractors would deliver a lower cost than that of public service cannot be attained without a proper monitoring, articulated contract performance measures and enforceable contract sanctions. Clear definitions of measurable output of service required of the contract, as it enables performance monitoring, should be stated. Besides, the local government should also be in a position to get rid of a contractor whose fees are too high and/or service quality is so low at the end of the contract period.

Evaluation of the private firm's service provision based on concrete data collected with regard to collected transported and disposed solid waste from time to time is essential to make decisions regarding continuation or termination of contract with private firms.

The Length of Contract is also an important issue to be well considered by the local government. It would be necessary to make the contract duration long enough to enable the private firm to depreciate capital expenditures for appropriate technology and equipment. Collection vehicles are believed to have an economic life of six to eight years under a single shift use and life of four to five years under intense use; the length of contracting solid waste collection should be at least four years.

**Informal sector**: The informal sectors are mainly involved in collection and recycling of waste. They undertake their collection activities as itinerants' waste buyer by moving from neighborhoods; and as scavengers or waste pickers from communal container and final disposal site. They are also involved in small scale recycling activities. Although the contribution of informal sectors to SWM system is great, the government hardly gives recognition of their activity.

# 5. The contingent valuation survey: Results and analysis

This section presents the empirical findings of the contingent valuation survey, and discusses the results obtained. Both descriptive analyses and multivariate regression analyses are performed. In the descriptive analyses, cross tabulation between willingness to pay and socio-economic characteristics of the respondents and the frequency distribution of responses for the valuation question have been done. In the multivariate regression analyses, censored LAD (censored quintile) regression is used. Before we do the estimation, an exploratory data analysis (EDA) for some selected variables have been done.

## 5.1 Descriptive analysis

### 5.1.1 Existing solid waste service situation

In order to know the existing solid waste management system in the city, sample households were asked about the existing situation of the service. Different questions were included in the questionnaire that enables to understand the situation and help for the better improvement of the service.

Accordingly, responses regarding whether or not the household is obtaining solid waste collection service from the municipality revealed that only 158(32%) of the total sample household is getting the service once or twice per week.

Responses about the collection and disposal system of solid waste in the city indicate that the majority of the households in the city dispose solid waste collected from their house into the municipality's containers. However, some of the households collect in their own garbage and wait until the collector comes and takes it to dispose it in some other place. There are also some other households who throw their solid wastes into river around their village, the other small number either burn it or bury it near their house or they use either of the above alternative means.

About 22 % of the total sample households get the service from private organization, community associations and daily laborers. Out of these the majority get the service from private organizations and daily laborers with an average fee of birr10 to birr20 per month.

Likewise, 60.5% of the households do not separate the recyclable from non-recyclable solid waste, and they simply dispose them together. Of those who separate, 75% sale the recyclable waste to those who move house to house to buy such items. The reuse of recyclable solid waste is more common in medium income area, and the least is in high income area.

### 5.1.2 Attitude of households towards the existing solid waste service

Households' opinion regarding the current communal containers found in their neighborhood reveal that the containers are too small to contain all the solid waste and filled containers are not emptied properly or on time and produce unpleasant odor. Households indicate that to improve the existing situation of solid waste thrown in their neighborhood, it should be collected regularly and those containers filled with the waste should be emptied on time.

Concerning the awareness of the households on the health impacts caused due to the existence of poor solid waste service, the survey results indicated that almost all households are aware of the negative impacts on health, and the level of awareness is almost the same across the three income clusters.

The majority of the households (62%) said that solid waste management should be the responsibility of the government, the community and the polluter, and there should be an integrated effort among the three parties to improve the service. However, at least 51% of the total respondents prefer the service to be given by the government, and 27.5% prefer private organizations. Only 14% prefer the service to be given by community associations.

Sample households were also asked whether they would be willing to contribute for the improvement of the existing situation; the response revealed that the majority of the respondents (53.4%) said that they are willing to contribute for the improvement of the existing solid waste service situation by paying for an amount agreed upon by the community for the solid waste collection and disposal and by bringing their own garbage to the communal container. Moreover, the vast majority of the respondents (93%) are willing to separate the recyclable from the non-recyclable solid waste if they are asked to do so.

Table 5.1 means of households' WTP for improved solid waste management service and some selected socio-economic variables that are expected to influence the WTP.

**Table 5.1: Means of WTP and selected independent variables**

| Variable name | Addis Ababa city | Low income area | Middle income area | High income area |
|---|---|---|---|---|
| Household sample | 494 | 159(32.19%) | 256(51.82%) | 79(15%) |
| WTP/(Birr/month) | 9.46 | 4.57 | 10.28 | 16.67 |
| mean monthly income (Birr) | 1630.03 | 437.7 | 1531.17 | 4350.13 |
| Average family size | 6.42 | 6.45 | 6.35 | 6.53 |
| education(No.of Yrs | 9.29 | 6.75 | 10.45 | 10.68 |
| Age | 35.6 | 36.64 | 35.38 | 34.25 |
| sex of respondent | | | | |
| male | 260(45.14) | 90(56.6%) | 138(53.9%) | 32(40.5%) |
| female | 234(47.37) | 69(43.4%) | 118(46.1%) | 47(59.5%) |
| status of respondent | | | | |
| not head | 223(45.14%) | 72(45.3%) | 104(40.6%) | 47(59.5%) |
| head | 271(54.86) | 87(54.7%) | 152(59.4%) | 32(40.5%) |
| wealth | | | | |
| not own house | 208 | 120(75.5) | 67(26.2%) | 21(26.6%) |
| own house | 286 | 39(24.5%) | 189(73.8%) | 58(73.4%) |
| occupation | | | | |
| formal | 349 | 112(70.4%) | 172(67.2%) | 65(82.3%) |
| informal | 145 | 47(29.6%) | 84(32.8%) | 14(17.7%) |
| Level of satisfaction | | | | |
| not satisfied | 466(94.33%) | 148(93.1%) | 242(69.3%) | 76(96.2%) |
| Satisfied | 28(5.67%) | 11(6.9%) | 76(29.7%) | 3(3.8%) |
| responsibility | | | | |
| all stakeholders | 476(96.36%) | 155(97.5%) | 246(96.1%) | 75(94.9%) |
| only government | 18(3.64%) | 4(2.5%) | 10(3.1%) | 4(5.1%) |
| Awareness | | | | |
| aware | 482(97.57%) | 153(96.2%) | 250(97.7%) | 79(100%) |
| not aware | 12(2.43%) | 6(3.8%) | 6(2.3%) | 0 |
| Servant | | | | |
| hire | 268(53.7%) | 15(9.4%) | 145(56.6%) | 66(83.5%) |
| not hire | 226(46.3%) | 144(90.6%) | 111(43.4%) | 13(16.5%) |

### 5.1.3 Willingness to pay (WTP) for improved solid waste service

Responses for the valuation question reveal that the average willingness to pay for the whole sample is birr9.46 per month. Of the three clusters, we obtained the highest mean WTP of birr16.67 per month in area a where high proportion of the residents are classified under high-income group. The mean WTP obtained from

areas where the middle and low income group live are birr10.28 and birr4.57, respectively (See table 5.2). This result goes in line with the theory that higher income households are more willing to pay for improved solid waste service than low-income households.

Of the total sample, 9.72% of the households are not willing to pay any amount to improve the solid waste management service of the city. The reasons given are that they cannot pay any amount though they want the improved service, satisfied with the current service and some of them said that the government should pay.

The frequency distribution for WTP responses is indicated in table 5.2. As can be seen from the table, 41.7% are willing to pay between Birr 0.00 and 5 per month, 28.9% between Birr 5 and 10, 13.16% between Birr 10 and 15 per month, 12.35% between Birr 15 and 20, 1.6% between Birr 25 and 30 and 0.61% are willing to pay more than or equal to Birr 30 per month. This reveals that 98.02% of the total sample households are willing to pay less than birr 25 per month. Table 5.2 also shows the results of the cross tabulation of mean of some of the independent variables within the range of the WTP of the households. For example, from the table we can see that the mean income of those respondents whose WTP is between zero and 5 is birr 611.6, and the table shows us that as mean of income increases the willingness to pay also increases.

**Table 5.2 Range, Frequency of WTP and Mean of some selected Variables**

| Range of WTP | Frequency | Cumulative (%) | Mean of income | Gender | Age | Family size | Status of respondent | Education | Starting bid |
|---|---|---|---|---|---|---|---|---|---|
| 0-5 | 206 | 41.7 | 601.6 | 0.618 | 36.94 | 6.519 | 0.608 | 7.77 | 7.28 |
| 5.001-10 | 143 | 70.89 | 1660.8 | 0.545 | 35.43 | 6.125 | 0.545 | 10.19 | 7.66 |
| 10.001-15 | 65 | 84.05 | 2666.6 | 0.384 | 35.69 | 6.4 | 0.569 | 11.14 | 7.54 |
| 15.001-20 | 61 | 96.4 | 3117.6 | 0.393 | 33.75 | 6.623 | 0.361 | 11.03 | 8.19 |
| 20.001-25 | 8 | 98.02 | 1905 | 0.375 | 43.25 | 7.875 | 0.75 | 10.13 | 7.5 |
| 25.001-30 | 8 | 99.62 | 2852.3 | 0.625 | 30.63 | 6.5 | 0.375 | 11.75 | 6.88 |
| 30.001 - ∞ | 3 | | 8325 | 0.5 | 31 | | | 12.75 | 7.5 |
| Total | 494 | | | | | | | | |

Source: Study result

### 5.1.4 WTP and starting bid

For the valuation question two starting values were chosen based on the modes of their occurrence in the pretest survey. These prices are birr 5.00 and birr 10.00 per month, and 49% and 51% of the respondents were randomly selected and given the respective starting price for the bidding game (table 5.3). When we see the distribution of starting bid across area, it can be seen from the table that 80(50.3%) and 79(49.7%) of the respondents from low-income area are randomly given starting price of five and ten birr respectively. The distribution in middle-income area shows that 126(49.2%) are given five birr and the rest 130(50.8%) are given ten birr. 36(45.6%) and 43(54.4%) of respondents from high income area are given a starting price of birr5 and birr10, respectively.

**Table 5.3: Starting bid and mean WTP**

| Starting bid(birr) | Number of respondent | | | | Mean WTP (birr/month) | |
|---|---|---|---|---|---|---|
| | Area | | | | | |
| | 1 | 2 | 3 | | | |
| 5 | 80 | 126 | 36 | 242(48.98%) | 8.91 | |
| 10 | 79 | 130 | 43 | 252(51.1%) | 9.99 | 9.46 |
| Total | 159 | 256 | 79 | 494 | | |

## 5.2 Regression results and discussions

In this section results obtained from regression estimation of willingness to pay equation are presented. Before directly going to the estimation process, we explored selected variables. Here, we examine the distribution of each variable including the mean, median and other percentiles and the skewness and kurtosis of each variable. The results indicate that none of the continuous variables including: average monthly incomes of the household, age of the respondent and family size of the household have normal distribution. We checked whether the residuals are normally distributed or not using Jack-Bera test for normality. The results show that the residuals are not normally distributed since the P.value we obtained is equal to 0.000 for the calculated chi-square, which is sufficiently low to reject the null hypothesis that the residuals are normally distributed.

The estimated willingness to pay model was also tested for problems of multicollinearity since it was felt that a number of socio-economic variables used to characterize households might themselves be correlated. A simple technique, which involves calculating the simple correlation coefficient matrix for the independent variables, was used to test the multicollinearity. The results show that multicollinearity is not a serious problem in our data set since no value whose $R^2$ is greater than or equal to 0.8, which is, according to rule of thumb, an indication for the presence of serious multicollinearity problem (Gujarati, 1995**).**

A test for the presence of heteroscedaciticty problem in our model was also done. The test result shows that the null hypothesis of homoskedaciticity is rejected since the calculated chi-square we obtained from the estimated model is 53.84 with p. value of 0.000. This implies that there is heteroskedaciticity problem in our model, which is expected from survey data.

Therefore, the normality and heteroskedaciticty test for our model data set falls to accept the null hypothesis of normal distribution of the error term and the homoskedasitic error term. These indicate that the use of OLS or Tobit model in our estimation of the model does not guarantee to get sensible results. In the descriptive analyses, we obtained that forty eight observations are censored to zero since we get a zero response to the valuation question from 48 respondents, which implies our model is censored to 48 observations. Therefore, the use of censored quantile regression (censored LAD) estimation is the alternative method to get sensible results (Deaton, 1997).

The censored LAD, CLAD, estimation result is shown in table 5.4. The estimation is done following procedures described in Johnston or following a repeated application of the median regression, which is suggested by Buchinsky's (1994), as cited in Deaton (1997). A bootstrapping estimation is done on whole procedures. We reported the reduced form of our estimation result.

The pseudo $R^2$ for the censored LAD estimation is 0.3044. This value of $R^2$ indicates that 30.44% of the variation in the WTP is explained by the explanatory variables specified in our study. This value of $R^2$ is expected from regression estimation results obtained by using cross sectional CV studies. Mitchell and Carson (1989) proposed, "

The reliability of a CV study which fails to show an $R^2$ of at least 0.15, using only a few key variables, is open to question." In line with this standard, ours is reliable.

From the table we can also see that the constant term is positive though it is not significant showing that the people associate a positive value to an improved solid waste service irrespective of the independent variables specified for the study.
The coefficient of status of the respondent is negative and significant at 1%, indicating that head of a household is less willing to pay than non-head respondents. The possible reason for this could be that since head of the household is responsible for allocating the financial and other resources of the household he/she is very cautious in deciding on any of the resources of the household, and thus he/she is less willing to pay.

The variable 'interest in environmental problem' is found to be positive as expected and significant at 1% level of significant. Generally we can say that those individuals who have an interest to see a good quality and protected environment, which is expressed either by participating in civil environmental association or in other way, are more willing to pay for improvement of the environment.

The other variable that is significant and positive as expected is delivery of improved solid waste disposal service. It is significant at 1% level of significance, indicating that those respondents who prefer the private organization to deliver the improved solid waste service in the city are more willing to pay than those who prefer the government organization to deliver the service.

The other variable consistent with a priori expectations is monthly income of the household. It is significant at 1% and has the expected positive sign. This result confirms with economic theory, which states that an individual demand for a particular commodity depends on his/her income, and that income and quantity demanded are positively related, except in the case of inferior goods. The result shows that those higher income households are more willing to pay for an improved solid waste disposal service than lower income households. The related variable with income included in the estimation is the variable location of the study site. It is included to capture the clustering effect, and is found to be significant at 1% and has a positive sign as expected. This indicates that clustering is so important for the valuation of improved solid waste disposal service in the city.

The variable occupation of the respondent is found to be positive and significant at 1%, as expected. The result is consistent with the idea that those individuals working in the formal sector such as government organization, private organization, NGO's and other related areas are more willing to pay for improved solid waste disposal service than those who are unemployed, and/or engaged in the informal sector. This is because the know-how of those working in the formal sector regarding different environmental situations and their impact on human being is more than the other group.

The other variable that is negative and significant at 1% level of significance is the variable 'servant', which refers whether or not the household hires household servant. The result is consistent with priori expectation. It indicated that those households who hired household servants are less willing to pay for improved solid waste disposal service than those who do not hire servants. The possible explanation for this is that in a household it is usually the servant who is responsible for cleaning, collecting and disposing the solid waste of the household, and the household is paying a wage for the servant to do such and other home economic activities. Therefore, these households are less willing to pay for solid waste disposable service than the other group.

The variable education level of the respondent is found to be insignificant but positive in the reduced form of estimation though it was positive and significant at 10% level of significance in the first estimation result. The other variables including gender, age, family size, level of satisfaction to the existing solid waste service, awareness of the respondent to the effect of improper handling of solid, wealth (proxied by house ownership), number of children and women in the household are found to be insignificant. This implies that these variables are not as such important explanatory variables in the willingness to pay of residents of Addis Ababa for improved solid waste service.

The variable starting price for the bid game was included in the estimation to see whether the starting price creates a bias on the response for the WTP question, i.e. to see whether there was a systematic difference between the WTP bid of households who were randomly assigned a high or low starting price. The test result shows that it is found to be insignificant at the conventional test level. This indicates that the starting price used in the bidding game did not influence the value the respondents

place on the public good. This is an interesting result compared to what is expected from a CV survey using a bidding game as an elicitation method for the valuation question. From Mitchell and Carson (1989), “one of the disadvantages of using a bidding game, as an elicitation method is that the starting price used may lead to a bias results.”

**Table 5.4: Censored LAD estimation result**
**Dependent variable WTP**

| Variable | Coefficient | t-ratio |
|---|---|---|
| Status of respondent | -1.394 | -2.607 |
| Interest in environmental issues | 1.479 | 2.568 |
| Delivery service | 1.564 | 3.178 |
| Household’s monthly average income | 0.001 | 3.948 |
| Occupation of the respondent | 1.345 | 2.376 |
| Servant | -2.006 | -2.519 |
| Location of study (area) | 3.042 | 3.762 |
| Constant | 0.194 | 0.110 |
| No. of observation 494 | | |
| Pseudo R2 0.3019 | | |
| WTP (birr/month) 10 | | |

# 6. Conclusion and direction for improved SWM

## 6.1 Conclusion

This study set out to define the SW collection problem in Addis Ababa and to propose ways of improving the same. Through a household survey, interview with relevant institutions and a physical survey of the city, it was established that the municipality of A.A is not able to provide an adequate solid waste collection and disposal service to its residents. Some 50-60% of generated waste is collected. The rest is either burnt or scattered around the town in open area, streets, and even drainage systems. This situation contributes to environmental degradation, poor public health conditions, high risks of epidemics, and a generally aesthetically unpleasant environment. The reasons for this situation include among others, inadequate financing mechanisms, inadequate technical capacity, failure to enforce existing legislation, poor participation of stake holders, and generally a weakness in existing gestational structures.

Despite all the problems of SWM of Addis Ababa, the survey identified positive indications upon which possible solutions can be made. They include household acknowledgment of the need to pay for waste collection service and private sector willingness to be involved in waste collection service. These offer an opportunity for the Addis Ababa City Government (AACG) disposes of those activities, which the private sector can take care of. Building on these, increased participation of the private sector and the community seems the direction for improved SWM in Addis Ababa. AACG should be involved because it has ultimate responsibility for refuse collection; the private sector should be involved because it has a greater capacity to mobilize resources and run its operations on commercial and business principles (private sector involvement is not a new concept and it has been tried with varying success levels in a number of developing countries); and communities should be involved because as consumers of the service they have an obligation to make some contribution that will ensure that the service is provided

The problem of solid waste thus requires community and private sector participation in its management. One of the ways community participation can be achieved is by requiring them to pay for it. In line with this, the present study determines household's willingness to pay for improved solid waste collection and disposal service for the inhabitants of Addis Ababa. One of the main findings of the study is that almost all households are willing to pay positive amount for the improved service. The mean willingness amount was 9.46 Birr per month per household for the entire sample while across income categories the corresponding figures were 4.56 Birr, 10.28 Birr and 16.67 Birr per month for low-, middle- and high- income areas, respectively.

The multivariate analysis revealed that income, status of respondents, interest in environmental issues, occupation, servant, area and types of service provider are significant determinants of willingness to pay of households. Income has a positive effect on willingness to pay and is significant at 1%. The coefficient of status of respondents is negative and significant at 1% indicating that head of the household is less willing to pay. The relation between interest in environmental issues and willingness to pay is positive. It is significance at 1% level of significance. The occupation variable shows that engagement in the formal sector is important when the environment is valued. Occupation is significant at 1% and has the expected sign. Servant employment is also relevant as households who hire servants are willing to pay less amount. The variable servant is significant at 1% and has the expected

negative sign. The coefficient of service provider dummy is significant and positive. It can be interpreted that people prefer the private sector to carry out such type of service.

It appears that solid waste management service is a necessity for inhabitants of Addis Ababa and hence, there exists a positive willingness to pay for it. This would mean that the system should exploit this particular opportunity by encouraging the private sector involvement in the venture. The participation of the private sector will be important in bridging the gap created by the inefficient performance of the Addis Ababa municipality. It would also be good to improve the general awareness of the health benefits of the improved waste management to give the willingness to pay a boost in the sector. In addition, the different options for community participation other than willingness to pay should be investigated for enhancing policy formulation and implementation.

## 6.2 Direction for improved SWM

The two strong points identified in the survey are household acknowledgment of the need to pay for waste collection service and private sector willingness to be involved in waste collection service. Building on these, the study proposes to improve solid waste collection through a participatory approach. This participation should aim at promoting public health, environment protection, economic efficiency, and good governance. In order for AACG to achieve this goal new technical, financial and institutional arrangements will have to be made.

Solid waste collection and transportation service could be privatized in an area of the city where the survey indicates the acceptance of the private option is greatest. Solid waste is among the easiest of municipal services to privatize. At the same time, the municipality can continue to provide services in some areas (i.e. low income areas) of the city to retain backup capacity. Such arrangement valuable evidences on the relative efficiency of public and private providers in the city while at the same time acting as a spur for the public sector to improve its performance.

Service charges for SWM should be based on the willingness and ability to pay. Service charges can be billed with other services such as water or electricity as a

means of achieving compliance. AACG collects a service charge from high and middle-income neighborhoods to private firms. It will be more appropriate to design cross subsidy of waste collection from low-income areas. Nevertheless, small fee will have to be collected from low-income inhabitants.

AACG is expected to facilitate and control the activities of the private sector through contracts and licensing. AACG has to be involved with giving out contract to private firms for the service of formal residential areas. This contract should stipulate clearly the population or area to be served, agreed performance standards and agreed penalties for non-performance.

It is also important to design an institutional framework that fosters participation, that the role and responsibilities of each stakeholders are clearly defined. The main objectives of the regulatory framework are to ensure compliance with standards of service operations, and environmental regulations and standards to guide private collections and residents need to be set up.

Finally, the survey result has also identified that the roads specially in low income and high income areas are in a bad conditions. Improving the road network is vital for increasing truck efficiency by reducing time to visit site and it also assists in reducing maintenance cost.

## References

Addis Ababa City Administration. 1998. Improving Urban Environmental conditions in Addis Ababa. Addis Ababa Ethiopia.

Altaf, M.A. and J.R. Deshazo. 1996. Household demand for improved solid waste management: a case study of Gujranwala, Pakistan. World Development, vol. 24, no 5.

Beede, David N. and Bloom, David E. 1995. The Economics of Municipal solid waste. The World Bank, Research Observer 10(2): 113 -151.

Beukering, Van Pieter. 1994. An Economic Analysis of different types of formal and informal entrepreneur, recovering urban solid waste in Bangalore (India). Resource, conservation and recycling 12: 229 -252.

Birungi, B.P. 2002. Income elasticity and household solid waste management in developing countries: Evidence from Uganda. Draft.

Bishop, R.C and T.A. Heberlein. 1990. The contingent valuation method. Economic valuation of natural resources: Issues, theory and applications. Edited by R.L. Johnson and G.V. Johnson, Westveiw press, Oxford.

Blore I., and F. Nunan. 1996. Living with waste: Public valuation of solid waste impacts in Bangkok. Development administration group school of public policy, the university of Birmingham, no. 57.

Camell de Stoop. 1998. Waste collection and Disposal in Addis Ababa. Proceedings, workshop held in Addis Ababa, The Royal Netherlands Embassy.

Carson, R., Y. Robert and C. Mitchell.1993. The value of clean water: the public's willingness to pay for boatable, fishable, and swimmable quality water. Water resources research, vol.29, no. 7, pp 2445-2454

Cointreau, S.J., Gunnerson, C.G, Huls, J.M. and Seldam, N.N. 1984. Recycling from municipal refuse: A state of the Art Review and Annotated Bibliography. World Bank Technical Paper No.30. The World Bank, Washington , DC.

Cointreau, S.J. 1987. Environmental Management of Urban Solid Wastes in Developing Countries. Urban Development Technical Paper, no.5. The World Bank, Washington , D.C.

Cointreau, S.J. 1992. Environmental management of urban solid waste management: A project guide, urban development technical paper, no.5. World Bank, Washington D.C.

Diamond, P.A. and Y.A. Hausman.1994. Contingent valuation: Is some number better than no other. Journal of Economic perspective. Vol. 8, no. 4, pp 45-65

Duston, Thomas E. 1993. Recycling solid waste: The First choice for private and public sector management. Edit. Quorum USA.

Engenia M. and E. Mayett. 2001. Economic valuation of the environmental impact of solid waste management: A case study. Department of economic, University be las Americas-puebla.

Freeman, A.M. III. 1993. The measurement of environmental and resource values: Theory and methods. Washington, D.C.: Resource for the future.

Gerlagh, R., Pieter Van B., Verma, M, Yadav, P.P. and Pendey, P. 1999. Integrated Modeling of Solid Waste in India. Working Paper No 26. The world Bank, Washington, D.C.

Hanneman, W.M. 1994. Valuing the environment through contingent valuation. Journal of economic perspective 8, no.4, pp 17-43.

Hartwick J., M.Y. Nancy and D. Olewiler.1998. The economics of natural resource use. Edit. Addison Wesley, USA.

Johansson, P.O.1993. Cost-benefit analysis of environmental change. Cambridge: Cambridge university press.

Katalin, K.Z. 1998. The right garbage collection service charge estimated through contingent valuation method: the case study of Istanbul, Bilkent University. Draft.

Mitchel, R.C. and R.T. Carson.1998. Using survey to value public goods: The contingent valuation method, Resource for the future, Washington, D.C.

OECD. 1994. Project and policy appraisal: Intergrating economics and environment. Chapter 6 and 7.

Portney, R.Paul.1994. The contingent valuation debate: Why economists should care. Journal of perspectives. Vol. 8, no.4, pp 1-17.

Region 14 Administrative Hygiene and environment sanitation regulation, proclamation no 1/1994. Addis Ababa 1994.

Richard T.C., E.F. Nicholas and F.M. Norman. 1996 Contingent valuation: Controversies and evidence. Draft.

Rogier, M. 1998. Marketing of solid waste management service in Tingloy, the Philippines: A study on affordability and willingness to pay, UWEP working document 9, the Netherlands.

Whittingtol, D, V. Kerry Smith, A.Okorafr, A. Okore, J. Long Liu, A. McPhail. 1992. Giving respondents time to think in contingent valuation studies: a developing country application. Journal of environment economics and management, no.22, pp205-225.

World Bank. 1989. Guidelines for conducting demand assessment and willingness to pay survey for solid waste collection and disposal services. UNDP/World Bank regional water supply and sanitation group, Abidjan, Ivory Coast.

Yitbarke, M. 1998. Contingent valuation survey in solid waste collection: A case study in Addis Ababa, Ethiopia. M.Sc. Thesis. Department of Environment economics Waganingen Agricultural University.

Zellek Zewdie. 2002 Solid waste management in Addis Ababa: Problems, prospects and strategic actions. Addis Ababa development and improvement project office.

## Appendix

The expected signs are determined based on theoretical, empirical and the characteristics situation of the city.

1. Age of the respondent (Age): since old people may consider waste collection is the responsibility of the government, they are less willing to pay whereas younger generation are willing to pay more since they can easily understand the cost sharing concept of providing public services.
2. Gender of respondent (Gen). Since in the study area traditionally waste collection and disposal house cleaning is the role of female, we expect female respondents are more willing to pay than men respondents. The variable entered the regression as dummy variable taking one if the respondent if male and zero if the it is female.
3. Status of the respondents (status): a dummy variable taking one if the respondent is head of the household, zero otherwise. This variable is included to examine whether or not interviewing the household head or its representative has a significant different effect on the amount of willingness to pay for improved solid waste service.
4. Family size (Fsize): this is a continuous variable, and represents the number of persons living within one household. It is expected to have negative sign.
5. Number of children (nchild): the variable refers to the number of children below 15 years of age. A positive relationship is expected between this variable and willingness to pay since a household with larger number of children prefers to have clean environment.
6. Number of women (nwom): refers to the number of female in the household. It is expected to have negative influence on willingness to pay since traditionally women are responsible to clean, collect and dispose wastes.
7. Interest in environmental problem (iep): a dummy variable taking one if the respondent is interested in environmental issues which is reflected by being membership of environmental association or participated in any environmental improvement activities or interested to participate or to be a member of the association, otherwise the dummy will take zero. This is expected to have a positive relationship with the dependent variable willingness to pay.
8. Level of satisfaction (lsat): a dummy variable taking one if the respondent is not satisfied by the existing solid waste management of the city, otherwise it is zero. Respondents not satisfied with the existing solid waste service are more willing to pay than those that are satisfied.
9. Awareness of environmental problem (Aware): a dummy variable taking one if the respondent is aware of the problems caused by deteriorated environment, otherwise it is zero. We expect higher willingness to pay from those who are aware of the effects of deteriorated environmental situation on human beings.

10. Responsibility of solid waste management (Respo): a dummy variable taking one if the respondent says that improved solid waste management is the responsibility of government, the community and private organizations i.e. it is a responsibility of all stakeholders in integrated manner. Otherwise it is zero. Respondents who say it is an integrated activity of all stakeholders are more willing to pay than the other groups i.e. those who say it is only the government's or only the polluter's responsibility.
11. Level of education of the respondent (edu): refers to the number of years the respondent attends in the school. Respondents with higher education level are more willing to pay to improved solid waste management since the higher the level of education the easier to understand the effect of mishandling solid waste and thus the more the value given to cleaner environment.
12. Servant (serv): dummy variable taking one if the household hires a house servant, otherwise zero. We expect a negative relationship between the variable 'servant' and willingness to pay since cleaning, collecting and disposal of the waste of the household is handled by the house servant.
13. Service delivery (dservice): refers the preference of the respondent towards the management of solid waste service in the city. It is a dummy variable and takes one if the respondent prefers private organization to government organization for the management of solid waste disposal in the city. We expect more willingness to pay from those who prefers private organization.
14. Area: refers to the area where the respondent lives. It is a categorical variable taking 1, 2 and 3 if the respondent is currently living in low, medium and higher income area, respectively.
15. Household income (hhincome): refers to the monthly income of the household in terms of birr. This includes the monthly income earned by the household from any source. Theoretically, there is a positive relationship between income and demand for improvement in environmental quality. Thus we expect a positive impact on willingness to pay for improved solid waste management.
16. Occupation of the respondent (occup): the type of the respondent is currently working. It is a dummy variable taking one if the respondent is working in formal sector ( government, NGO, private organization, etc), otherwise it takes zero. We expect a positive relationship with willingness to pay.
17. Wealth : the variable is used as a proxy to ownership of the house in which the household is currently living. It is a dummy variable taking one if the household owns the house. Otherwise it is zero. The variable is expected to have a positive sign.
18. Starting bid (sbid): this variable is entered the regression to examine whether or not the respondent's willingness to pay is influenced by a starting bid i.e. to examine the existence of starting price bias.