Ethiopian Economics Association (EEA)

PROCEEDINGS OF THE SEVENTH INTERNATIONAL CONFERENCE ON THE ETHIOPIAN ECONOMY

Edited by
Getnet Alemu

May 2010

Volume II

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❖ ALL ACTIVITIES OF EEA ARE SPONSORED BY THE AFRICAN CAPACITY BUILDING FOUNDATION (ACBF), EMBASSY OF UK (DFID), EMBASSY OF SWEDEN (SIDA), THE NORWEGIAN CHURCH AID, EMBASSY OF NETHERLANDS, EMBASSY OF IRELAND (DCI), FRIEDRICH EBERT STIFTUNG OF GERMANY (FES), AND INTERNATIONAL DEVELOPMENT RESEARCH CENTER (IDRC) OF CANADA.

FOREWORD

The Ethiopian Economic Association (EEA) is happy to issue three volumes of the proceedings of the 7th International Conference (the 18th Annual Conference) on the Ethiopian Economy that was held from June 25 – 27, 2009 at EEA Multi-purpose Building Conference Hall. EEA has been organizing annual conferences on the Ethiopian Economy every year as part of its overall objectives to contribute to the economic advancement of Ethiopia through dissemination of economic research findings; promotion of dialogue on socio-economic issues; promotion of education in economics in higher learning institutions; enhancing national, continental and global networks of professionals and institutions; and advancement of the professional interests of its members.

Since its establishment, the Ethiopian Economic Association has been actively engaged in economic research, training, and organization of International and National conferences and round table discussions on the Ethiopian economy and the dissemination of the results of these activities through its various publications. It has also been able to provide professional opinion and advice on many issues affecting the development of the country.

As a result of these and other efforts of the Association, EEA has successfully established itself as a key player in the economic and social development process of Ethiopia and become 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 7th International Conference on the Ethiopian Economy attracted high turnout of the participants, papers presenters and session organizing institutions. The conference was attended by about 420, 238 and 252 participants during the first, second and third days of the conference, respectively. The conference officially opened by H.E. Ato Neway Gebre-Ab, Director, Ethiopian Development Research Institute and chief economic Advisor to the Prime Minister of FDRE.

All in all, 74 papers were presented in seven plenary and five parallel sessions. Of the total paper presented at the three day conference, 19 papers were presented by session organizers that include World Bank, Future Agriculture, EDRI, IFPRI, RiPPLE, Economics Department of AAU, Young Lives Study and Ethiopian Development Research Institute. The remaining 55 papers were presented by individual researchers.

Out of the total 55 papers presented by individuals on this 7th International Conference, the editorial committee received 37 papers from authors and reviewed them. Comments and suggestions including editorial comments were communicated to authors for improvement. Among the 37 papers, the editorial committee selected 25 papers to be included in this edition. In addition to this, six papers which were presented by session organizers (IFPRI, Future Agriculture, EDRI and AAU) were edited and included in this edition. All these papers are organized into three volumes. Volume I contains Growth & Development, Volume II contains Finance and Social Sector Development and Volume III contains Agriculture and Related Development.

I would like to take this opportunity to express my heartfelt gratitude, on my own behalf and on behalf of the Ethiopian Economics Association, to the many people and organizations that made the conference a resounding success. First and foremost, I thank the authors of the papers and the audience whose active participations made the conference meaningful and dynamic. The World Bank and Commercial Bank of Ethiopia are sincerely acknowledged for sponsoring the Conference. The many professionals who dedicated their time to the conference and served as chairpersons deserve due thanks for their special contributions.

Our special thanks go to our partners who have shared our vision and provided us with generous financial support to materialize the activities of EEA. These include; The African Capacity Building Foundation (ACBF), The Norwegian Church Aid, The Royal Netherlands Embassy, The Swedish Embassy through SIDA, The Development Cooperation of Ireland (DCI) and the Ireland Embassy, the British Embassy through DFID, the Friedrich Ebert Stiftung of Germany, and International Development Research Center (IDRC) of Canada.

Finally, I would like to extend my sincere gratitude to H.E, Ato Neway Gebre-Ab, Director, Ethiopian Development Research Institute and chief economic Advisor to the Prime Minister of FDRE, for his an insightful keynote address; and other senior government officials who spared their busy schedule and participated in the conference.

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

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Finance and Social Sector Development

LOAN REPAYMENT, RATIONING AND BORROWERS SCREENING IN MICRO-FINANCE CREDIT: THE CASE OF THE OROMIA CREDIT AND SAVINGS SHARE CO. (OCSSCO) IN KUYU, ETHIOPIA

Jemal Abafita[1]

Abstract

Despite the potential benefits of group-lending schemes employed in the delivery of micro-credit, micro financing programmes are increasingly facing default problems. This study was conducted to investigate the factors that influence microfinance loan repayment and evaluate the loan rationing mechanism employed by the lender, using survey data. The results showed that education, income, loan supervision, suitability of repayment period, availability of other credit sources and livestock are important and significant factors that enhance the loan repayment, while loan diversion and loan size are found to significantly increase the probability of loan default. In addition female borrowers were found better in terms of loan repayment. On the other hand, the lender's rationing mechanism favoured borrowers who are older, male, apply for larger loan amounts, own livestock of higher value, perceive supervision as adequate and the repayment period as suitable, while those who are literate, loan diverters, support more dependents and earn more income, were not favoured. Moreover, the findings suggest that there were flaws in the rationing mechanism employed, as creditworthy borrowers (like literate borrowers) were rationed more while those who significantly contributed to the default problem (like male borrowers and those who applied for larger loan amounts) were rationed less. An important policy implication of these findings is that, a careful examination of the factors related to repayments helps reduce default problems while due attention should be paid to tackle problems associated with the rationing mechanism in designing a better lending strategy.

Key Words: Loan repayment performance, loan diversion, loan rationing, creditworthy, default, group-based credit scheme

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1. Introduction

Poverty is the main challenge and a fundamental issue of economic development in Ethiopia. The solutions to poverty are multifaceted as are its causes. Many argue that an inadequate supply of credit can affect production negatively. Alleviation of poverty and promotion of economic development can therefore be facilitated through providing credit to the poor.

In Ethiopia, credit schemes that target the poor were almost non-existent for long. The formal financial institutions have been largely excluding the majority of the rural as well as urban poor thereby forcing them to turn to informal sources. Credit from such sources is not only inadequate, but also exploitative and costly. Although some NGOs have been providing credit to poor households in some parts of the country since the 1970s, wide-scale micro-financing began in 1990s with a credit scheme that targeted the urban poor (Mengistu, 1997).

As these credit services were being carried out by various organizations in a fragmented and inconsistent way, there was a need for the government to put in place a strategy for coordinating and regulating their activity. As a result, a number of MFIs were established and went operational in many parts of the country.

Within a short period after establishment, the MFIs achieved an impressive performance. However they soon begun to increasingly face default problems, which in turn hampers their lending capacity thereby limiting credit access to new applicants and possibly distorting the efficiency of their lending mechanisms. Moreover, the financial viability and institutional sustainability of the MFIs may also be compromised as a result.

The implication of all these is quite detrimental and should be tackled at any cost, for the credit schemes to meet their intended goals of poverty alleviation. This calls for the designing of an efficient lending strategy. This in turn requires a thorough understanding of the factors that enhance loan default and studying of borrowers' characteristics that help distinguish between applicants in terms of trustworthiness. Hence, this paper examines the factors underlying the loan repayment performance of borrowers and how these factors relate to the lender's decision of rationing loan among its clients in an attempt to evaluate the efficacy of the rationing mechanism used with reference to the case of borrowers of OCSSCO in Kuyu district of Oromia.

A number of studies have been conducted on credit schemes that target the poor in Ethiopia. However, empirical studies on determinants of loan repayment performance

and their relationship to lenders' loan rationing decisions are quite limited, especially in the context of micro financing schemes in Ethiopia. In particular, there has never been a similar study in the past that focused on the case of OCSSCo. This study, therefore, provides a detailed empirical analysis on the loan repayment performance of OCSSCO. It also investigate the screening mechanisms used by the institution and attempts to suggest policy recommendations that help design efficient lending strategies for ensuring program sustainability.

The rest of this paper is organized as follows. The next section gives a brief review of the theoretical and empirical literature relevant to this study. In section 3 the framework of analysis is presented followed by the econometric model in section 4. With a brief description of the data in section 5, results and discussions part of the study is given in section 6. Finally, section 7 draws policy implications and concludes the paper.

2. Review of relevant theoretical and empirical literature

2.1 Group lending and loan repayment

Since the 1970s, group-lending programs have been promoted in many developing countries. A common characteristic of group lending programs is that the group obtains the loan under joint liability, so each member is made responsible for repayment of loans of his or her peers. Under such schemes, the functions of screening, monitoring and enforcement of repayment are to a large extent, transferred from lender to group members. This reduces lending transaction costs as lenders will have to deal with a larger group loan instead of a multiple of small individual loans thereby enabling financial intermediaries to bank with the poor (Zellar, 1996).

Zeller (1996) argues that probably the most important rationale for group lending is the information and monitoring advantages that group-based financial institutions at the community level have, compared to individual contracts between a bank and borrower. Group members get important information like reputation, indebtedness and asset ownership of the loan applicants at a lower cost. They can also easily monitor individual efforts made towards ensuring repayment.

In addition, groups may also have a comparative advantage in enforcement of loan repayment. Group members can potentially employ social sanctions or even seize physical collateral from the defaulter (Besley and Coate, 1995). Moreover, group

members appear to be in a better position to assess the reason for default and to offer insurance services to members who are experiencing shock that are beyond their control. (Zeller, 1996)

Despite all the above-mentioned benefits, group lending is not without its problems. There are several factors that may undermine the repayment performance in group lending. Zeller (1996) discusses that since the risk of loan default by an individual is shared by his or her peers, a member may choose a riskier project compared to that in the case of individual contract, and may count on other members to repay his or her loan (i.e. adverse selection of risky projects). He further notes that repayment incentives for a good borrower will vanish under joint liability, when he or she expects that significant number of peers will default.

Some of the factors well recognized in the literature as contributing to loan default problems include borrowers age, sex, marital status, level of education, household size, asset possession, level of income, number of income sources, loan size, loan utilization/diversion, repayment period, and timeliness of loan release among others (Vigano 1993, Zellar 1996, Kashuliza 1993 Njoku and Odii 1991, Chirwa 1997, Arene 1992, Adeyemo 1984).

2.2 Rationing in credit markets

The credit market in many developing countries is characterized by market imperfections of various forms. Particularly in the context of rural areas, these imperfections imply that poor households remain credit-constrained, despite government policies to improve access to credit. The formal financial institutions fail to satisfy the growing demand for credit with the result that poor households in developing countries fail to obtain as much credit as demanded-if they obtain any credit at all- and hence are credit rationed by the formal lenders.

Credit rationing is broadly defined as a situation where the demand for loans exceed the supply of loans at the going interest rate. Different types of credit rationing have been examined in the literature. Pehlivan (1996) saw it from the angle of loan size where borrowers receive a lesser amount of loan than they requested at a given loan rate.

Stiglitz and Weiss (1981) defined loan rationing as a situation where among loan applicants who appear to be identical some receive loans and others don't, even if these rejected ones offered to pay a higher interest rate or equivalently, some identifiable groups of individuals who, with a given supply of credit, are unable to

obtain loans at any interest rate, even though with a larger supply of credit, they would.

Jaffe and Stiglitz (1990) further broadened the classification and identified the following types credit rationing:

1. A situation where a borrower may receive a loan of smaller amount than desired;
2. A situation where some individuals cannot borrow at the interest rate they consider appropriate based on what they perceive to be their probability of default;
3. A situation where a borrower may be denied credit, when a lender thinks of not being able to obtain its required return at any interest rate.

The concept that this study addressed is, the first type of rationing.

An important study by Hunte (1996) examined repayment behavior of borrowers and the credit rationing technology of lenders in a rural financial institution, Hunte estimated loan rationing and loan repayment equations using tobit model and found out that only 33% of the criteria utilized identified credit worthy borrowers implying that the screening system was not efficient.

Looking at the situation of Ethiopia empirical studies on determinants of loan repayment and loan rationing are very few. Regarding loan repayment Mengistu (1997) used an econometric estimation taking the case of micro enterprises in Awasa and Bahir Dar towns. He estimated two equations, one for loan repayment and the other for loan rationing. The estimation results revealed that the number of workers employed has positive relation with full loan repayment for both towns, while loan size and loan diversion were negatively related. Age and weekly repayment period had positive relation with repaying loan in full for Awasa. In the case of Bahir Dar, loan expectation and number of workers employed have a positive relation with full repayment, while loan diversion and availability of other sources of credit have a negative impact. The predicted probabilities of full loan repayment were 53% and 78% for Awasa and Bahir Dar respectively.

With regard to loan rationing for Bahir Dar, six out of nine variables are significant. Accordingly, loan size, expectation for another loan and availability of other credit sources reduced the probability of being loan rationed. On the other hand number of workers employed, supervision visits and loan diversion have negative impact. For the case of Awasa, five variables are significant; namely, loan size, age, education, weekly repayment period and loan diversion. Literate borrowers and borrowers with relatively higher level of age were incorrectly rationed despite being good payers.

In a study on the Project Office for the Creation of Small–Scale Business Opportunities (POCSSBO) in Addis Ababa, Berhanu (1999) using probit model found that education, timely loan granting and the use of accounting system are negatively related to the proportion of loan funds diverted. However loan size, numbers of dependents with in the household and consumption expenditure is positively related to loan diversion. He reported that loan diversion and loan size are negatively related to full loan repayment while age is positively related.

Retta (2000) also employed probit models for loan repayment performance of Women Fuel Wood Carriers (WFCs) in Addis Ababa. He reported that educational level is negatively related to loan repayment while frequency of loan (repeat borrowers), supervision, suitability of repayment installment period and other income sources are found to encourage repayments and hence reduce the probability of loan default.

In another relevant study by Abreham (2002) examined determinants of repayment status of borrowers and criteria of credit rationing with reference to private borrowers around Zeway area who are financed by the DBE. The estimation result employing tobit model revealed that having other source of income education, work experience in related economic activity before the loan and engaging on economic activities other than agriculture are enhancing while loan diversion, being male borrower and giving extended loan repayment period are undermining factors of loan recovery performance.

With regards to loan rationing mechanism, it was found that borrowers who secured high value of collateral and those with relatively longer period were favored while those with higher equity share and extensive experience in related activity were disfavored. This leads to the conclusion that the bank's rationing mechanism didn't much with the repayment behavior of the borrowers.

Bekele et. al. (2003) employed a logistic regression model to analyze the factors influencing loan repayment performance of smallholders in Ethiopia. The authors used data on 309 borrowers of input loans in the Oromia and Amhara National Regional states and found out that individuals who took larger loans had better repayment performances than those who took smaller loans. Further the results of the study revealed that late disbursement of inputs purchased by the loan funds was an important bottleneck in loan repayment while livestock were found to be important in improving the farmers' repayment performance.

With the exception of Hunte (1996), Mengistu (1997) and Abraham (2002), all of the studies discussed above focused on either loan repayment aspect alone or impact of credit with no attention to loan rationing aspect. However, none of these studies

focused on the case of micro finance. Thus in the current study, we apply loan repayment and rationing techniques on the micro financing scheme of OCSSCO.

3. Materials and methods

3.1 The data and sampling procedure

The data used in this study are primary and cross-sectional in type and cover seven rounds of loans. The branch office of OCSSCO in Kuyu has conducted seven rounds of loans since it begun its operation in the district. Of the eight rounds only those loans for which the maturity has already passed at the time of data collection were considered. That is, loans extended during the first six rounds (beginning 1995/96 through 2001/02) were considered, while those granted in 2002/03 were excluded, since their maturity dates fall in 2003/04.

The data were collected in 2003 using a structured questionnaire that was administered with the help of trained enumerators. List of borrowers was found from a book called master group register. This is a book containing lists of clients recognized and registered at the office along with group number, centre number, sex and age of clients. It also contains information on clients that quitted membership, date and reason for the quitting. Information obtained using the survey questionnaire included borrower characteristics like age, sex, marital status, level of education, household size, occupation, etc; loan history like amount, purpose and utilization of loan, loan group characteristics, income, access to medical and educational facilities, nutritional status, savings and financial recording, borrowers' perception of cost of default and adequacy of supervision, and other relevant variables.

Besides, discussions were made with borrowers, and relevant documents of OCSSCO Kuyu branch office were also used. Information obtained from the branch office included repayment period, loan term, loan disbursement and collection, screening mechanisms, saving services, formation of groups/centres, supervision, etc.

The study area has 23 PAs and 2 Kebeles in the rural and urban areas respectively. Both the two kebeles in Gebre Guracha town, the administrative capital of the district and fourteen of the PAs in the rural area are covered by OCSSCO's credit scheme. For the purpose of the study, 11 out of the 14 rural PAs and both the urban Kebeles of Gebre Guracha town were selected as follows. First Kebeles/PAs were identified after which beneficiaries were selected using simple random sampling from the list of all the borrowers found in the kebeles and PAs selected. Obviously simple random sampling in the context of rural Ethiopia happens to be difficult. This is because it is

not easy to get all the randomly selected individuals from the list of the total population of clients for the interview. In such cases interviewing others who were available during the survey in place of those selected was done to solve the problem. The sample size was 203, which was 9.3 percent of the total beneficiaries of the program. Pre-testing was made on seven beneficiaries to make some modifications on the design of the questionnaire.

3.2 The analytical model

3.2.1 Loan repayment performance

The loan repayment equation is specified based on the assumption that the decision of the i^{th} borrower whether to repay loan in full or not depends on an unobservable utility index, u_i explained by a set of independent variables. This utility index, which indicates that the probability of repaying loan in full will be greater if its value is larger, can be defined by a regression relationship as:

$$U_i = \beta' X_i + \varepsilon_i$$

where u_i = utility index, β=Vector of parameters, X_i= Vector of explanatory variables (Maddala, 1983).

This unobservable utility index is precisely a measure of the utility derived from repaying. For example, if a borrower expects to get another round of loan, he/she will repay the current loan (Mengistu, 1997).

In order to relate this unobservable utility index to the decision of repaying loan in full, we assume that

$$\begin{cases} LREP_i = 1 \quad if \quad U_i > 0 \qquad (borrower repaid\ loan\ in\ full) \\ LREP_i = 0, \quad if \quad U_i \le 0 \quad (borrower didn't\ \ repay\ loan\ in\ full) \end{cases} ; \qquad (1)$$

where $LREP_i$ is loan repayment for the i^{th} borrower.

Assuming U_i are normally distributed with a zero mean and variance δ ^{2,} the probability that U_i; >0 can be computed as:

$$P_i = \Pr ob(U_i > 0) = F(U_i) = F(\beta' X_i) \qquad (2)$$

where F is the CDF.

Hence the likelihood function (the joint probability) is given by: (Maddala, 1983).

$$L = \prod_{LREP=1} P_i \prod_{LREP_i=0} (1 - P_i)) \qquad \textbf{(3)}$$

Since we do not have actual repayment rates, i.e., what we know is only whether a borrower has repaid his loan or not, we need to categorize borrowers into two to address the issue of determinants of total loan repayment. Hence, we have to look for an appropriate model for our analysis of the determinants of repayment and probability of falling in either of the two groups. Application of OLS, which in this case is the Linear Probability Model (LPM)- since our dependent variable is dichotomous- is not feasible because of problems of non-normality and heteroscedasticity of the error terms; and possibility of estimated probabilities lying outside the [0,1] range.

In practice the probability of repaying loan in full is expected to be non-linearly related to a set of explanatory variables, the estimated probabilities lying in the [0,1] range. Such a specification would provide us with a Cumulative Distribution Function (CDF) from which the two commonly chosen distributions; namely, the logistic and the normal CDFs emerge. These CDFs give rise to the logit and the probit models respectively (Gujirati, 1995).

The logistic and the normal CDFs are very similar in their shape except that the former is slightly fatter around the tails than the latter (Maddala, 1983). Although the choice between either of these models is difficult based on theory, the logit model is chosen for the purpose of this study.

On the other hand, loan diversion rate, which is included as one explanatory variable in the repayment equation, is itself dependent on some of the other explanatory variables in the same equation. This necessitates the use of its fitted values to avoid interdependence between the variable and the error terms. The values of loan diversion rate (ratio of amount of loan diverted to total loan received) are limited between zero and one. Although the use of OLS is possible here, the two-limit tobit is a commonly applied model, in cases when the outcome is a probability or a percentage (Long, 1997). This model is specified as:

$$\mathbf{LDVR_i^* = \gamma X_i + \varepsilon_i} \qquad \textbf{(4)}$$

Where $LDVR_i^*$ is a latent variable and **Xi** and $\boldsymbol{\varepsilon_i}$ are set of explanatory variables and error terms respectively.
If $LDVR_i$ is the observed variable, the Tobit model will be:

$$LDVR_i = \begin{cases} 0 & if \quad LDVR_i \le 0 \\ LDVR^* & if \quad 0 < LDVR^* < 1 \\ 1 & if \quad LDVR^* \le 1 \end{cases} \qquad \textbf{(5)}$$

where 0 and 1 are the lower and upper limits respectively. Thus, the models for loan repayment and loan diversion can be given as follows:

LREP = f(AGE, SEX, EDUC, LSZE, TIML, LDVR, INCLN, INCOTH, LVSTK, SUITRP, ADQSV, AREA, NUMDP, ξ) **(6)**

LDVR=f (NUMDP, ADQSV, EDUC, BKEEP, INCOTH, LSZE, NUMTB, SUITRP, ζ) **(7)**

Below are given the list of the variables used with their expected signs.

Variable	Description	expected signs	
		loan repayment	Loan diversion
AGE	Age of borrower	+/-'	not used
SEX	Sex of borrower (0 = FEMALE)	(-/+)	not used
EDUC	Borrower's level of education (ILLITERATE, PRIMARY, HIGHSCHOOL & ABOVE HIGHSCHOOL)	(+)	?
OSC	availability of other sources of credit (0=not available)	not used	?
LSZE	Loan size (IN BIRR)	?	(+)
TIML	Timeliness of loan release (0 = NOT TIMELY)	(+)	not used
LDVR	loan diversion (AMOUNT OF LOAN DIVERSTED TO TOTAL LOAN RECEIVED)	?	not used
INCLN	income from projects financed by the loan (ANNUAL)	?	not used
INCO	income from other sources	?	not used
LVSTK	possession of livestock (worth value in Birr)	?	not used
SUTRP	suitability of repayment period (0=NOT SUITABLE)	(+)	(-)
ADQSV	adequacy of loan supervision visits to borrower (0=INADEQUATE)	(+)	(-)
AREA	location of residence of the borrower (0=URBAN)	(-)	not used
NUMDP	number of dependents	not used	(+)
BKEEP	use of financial recording (0=no recording)	not used	(-)
NUMTB	number of times borrowed	not used	?

3.2.2 Loan screening (rationing) mechanism

The method of analysis employed by Hunte (1996) stands appropriate for this section of the study. Unlike the loan repayment equation, the dependent variable for the loan rationing equation is continuous and limited between 0 and 1, i.e., we have some who are rationed loan and others who are not (with varying degrees). The appropriate model is tobit (Maddala, 1983). But for the purpose of this study, since we are going to use a dummy variable by defining loan rationing to be equal to 1 if a borrower is not rationed and zero otherwise. The model we are going to use will be the logit model, which will be given as:

$$LRATi^* = \alpha Xi + \eta_i \qquad \textbf{(8)}$$

LRATi* = is loan rationing (LRAT=1 if a borrower is not rationed and zero otherwise).
Xi= set of explanatory variables
$\boldsymbol{\eta_i}$ = Error terms

Note that LRATi* are latent variables like the LRi*'s. All the explanatory variables of loan repayment equation are to be employed by the LRATi equation as well. Comparison of the sign and level of significance of the estimates in the two equations, i.e., loan repayment and loan rationing equations, will accomplish the task of evaluating the accuracy of the screening mechanism as done in Hunte (1996).

Accordingly, if a variable is significant in the rationing equation but not in the repayment equation, it implies that variable is useless as a means of screening. This is because, there is no information observed on default probabilities, since the variable is insignificant in the loan repayment equation. Alternatively, if a variable is significant in the repayment equation but not in the rationing equation, it reveals that the lending institution is ignoring useful information that will help to identify creditworthy applicants clearly.

A significant positive sign in both equations indicates the accuracy of the screening mechanism in identifying good borrowers while a significant negative sign in both equations reveals that the screening mechanism is efficient in identifying default prone borrowers. If a variable is significantly positive in the rationing equation but is significantly negative in the repayment equation, it shows that there is weakness in the screening mechanism since it is attracting default prone borrowers. On the other hand if a variable is significantly negative in the rationing equation but is positive in the repayment equation, it indicates that the screening mechanism is incorrectly rationing credit too strictly to credit worthy borrowers.

Since we are interested in comparing the coefficients of the estimated model with that from the loan repayment equation in an effort to evaluate the efficiency of the screening of borrowers using the methods suggested above, we are not going into the details of the expected results of the variables.

4. Results and discussion

OCSSCO Kuyu branch was extending loans for about 2175 borrowers in the rural and urban areas of the district starting from 1995/96 up to February 2003. Out of the total 203 respondents 186 (91.6%) settled their loans in full while 17(8.4%) failed to repay their loans in full. Borrowers in the urban area of the district managed to repay their loans while 17(8.4%) of those in the rural areas didn't.

4.1 Descriptive analysis

4.1.1 Socio-demographic characteristics of the respondents

Majority of the respondents were from rural areas (87.2 %). Although male borrowers dominate in rural areas with over 80% of the total respondents being male, it's quite the reverse in the case of urban borrowers, where about 65 percent of the respondents were female. The fact that a small proportion of the female borrowers were being served in the rural areas shows that very little might have been done in terms of empowerment of women.

Table 2: respondents by sex and area of residence

Area	Sex of Borrower		Total
	Female	Male	
Urban	17(65.4)	9(34.6)	26(100)
Rural	22(12.4)	155(87.6)	177(100)
Total	39(19.2)	164(80.7)	203(100)

Source: computed for survey data
Note: Figures in parenthesis are percentages[2]

As mentioned in the introduction part above, urban borrowers have performed better than those in rural areas in terms of repayment. The main reason for low repayment performance by the rural borrowers could be loss of assets acquired by the loan and crop failure due to frost. According to the results of the sample survey, 11(64.7%) of

[2] This applies to all tables in this section.

those who failed to repay their loans in full reported crop failure as the main reason for non-repayment.

The mean age for the whole sample was 44 years with the minimum and maximum being 20 and 70, respectively. Rural borrowers were on the average older than their urban counterparts. The mean age for the rural sample was 45 ranging between 20 to 70, while that for the urban sample was 40 ranging between 20 to 60.

Table 3: Respondents by age group and area of residence

Age group	Urban	Rural	Total
20-29	6(23.1)	17(9.6)	23(11.3)
30-39	5(19.2)	41(23.2)	46(22.7)
40-49	9(34.6)	57(32.2)	66(32.5)
50-59	5(19.2)	48(27.1)	53(26.1)
Above 60	1(3.9)	14(1.9)	15(7.4)
Total	26(100)	177(100)	203(100)

Source: Computed for survey data

Most of the borrowers in the sample (64.5%) were illiterate. Those who attended either elementary or junior secondary school were 64(31.5%) and those who attended up to grade 12 were only 8(3.9%). Most of those who were illiterate (67.9%) were also in the age group 40-59 while half of those who attended grades 9-12 were in the younger age group 20-29. (See Table 4 below).

Table 4: Respondents by age group and level of education and residence area

Area	Age group	Levels of education			Total
		Illiterate	Grade 1-8	Grade 9-12	
Urban	20-29	1	2	3	6
	30-39	1	2	2	5
	40-49	2	7	0	9
	50-59	1	4	0	5
	Above 60	1	0	0	1
	Total	***6***	***15***	***5***	***26***
Rural	20-29	8	8	1	17
	30-39	20	20	1	41
	40-49	41	15	1	57
	50-59	45	3	0	48
	Above 60	11	3	0	14
	Total	***125***	***49***	***3***	***177***
Grand Total		**131**	**64**	**8**	**203**

Source: computed for survey data

Over 70% of the rural borrowers were illiterate, of which nearly 3% only were found to have kept financial records. On the contrary, only 23% of the urban borrowers were illiterate, with close 17% being users of financial recording. So the large proportion of illiterate beneficiaries in the sample explains the poor status of financial recording habits [only 26 (12.8%) of the total borrowers in the sample kept records]. Most of those who don't use financial records (87.6%) reported lack of knowledge as the main reason for not recording their financial transactions, while the remaining 12.4% indicated that their financial position were too little to keep records.

Table 5: Respondents by area, financial recording habits and level of education

Area	Using financial recording?	Level of education			Total
		Illiterate	Grade 1-8	Grade 9- 12	
Urban	No	5	10	2	17
	Yes	1	5	3	9
	Total	6	15	5	26
Rural	No	121	37	2	160
	Yes	4	12	1	17
	Total	125	49	3	177

Source: computed for survey data

In line with the existence of more educated borrowers in the urban area[3], the number of urban borrowers that kept records was 34.6% while that for the rural borrowers was only 9.6%.

The mean loan amount was Birr 1405 ranging between Birr 700 and Birr 3000. The mean loan size for rural borrowers was 1383 ranging between Birr 700 to Birr3000, which was less than that for the urban borrowers (Birr 1553 varying between Birr 1000 to Birr 2500).

In terms of sufficiency of the loan amounts released, Table 6 below shows that 174(85.7%) of the borrowers in the sample reported that the loans they received were sufficient for the purpose they planned. On the other hand 29 (14.3%) i.e., 19 (10.7%) of the rural borrowers and 10 (38.5%) of the urban borrowers declared that the loan amount they took was not sufficient. This could have some implication for loan diversion.

[3] 76.9% having attended grades 1 through 12 as compared to only 29.4% of the rural borrowers having been able to attend the same level of education

Table 6: Distribution of respondents by location and opinion on sufficiency of loan size

Sufficiency of loan amount	Urban	Rural	Total
No	10(38.5)	19(10.7)	29(14.3)
Yes	16(16.5)	158(89.3)	174(85.7)
Total	26(100)	177(100)	203(100)

Source: computed for survey data

With respect to the purpose for which loan was taken, it was observed that the majority of the borrowers, i.e., 71 (35.0%) took the loan for purchasing farm oxen, all of them being rural borrowers. The next activity for which most of the borrowers took loan was petty trade, 46 (22.7%). This included all the 26 urban borrowers and 20 rural borrowers.

Table 7: Respondents by area and the purpose for which they took the loans.

Purpose	Urban	Rural	Total
Purchase of farm oxen	0	71	71
Farm oxen and agricultural inputs	0	13	13
Farm oxen and fattening	0	20	20
Farm oxen and petty trade	0	7	7
Purchase of agricultural inputs	0	20	20
Agricultural inputs and petty trade	0	1	1
Fattening	0	11	11
Fattening and petty trade	0	1	1
Petty trade	26	20	46
Others (More than two purposes from among the above)		13	13
Total	26	177	203

Source: computed for survey data

To see if at all purpose of borrowing has some association with loan repayment performance, Table 8 was constructed from the survey data. Accordingly, only 97.8% of those who borrowed for the purpose of petty trade were non-defaulters. The same trend was observed in the rest of the cases, i.e., more than 90% of the borrowers have replayed their loans except those who used the loan for purchasing agricultural inputs. This indicates that purpose of borrowing might not have a no implication on the loan repayment performance of borrowers. In fact this could be an issue for future research.

Table 8: Respondents by repayment status and purpose of borrowing

Purpose of Borrowing	Defaulters	Non-Defaulters	Total
Purchase of farm oxen	5(7.0)	66(93.0)	71
Purchase of agricultural inputs	7(35)	13(65)	20
Fattening		11(100)	11
Petty Trade	1(2.2)	45(97.8)	46
Others	2(15.4)	11(84.6)	13
Total	15(9.3)	146(90.7)	161

Source: computed for survey data

Sufficiency of supervision on loan utilization is an important factor contributing to a better loan repayment performance. During the survey it was observed that people from OCSSCO appear on the monthly meetings of centers and collect savings. It is during such meetings that supervision is done with main focus on loan repayment. Only 90 (44.3 %) of the respondents declared that supervision on loan utilization is not sufficient.

From the above table, 98 (55.4%) of the rural borrowers and 15 (57.7%) of the urban borrowers in the sample reported that supervision was adequate, while 79 (44.6%) of the rural respondents and 11 (42.3%) of the urban respondents said that supervision on loan utilization was insufficient.

Regarding suitability of repayment only 25(12.3%) of the sample respondents had of the opinion that the repayment period, which is one year, is not suitable. Of these borrowers 16(64%) recommended a repayment period that is longer than a year while the rest recommended a repayment period that is less than a year, with 7(27.7%) of them showing preference of paying at least twice a year.

Another finding was that 55(27.1%) of the borrowers have violated the loan agreement, all of them diverted the loan proceeds to other purposes than they planned. Of these 18(8.9%) reported that the loan agreement didn't match with their true intention they had in their mind, while 8(4%) reported market problem, 6(3%) too small loan amount and 16(7.9%) reported other reasons for not keeping their agreement. Almost all the loan diverters were from the rural areas.

Looking at how loan is rationed, it was observed that 29(14.3%) of the total respondents were rationed of which 19 (65.5%) were rural borrowers. In relation to loan diversion, the institution favored non-diverters by rationing only 10(34.5%) as compared to 19(65.5%) who were diverters being rationed (Table 9 below).

Table 9: Rationing by area of borrowers and loan diversion

	Area (Location)			Loan Diversion		
	Urban	Rural	Total	Diverted	Not diverted	Total
Rationed	10(38.5)	19(10.7)	29(14.3)	19(65.5)	10(34.5)	29(100)
Non Rationed	16(61.5)	158(89.3)	174(85.7)	129(74.1)	45(25.9)	174(100)
Total	26(100)	177(100)	203(100)	148(72.9)	55(27.1)	203(100)

Source: computed for survey data

According to the results of the survey, all the borrowers in the sample believed that loan should be repaid. Similarly all borrowers interviewed reported that the loan was issued timely. Many studies considered attitude of borrowers towards loan repayment and timeliness of loan issuance as important variables affecting loan repayment performance. These two variables, however, were not going to be used in this study for regression, since they perfectly predicted the probability of repaying loan in time; and hence were excluded from the loan repayment equation.

Since the credit delivery mechanism of OCSSCO was a group based one that relies on peer pressure and social sanctions that existed among borrowers, questions regarding these issues were included in the survey questionnaires. Almost all of the borrowers responded “yes” to questions regarding peer group that they knew each other very well, felt responsible for each other and monitor each others’ action.

Another variable of concern in this study was borrowers’ attitude to cost of default. Of the total respondents almost all, i.e., 202(99.5%) reported that cost of default was high. Such an attitude had a clear implication in terms of improving loan repayment performance. Regarding the perceived costs of default 113(55.7%), i.e. the majority of the borrowers responded social sanction as the most important factor forcing them to repay their loans in time. So it was observed that group pressure and social sanctions were important factors affecting loan repayment performance of borrowers by serving as social collateral for the lending institution.

Table 10: Perceived cost of default

Perceived Cost of default	Frequency	Percent
Claims against personal wealth	24	11.8
Claims against the wealth of guarantors	23	11.3
Social sanctions	113	55.7
Fear of losing another round of loan	35	17.2
Other	8	3.9
Total	203	100

Source: computed for survey data

On the other hand, during the survey it was observed from informal discussions with borrowers that most of those who took loans for purchasing farm oxen, used the oxen for farming and finally sold them in order to be able to repay their loans. Also some borrowers shifted between the lending institution and moneylenders, i.e., they borrowed from moneylenders for a very short period in order to repay the loan they took from OCSSCO and then they immediately replayed the money lenders after OCSSCO releases the next cycle of loan.

Although this calls for a further investigation, only 6(3%) of the respondents were found to have other sources of credit in addition to that of OCSSCO. Four of these reported moneylenders as their additional source of credit while the rest two indicated that they also borrowed from friends or relatives since their participation in the credit scheme by OCSSCO. This finding doesn't seem to support the behavior of the borrowers explained above (i.e. based on the informal discussions made with borrowers themselves), since only 2% of the borrowers reported to have borrowed from moneylenders, after all.

Livestock was another variable of interest in this study. Accordingly 185 (91.1%) of the total sample have reported that they own livestock. Specifically 168 (94.9%) of the rural borrowers have livestock. Since livestock can be considered as a proxy for wealth particularly in rural areas, it is likely that this variable positively affects loan repayment performance.

Household size was another important variable considered in this study. The mean number of dependents within the households was 6.72 varying between a minimum of 1 and a maximum of 16. The mean number of dependents supported outside of the households of borrowers that constitute 10.4% of the sample respondents is 1.62 ranging between 1 and 4. Overall the mean number of dependents stands at 6.89 varying between 1 and 16.

With regard to income sources, about 88 (56.7%) of the borrowers in the sample reported their having income source before the loan program. Of these 58(51.04%) reported income from sale of farm produce, 8(7.4%) reported income from private labor, i.e. from being hired for others and the rest 22(19.36%0 reported income from various sources.

4.1.2 Creditworthy versus non-creditworthy borrowers

In this section we compare creditworthy borrowers with defaulters, in an attempt to identify the factors that influence the loan repayment behavior of borrowers. Although,

the number of the defaulters in the sample is small compared to those who settled their loans, the comparison will somehow give an idea as to how our variables influence the loan repayment performance. The comparison is done using t-test.

As reported earlier we have seen that 186 (91.6%) of the sample borrowers have settled their loans in full and hence are creditworthy; while the rest 17 (8.4%) are defaulters. The mean age for creditworthy borrowers 44.6 is slightly greater than that of defaulters, which is 43.9. This implies defaulters are a bit younger than non-defaulters, showing that age is positively related to loan repayment performance.

Regarding sex, 80.7% of the creditworthy borrowers are male, which is lower than the corresponding figure (82.4%) for the defaulters. Moreover only 7.7% of the female are defaulters while the corresponding figure for the male is 8.5%. This implies that being male is negatively related to loan repayment performance as expected, although the difference is not statistically significant.

There is no significant difference between the two groups in terms of level of education, although creditworthy borrowers have attended on average grades 1-8 while defaulters are on average illiterate. This shows the existence of a positive relationship between education and loan repayment.

The mean loan size for credit worthy borrowers is Birr 1382.35which is less than that of the defaulters (Birr 1406.99) showing that there is a negative relationship between loan size and loan repayment performance. This could be due to the rationing mechanism although the difference is not significant according to the t-test.

Regarding loan diversion, 52.9% of the defaulters have diverted the loans they received to other purposes than specified in their loan agreement, while only 24.7% of the creditworthy borrowers diverted the loan they took to other purposes. This shows that loan diversion is negatively related to loan repayment performance. The t-test shows that there is a significant difference between the two groups of borrowers in terms of loan diversion.

With respect to perception of borrowers about supervision on loan utilization 57% of the creditworthy borrowers think that supervision on loan utilization is adequate, while only 41% of the defaulters are of the opinion that the supervision on loan utilization by OCSSCO staff is sufficient. So the relationship between supervision and repayment performance seems to be positive as expected.

Regarding perception of suitability of repayment period 90.3% of the respondents who consider it as suitable are creditworthy, which is greater than the corresponding

figure for the non-creditworthy borrower (58.8%), which is a significant difference at the 1% level.. This is an indication that the variable under consideration is positively related with repayment performance.

Concerning value of livestock owned by borrowers, the mean value of livestock for creditworthy borrowers is Birr 4330.65, while that for the defaulters is only Birr 925.00, with a significant difference between the two groups being observed in this regard, i.e., a higher value of livestock improves the loan repayment performance of borrowers. Similarly the mean annual income from the activities financed by the loan for the case of creditworthy borrowers is Birr 1000-2000 while that for defaulters is below Birr 1000, the difference between the two groups being significant.

As explained earlier from a total of 55 borrowers who diverted their loans 18(32.7%) have indicated the fact that the loan agreement is not their initial intention of investment, while 16(21.1%) of them gave other reasons for diverting the loan, of which 9 (56.3%) indicated unplanned health expenditure as a reason for their diverting the loan they received. In this regard the mean annual health expenditure of creditworthy borrowers is Birr 93.50 while that for defaulters is below Birr 154.00, though the difference between the two groups is not significant.

The mean number of dependents for the creditworthy borrowers is 6.8, which is less than that for the defaulters (7.5). Here we observe that defaulters support on average a bigger number of dependents than creditworthy borrowers, although there is no statistical difference between both. This is equivalent to saying that the number of dependents that are supported by the borrowers is negatively related to loan repayment performance.

4.1.3 Rationed versus non-rationed borrowers

The term rationing in this study refers to a situation where a borrower receives an amount of loan that is less than he/she requested. As described earlier the proportion of those who are rationed (i.e. given loan amounts that are less than requested) is 14.3%, while the rest 85.7 were not rationed. The mean age of those borrowers who are rationed is 42.9, which is lower than the mean age of the borrowers who are not rationed (44.1). That is younger borrowers are more rationed than their older counterparts as is expected.

In terms of sex, 13.4% of the male are rationed which is less than that for the female borrowers (18.0%). This shows that female borrowers are being more rationed (i.e., there is a positive relation between sex and loan rationing, though not significant).

This seems incorrect since female have performed better in terms of repayment than the male borrowers.

Let us compare the difference between the two groups with respect to education by categorizing borrowers into those who have no education (illiterate) and those who have gone to school (literate). Accordingly 131(64.5%) of the respondents are illiterate while the rest 72(35.5%) are literate. 17(23.6%) of the literate borrowers were rationed while only 12(9%) of the illiterate borrowers were rationed, showing that the institution is rationing literate borrowers more, which seems not correct when the loan repayment performance of such borrowers is taken into consideration. As explained in the previous section literate borrowers have performed better in terms of repayment than the illiterate ones.

The mean loan amount released to the borrowers who are rationed (Birr 1467.24) is higher than that for the non-rationed borrowers (Birr 1394.54). This implies the institution is probably stricter on those borrowers who request loan amounts that are abnormally larger, so that they are rationed to some extent; though the extent of rationing being not so severe that such borrowers still receive loan amounts that are on average larger than those who apply for a reasonable amount of loan according to the institution's preference. Here we observe that the more borrowers apply for larger loans the more they are rationed, just in the way explained above.

The proportion of borrowers who are rationed and non-rationed is almost similar when one considers borrowers who perceive supervision as adequate, i.e., 55.2 and 55.6 respectively. In fact there is a slight difference between the two groups with the proportion of those who are not rationed being slightly more than that for the former group, though the difference is very far from being significant. Similarly 79.3% of those who perceive repayment period as suitable are rationed, while the corresponding figure for those who are not rationed is 89.1%, indicating a negative relationship. The difference between the two groups though is not significant.

The same is true regarding the income level borrowers earn as a result of their participation in the program. With regard to value of livestock, the mean for the former group (i.e., the rationed borrowers) is Birr 3420.35, which is less than that for the latter one (Birr 4149.63). This shows that the more the value of livestock, the less the borrower faces loan rationing. In fact there is no significant difference between the two groups, in terms of value of livestock.

In relation to area, the difference between the two groups happens to be significant at the1% level. Only 65.5% of those who are rationed are rural borrowers while a larger proportion (i.e., 90.8%) of those who are given the same amount of loan as they

requested were rural borrowers. On the other hand the proportion of urban borrowers in the former group (34.5%) by far exceeds that in the latter group (9.2%). This shows that the institution rations more urban borrowers than their rural counterparts, i.e., the variable 'area' is positively related to the loan rationing mechanism employed by the institution, contrary to what is expected. This is because most of the rural borrowers are farmers and this sector is associated with high risk, so that the institution is expected to ration more rural borrowers than their urban counterparts. Moreover urban borrowers are better in terms of repayment than their rural counterparts.

The other variable of interest is number of dependents supported by the borrowers both within the household and outside. The difference between the two groups in this respect is again significant at the 10% level. Here we observe that the mean number of dependents foe the former group (the rationed group) is 7.6, which is greater than that for the latter group (6.8). So this variable is negatively related to the loan rationing as is expected.

Concerning loan diversion 65.5% of the diverters are rationed while only 34.5% of the non-diverters were rationed, which is in line with our expectation. The difference between the two groups though is not significant in this regard.

4.2 Results of the econometric analysis

In this section the method of model estimation will be presented and the estimation results will be discussed in detail. An attempt will be made to compare the results obtained by the descriptive analysis given in the previous section with those obtained from the econometric estimation.

4.2.1 Determinants of loan repayment performance

As discussed in section 3.3, one of the explanatory variables that is thought to influence the loan repayment equation is loan diversion rate. This variable is identified to be endogenous because of its dependence both on variables that are included in the loan repayment equation and on other variables. In order to avoid endogeniety, loan diversion equation has to be estimated first and the fitted values of this variable will be used in the equation of loan repayment performance.

It is obvious that hetroscedasticity is a problem, which is highly associated with cross-sectional data such as the one used for this study. Hetroscedasticity is a situation where the disturbance terms don't have constant variance. It is evident that the presence of hetroscedasticity would result in inconsistent estimators.

As discussed in section 3, since loan diversion rate is continuous and can assume any value between zero and one, the appropriate model to be employed here is Tobit, more specifically the two-limit Tobit model. However, this model has its own drawback in terms of correcting for hetroscedasticity, i.e., it is difficult to obtain robust standard errors.

During the estimation process, the equation for loan diversion was detected to have problem of hetroscedasticity. Hence, the method of interval regression was employed to obtain robust estimation results. The estimates so obtained are given below.

Table 11: Maximum likelihood estimates of the tobit regression for loan diversion equation, Interval regression

	Coefficients	Robust Std. Err.	P>|z|
EDDUM	-0.2057434*	0.113017	0.069
NUMYB	0.0754362*	0.0481348	0.102
NUMDP	0.0004972	0.0191063	0.979
BKEEP	0.1500751	0.1702739	0.378
INCOTH	-0.0000298	0.0001758	0.865
ADQSV	-0.0172498	0.0985662	0.861
SUITRP	-0.3266075***	0.1147342	0.004
LSZE	0.0000411	0.0001404	0.770
_cons	-0.2642259	0.2515055	0.293
/sigma	0.5177089	0.0467682	
Number of obs = 203			
Wald ch2 (8) = 15.64			
Log likelihood=-106.99844			
Prob > chi2 = 0.0478			

***significant at 1% * significant at 10%

Observation summary: 55 uncensored observations

148 left-censored observations

0 right-censored observations

0 interval observations

The estimated model is significant at the 1% level. As shown in the table, loan diversion is positively related to number of dependents supported by the borrower, use of bookkeeping, loan size and number of times borrowed from the same source. Education, income from other sources, loan supervision and suitability of loan repayment period were found to be negatively related to loan diversion. Suitability of repayment period was found to be significant at 1%, while education and number of years borrowed were found to be significant at 10%.

The sign of the variable representing the use of financial recording systems has an unexpected sign (positive) but insignificant. The reason for this could be the fact that the vast majority of the borrowers in the sample are illiterate and even the few educated ones are unable to use modern and accurate methods of keeping financial records. The rest of the variables have exhibited the expected signs.

The results indicate that education, number of years borrowed and suitability of repayment period are significant determinants of loan diversion. The positive sign for education indicates that, literate borrowers have effectively used the loan for the intended purposes. But those who borrowed for more years on the average have contributed to the increase in the probability of diversion, may be due to the fact that they no more need further loans from the same source.

The finding about the sign for coefficients of education and loan supervision coincides with that in Teferi (2000) and Retta (2000), while that for number of dependents is similar to the findings of Mengistu (1997), Berhanu (1999) and Retta (2000).

Comparing the results obtained here with those in the descriptive statistics, there is some difference in the findings for loan size, supervision and use of financial records. Since possible explanation for the latter two variables is given in descriptive section, let's consider loan size here. This variable was found insignificant in both the analyses, implying that the discrepancy observed is not that worrying. The fact that the variable is positive in the regression seems more realistic and consistent with findings in many studies (Abreham, 2002; Berhanu, 1999; Teferi, 2000).

To see if there is any gain of using the tobit model to estimate loan diversion, OLS was run on the same variables. The result revealed that only education and suitability of repayment period were significant, implying that there was indeed a gain in using the tobit model instead of the OLS.

Coming to the discussion of the estimates of the logit model for our loan repayment equation, the existence of hetroscedasticity has been detected. This has necessitated the estimation of robust model. The estimation results are presented in Table 12.
The overall goodness of fit indicates that it is significant at 1%, implying that the explanatory variables used in the regression equation explain the variation in the dependent variable quite well.

Table 12: Maximum likelihood estimate of a logit model for loan repayment performance (Probit estimates)

Explanatory variables	Coefficients.	Robust Std. Err.	P>|z|
EDDUM	1.218347*	0.6817127	0.074
AGE	0.0077951	0.1234208	0.95
AGSQ	-0.00043	0.0013922	0.757
SEX	-0.1295234	0.6335709	0.838
OSCR	3.057801***	1.112444	0.006
LSZE	-0.0020723**	0.001014	0.041
SUITRP	2.166316***	0.6107892	0.000
ADQSPV	0.9705793*	0.5811818	0.095
INCLN	0.0346739***	0.0145101	0.017
LVSTK	0.0013884***	0.0003601	0.000
NUMDP	-0.0415804	0.1120186	0.710
FITLDR[4]	-9.794303**	4.710661	0.038
_cons	-3.491235	2.933985	0.234
No. of observation	203		
Wald ch2 (12)	53.07		
Prob > ch2	0.0000		
Pseudo R2	0.8070		
Log likelihood	-11.278366		

*** Significance at 1% ** Significance at 5% * Significance at 10%

Among the variables that were thought to affect loan repayment performance, variables like timeliness of loan issuance and cost of default are excluded due to the reasons explained in the descriptive analysis section. Variables like, use of financial recording methods, income from other sources and area are dropped because they were inestimable using the software. For instance area = 1 predicts success perfectly and hence was dropped during the estimation.

Eight of the eleven explanatory variables used in the estimation of loan repayment performance equation were found significant. According to the estimates, loan diversion is significant and negatively related to loan repayment performance as expected. The negative sign probably implies the use of diverted funds for non-income generating purposes, and it is significant at 1%.

Sex, loan size and number of dependents are all negatively related to the probability of loan repayment, none being inconsistent with prior expectation. Only loan size is

[4] Fitted values of loan diversion rate

significant at 5% level. This shows that the higher the loan size, the lower the probability of repaying the loan. The negative sign for sex indicates that female borrowers are better payers of loan than their male counterparts, although it is not significant. This result is consistent with the findings in Teferi (2000) and Berhanu (1999).

On the other hand age was found to be positive, while age squared turned out to be negative. This shows that as age increases, the probability of loan repayment increases up to a certain level of age beyond which performance will decline (i.e. there is a non-linear relation). Both this variables are statistically insignificant.

Income from activities financed by the loan, suitability repayment period, loan supervision, literacy and value of livestock are positively and significantly related to loan repayment performance. We have seen that the same conclusion was made in the descriptive analysis part. The coefficient of the dummy for education above grade 0 (i.e. grades 1-12) is significant 10% level of significance, indicating that with more education borrowers can use the loan efficiently and invest on more productive and income generating activities enabling them to settle their loan obligation in time.

Availability of other sources of credit has been included in the estimation and it was found to be positively related to loan repayment performance, consistent with prior expectation. This could be a possible explanation for the fact that some borrowers shift between OCSSCO and these other sources of credit such as moneylenders, during repayment probably despite their inability to repay the loan in full on their own. Owing to the fact that only very few of the respondents indicated that they have additional sources of credit this finding doesn't seem plausible and needs further study.

In summary, loan diversion and loan amount are significant factors that undermine repayment performance, while value of livestock, income, loan supervision, suitability of repayment period, literacy level are important and significant factors that enhance the probability of repayment. The results obtained here are in complete agreement with those found using the descriptive statistics.

4.2.2 Evaluation of the loan rationing mechanism

Like the previous two equations, problem of hetroscedasticity was also detected during the estimation of the probit model for loan rationing. As a result a robust estimation was run, the results of which are given in Table 13.

Six out of the eleven variables included in the model are found to be significant. According to the estimates presented in the table, loan diverters, borrowers supporting larger number of dependents, borrowers earning more income and literate borrowers are more rationed, i.e., the probability of such borrowers being rationed is high. On the other hand, borrowers who are older, male, apply for larger loan size, perceive supervision as adequate, perceive the repayment period as suitable and whose value of livestock is high are less rationed. Literacy level, age, suitability of repayment period, value of livestock, number of dependents and loan diversion are found to be significant in the model.

Table 13: Maximum likelihood estimate of a logit model for loan rationing

Explanatory variable	Coefficients	Robust Std. Err.	P>|z|
EDDUM	-0.5928361**	0.2545076	0.020
AGE	0.1202621*	0.064093	0.061
AGESQ	-0.0013319*	0.0007051	0.059
SEX	0.1747426	0.2897258	0.546
LSZE	0.0002257	0.0004294	0.599
SUITRP	0.5073275*	0.3421386	0.108
ADQSV	0.0408717	0.2420632	0.866
INCOM	-0.0073434	0.0050361	0.145
LVSTK	0.000075*	0.0000398	0.059
NUMDP	-0.1135034**	0.0502756	0.024
FITLDR	-2.878546*	1.72271	0.095
_cons	-1.534739	1.475238	0.298
No. of obs	197		
Wald ch2(11)	22.95		
Prob > ch2	0.0180		
Pseudo R2	0.1246		
Log likelihood	-72.055849		

** Significance at 5% * Significance at 10%

With this brief description of the estimation result, we now go to the evaluation of the loan rationing (screening mechanism). According to Hunte (1996) if a variable is positively signed in both equations, then the borrower with such a characteristic is correctly identified as creditworthy. If it is negatively signed in both equations, then the borrower with such a characteristic is correctly identified as non-creditworthy and hence should be rationed.

If on the other hand a variable is positive in the loan repayment equation and negative in the rationing equation, then the screening technique is incorrectly rationing a creditworthy borrower. Similarly if a variable is negative in the repayment equation but positive in the rationing equation, it implies that the borrower having

such a characteristic that results in poor loan recovery is less rationed while he/she must have been rationed more.

To proceed with the method of evaluation described above, the estimates of the logit models for loan repayment and loan rationing are reproduced in Table 14 below for easy reference.

Table 14: Comparison of the two estimates

Variables	Loan Repayment			Loan Rationing		
	Coefficients	Robust Std. Err.	P>|z|	Coefficients	Robust Std. Err.	P>|z|
EDDUM	1.218347*	0.681713	0.074	-0.5928361**	0.254508	0.02
AGE	0.0077951	0.123421	0.950	0.1202621*	0.064093	0.061
SEX	-0.1295234	0.633571	0.838	0.1747426	0.289726	0.546
OSC	3.057801***	1.112444	0.006			
LSZE	-0.0020723**	0.001014	0.041	0.0002257	0.000429	0.599
SUITRP	2.166316***	0.610789	0.000	0.5073275*	0.342139	0.108
ADQSV	0.9705793*	0.581182	0.095	0.0408717	0.242063	0.866
INCLN	0.0346739**	0.01451	0.017	-0.0073434	0.005036	0.145
LVSTK	0.0013884***	0.00036	0.000	0.000075*	3.98E-05	0.059
NUMDP	-0.0415804	0.112019	0.710	-0.1135034**	0.050276	0.024
FITLDR	-9.794303**	4.710661	0.038	-2.878546*	1.72271	0.095

* Significance at 10% ** Significance at 5% *** Significance at 1%

Accordingly borrowers who are aged, perceive the repayment period as suitable, perceive loan supervision as adequate and own larger value of livestock are correctly identified as being creditworthy and were not rationed or are less rationed. Similarly borrowers who are loan diverters and support larger number of dependents are correctly identified as being non-creditworthy, and hence are rationed.

On the other hand, borrowers who earn more income from activities financed by the loan and who are more educated are incorrectly rationed despite being creditworthy, while those who applied for larger loan amount and those who are male are less rationed in spite of the fact that they contribute to poor loan recovery rate. Here the screening technique happens to be problematic. In fact the rationing of borrowers with more income could be taken as a deliberate pro-poor strategy followed by the institution.

Overall according to the evaluation technique given above the screening mechanism employed by OCCSCO Kuyu branch seems to be fair (sound), since in six of the ten variables, the criteria used were correct.

Hunte (1996) further went on to investigate signs of the coefficients in conjunction with significance of the variable to evaluate the ***accuracy*** of the screening technique. Accordingly only two variables are significant in both equations; namely: Suitability of repayment period, value of livestock, education and loan diversion. So borrowers who have larger value of livestock and perceive repayment period are correctly identified as being creditworthy, while literate borrowers were incorrectly rationed despite their being better in terms of loan repayment. Loan diverters are however, correctly identified to be non-creditworthy and rationed accordingly. Mengistu (1997) got the same result for the case of Awasa regarding education.

The fact that borrowers who are literate are incorrectly rationed is consistent with what has been stated earlier in the descriptive statistics. The institution rationed literate borrowers despite their good performance in loan repayment. This is an important issue for the institution to look into and take a corrective measure.

In concluding this section, it is important to point out that although in over half of the criteria discussed above the screening technique was sound, there are serious mistakes that are being committed. Overall four of the ten factors on the one hand and one of the two significant factors on the other were incorrectly used by the institution for screening, which necessitates a careful examination of the screening technique being used by the institution.

5. Conclusions and policy implications

In general, the results of the study revealed that the overall repayment performance of the borrowers and the screening technique, which the institution follows to ration loan to its clients, were found to be sound.

Specifically, loan diversion was found to be one of the important and significant factors influencing loan repayment performance negatively, i.e., it increases default risk significantly. This variable is itself influenced by many factors, of which loan supervision, education and suitability of repayment period were found to reduce the probability of diverting loan to non-productive uses that ultimately lead to reduced recovery rate. So there is a need for a continuous supervision on loan utilization and training so as to reduce both the problem of using loan for non-income generating activities as well as lack of skill observed because of the wide-scale illiteracy (particularly in the rural areas).

The other significant determinant that was found to undermine the repayment performance was loan size. This implies that there is a need to determine an

appropriate loan amount that just suffices the project cost or purpose of the borrowing, through a thorough investigation of the demand for loans and proposals/plans submitted by borrowers.

Factors like income, value of livestock, availability of other sources of credit and being female were found to enhance the probability of repayment. Although designing the lending strategy in such a way that factors enhancing the repayment performance are duly taken in to account can be recommended in general, this needs a great care. For instance income was found to significantly increase the probability of repaying loan in full. But it is not recommended to exclude those with low income hoping to reduce loan default, since this contradicts the very objective of MFIs.

On the other hand evidences in this study show that female borrowers have performed better in terms of loan repayment than their male counterparts. But we have seen that the number of women being served particularly in the rural parts of the district is very small. This is also in conflict with one of the objectives of the establishment of such an institution; i.e., empowerment of women. So the institution has to do much in this direction.

In line with the basic idea of improving the loan repayment performance, the screening of borrowers deserves good attention. From the evidence provided in this study, borrowers with more income and educational level were incorrectly rationed despite their being creditworthy, while those applying for larger loan amounts and those who are male were rationed less despite their being non-creditworthy.

Rationing those with more income could be seen, as a deliberate pro-poor action on the part of the institution, if at all it is done with such an intention. On the other hand the majority of the institution's clients whose eligibility for participation in the scheme is based on the criteria of being poor are illiterate. Since most of the time literacy and wealth are positively related, and that it seems that the institution is focusing more on equity than efficiency by rationing the literate clients more strictly than the illiterate ones.

Although promoting equity may help OCSSCO move towards its objective of poverty reduction, it cannot sustain such an objective on a permanent basis. Screening of the clients is carried out by the Local Poor Representatives and PA administrators, assisted by the branch staff. Since this procedure is meant to identify the poor who are the target clients of OCSSCO, the issue of equity is somehow being addressed in the screening process. So it should focus more on making its services sustainable rather than promoting equity temporarily. Hence the institution is advised not to incorrectly ration creditworthy borrowers (the literate ones in this case) and also not to

leave non-creditworthy borrowers un-rationed (those applying for larger loan amounts and those who are male).

Moreover we have seen that only two out of eight variables that were significant in the loan repayment equation were also found significant in the rationing equation during the comparison of the two equations that was made to evaluate the rationing mechanism. This means that important information is being ignored as in the case where some variables contributing to good repayment performance are neglected when it comes to the use of these variables in identifying good borrowers with such characteristics. So another area of focus as far as rationing is concerned should be towards using more of the factors that can be used for identifying clients into creditworthy and non-creditworthy, while at the same time the institution should attempt to avoid incorrect use of such factors as criteria for rationing.

Finally, there are some important points that may need further investigation. These issues may serve as points of departure for further research. We have seen that complementarity was observed between the credit scheme of OCSSCO and that of the moneylenders operating in the area of study. Since from the data collected for this study the number of respondents that reported having access to other credit sources is very few, this finding needs to be further studied. Also there may be a need to test if there is some sort of association between loan repayment and purpose of borrowing.

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POVERTY AND ACCESS TO CREDIT IN RURAL ETHIOPIA: EMPIRICAL EVIDENCE FROM COFFEE-GROWING HOUSEHOLDS

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Abstract

This paper tries to establish the link that access to credit has on the welfare status of households in five coffee growing zones of Oromia and SNNP regional states. Both descriptive and econometric methods are used to see the link between poverty and access to credit. The incidence of poverty was found to be high in the study areas and differs across zones in the two regions. Moreover, poverty has a strong link with access to credit. The study found that households who have an access to credit have more probability of getting out of poverty than households who don't have an access to it. The odds of getting out of poverty for households who have an access to credit are 1.1 times that of the probability of getting out of poverty for those households having no access to credit. Moreover, a household having an access to credit is predicted to consume 1.4 per cent more ceteris paribus. This is because credit or savings can provide capital for financing inputs, labor and equipment for income generation. Therefore, provision of rural credit to these households will help them finance investments and to insure against risks and thereby enhance their welfare.

Keywords: poverty, poverty profile, credit
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1. Introduction

Poverty and low level of welfare is widespread in Ethiopia. According to official sources (MoFED, 2007), the incidence of rural poverty measured by the headcount index in 1995/96 was 51.6%. That is, more than half of the population was poor in 1995/1996. While this share of the poor declined to 38.5% in 2004/05 (see also Tassew et al., 2008; Bigsten et al., 2005), the country is still in the lowest rank as compared to other countries based on both human development and poverty indices. For example, as per the UNDP's 2008 reports, the Human Development Index (HDI) for Ethiopia is 0.389, which gives the country a rank of 169th out of 179 countries, with GDP per capita (in PPP) of $700 in 2006. A more relevant measure of poverty is the Human Poverty Index (HPI-1). HPI-1 is 51.6 % for Ethiopia ranking the country 130th among 135 developing countries for which the index has been calculated (UNDP, 2003, 2006 and 2008, 2009).

Previous researches, based on Ethiopian data, have found evidence on the determinants of rural poverty. Household and community characteristics, whether the household is engaged in agriculture and ownership of assets such as land have an influence on the welfare status of households (Bigsten et al. 2002b and 2005; Fitsum and Holden, 2002; Bevan and Bereket, 1996; Dercon and Krishnan, 1996). Access to credit is among the key factors and mentioned as critically important cause to rural poverty (IFAD, 2003; World Bank, 2001). Based on a household survey panel data, credit was found to be an important factor in consumption smoothing and hence poverty reduction in Ethiopia (Alemayehu et al., 2006). The role of credit was also found to be a key factor in poverty alleviation of the informal sector (Bekele, 1996; Solomon, 1996). However, the existing evidence on poverty and access to credit has some limitations. It is based largely on a much aggregated data set which is expected to represent the rural Ethiopia as a whole (e.g. Alemayehu et al., 2006) and can bypass pockets of poverty which need particular scrutiny. Other studies lack a thorough and rigorous analytical tool (e.g. Solomon, 1996; Bekele, 1996).

Average progress in human development conceals large disparities within sectors and regions and generalization about national poverty trends need to be complemented with an analysis based on a disaggregated data that reveals the large pockets of chronic poverty in rural Ethiopia. The overall objective of this study is to examine the extent of poverty in coffee growing zones and identify the role of financial markets in improving the welfare status of households in these zones. The working hypothesis of this study is that access to credits is significant in affecting positively the welfare status of cash crop households among coffee growing farmers.

The rest of this article is organized as follows. In the next section, relevant theoretical and empirical literatures are reviewed. Econometric models and estimation methods will be provided in the third section. Estimation and analysis of results are dealt with in the fourth section. Finally, section five concludes.

2. Conceptual framework on poverty

An important aspect of well-being identified in the literature is poverty, whether households or individuals possess enough resources or abilities to meet their current needs (see for e.g. Couduel et al., 2002). Poverty can be said to exist in a given society when one or more persons do not attain a level of material wellbeing deemed to constitute a reasonable minimum by the standards of that society (Ravallion, 1992). Poverty is multi-dimensional, however. The most comprehensive and therefore logical starting point in an attempt to capture the concept of poverty is Sen's (Sen, 1985) capabilities and functionings theoretical framework. According to this framework, what ultimately matters is the freedom of a person to choose his/her functionings. In order to function, an individual requires a minimum level of wellbeing brought about by a set of attributes (Sen, 1985; Bigsten et al., 2005; Thorbecke, 2005).

2.1 Measurement and analysis of poverty

In the literature, there are generally two approaches of measuring and analyzing poverty. The welfarist approach, which is a marginalist approach, is based on social welfare functions which are themselves functions of the indirect utility functions of individual households while the non-welfarist approach is based on the functioning/capabilities measures following Sen's definition of welfare above (Bigsten et al., 1999; Ravallion, 1994; Bigsten et al., 2002b). Following the welfarist approach, there are three steps in the measurement and analysis of poverty. In the first step, a single monetary indicator of household welfare is identified. A poverty threshold is then defined by setting a poverty line to distinguish the poor from the non-poor. Finally, an aggregation of the degree of poverty through average and relative deprivation is made. A series of indices can be formulated to measure some of the characteristics of poverty (Dercon, 2005; Bigsten et al., 1999; Bigsten et al., 2005; Ravallion, 1996).

One can choose either income or consumption as welfare indicator. Most analysts argue that, if enough information is provided, consumption gives a better indicator of living standards. Consumption is believed to vary more smoothly than income both

within a given year and across the life cycle (Duclos and Araar, 2006; Couduel et al., 2002). This is true specifically in poor agrarian economies where incomes for rural households may fluctuate during the year according to the harvest cycle. This implies a potential difficulty for a household in correctly recalling their income, in which case the information on income derived from a survey may be of low quality. Another merit of using consumption as an indicator is that actual consumption reflects the standard of living and the ability to meet basic needs than income does. Moreover, consumption is not equal to expenditure because the value of consumption equals the sum of expenditures on goods and services purchased and consumed in a given period plus the value of goods and services consumed but not purchased such as gifts and those produced by the household itself plus the consumption of durable goods and services owned.

Before models for poverty analysis are designed, one has to have an aggregate measure of poverty. Aggregate poverty indices are summary measures defined over mean income, the relevant poverty line, and the parameters characterizing income distribution. Poverty line can be defined as the monetary cost to any given person, at a given place and time, of a reference level of welfare. People who do not attain that level of welfare are deemed poor, and those who attain that level of welfare are said to be non-poor (Ravallion, 1998). The most commonly and practically used methods for setting poverty lines are food-energy-intake and cost of basic needs (see Ravallion, 1998; Thorbecke, 2005; Tassew et al., 2008 for more on this issue).

The above characterization of poverty measures will lead us to the well-known aggregate poverty measures known in the literature as the Forster-Greer-Thorbecke (FGT) indices. These indices are given by the more specific formula:

$$P_{\alpha} = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z - y_i}{z}\right]^{\alpha}$$

Where alpha (α) is an ethical parameter which is considered to be greater than or equal to zero, q is the number of poor people below the poverty line, n is the total number of people in the population, z is the poverty line and y is consumption level. The above formula is reduced to head count ratio for α=0 which measures the prevalence of poverty (i.e. it is the proportion of the population for which consumption is less than the poverty line, z). Other important measures include poverty gap ratio for α=1 and measures the amount of resources that would be needed to lift all the poor out of poverty through perfectly targeted cash transfers. A third measure which gives information on the severity of poverty is the squared poverty gap ratio for α=2.

2.2 Linking poverty with access to credit

There are three arguments that access to rural finance (savings and credits) can improve the wellbeing status of the rural poor. First, credit or savings can provide capital for financing inputs, labor and equipment for income generation. Second, access to credit, liquid savings (that can be readily converted to cash), and insurance services can help households increase their capacity to bear risks or reduce cost of insurance. Third, improved financial services can potentially stabilize consumption of food and other potential goods efficiently (Zeller et al., 1997). Since the incomes of rural households in developing countries depend directly or indirectly on agriculture, they vary seasonally. Such variations in incomes of the household translate into fluctuations in consumption if these households cannot fall back on savings and access to credit.

Moreover, a household's consumption standard in a specific year will depend on its ownership of assets, returns on those assets, shocks and the ability of the household to translate incomes into consumption. If the household is credit constrained, it will find it hard to cope with negative shocks and smooth consumption. The chronic component of poverty will depend on the household's lack of assets or its limited ability to translate assets into incomes. Incomes change over time by asset accumulation, changes in returns driven by savings behavior or exogenous shocks (Bigsten et al., 2004).

In developing countries, marginal customers-defined as those that are hardly reached by the market and that have no easy access to suitable financial products-represent a much larger market segment; on the one hand, it is quite common place that the very poor represent a large proportion of the population; on the other, a specific typology of marginal customers is represented by those individuals who, without being extremely poor-in relative terms- are not yet able to work with banks (Dejene et al., 2007). Very poor people are marginalized by the formal market but may find satisfaction of their expectations in the informal market. Some may be very poor and demand financial services for daily financial constraints while others may have micro investment plans whose financing may be satisfied by the informal market as well as (active poor). The informal market, in fact, is normally suitable up to a certain extent; micro/small entrepreneurs demanding relatively large loans for relatively long maturities sometimes find the informal market inadequate for their financial requirements (Dejene et al., 2007). This idea of imperfect substitution of the formal and informal markets is strengthened by Diagne (1999) who found informal credits to be imperfect substitutes. In particular, formal credit, whenever available, reduces but does not completely eliminate informal borrowing. This suggests that the two forms of

credit fulfill different functions in the household's inter-temporal transfer of resources (Dagne, 1999).

A distinction is made between access to formal credit and participation in formal credit programs. Participation in a credit program is something that households choose to do, while access to a credit program is a limiting constraint put upon them (e.g., availability and eligibility criteria of credit programs). Participation is more of a demand-side issue related to the potential borrower's choice of the optimal loan size [of credit], while access is more of a supply-side issue related to the potential lender's choice of the credit limit (Diagne et al., 2000; Dagne, 1999). The extent of access to credit is measured by the maximum amount a household can borrow (its credit limit). If this amount is positive, the household is said to have access. A household is credit constrained when it lacks access to credit or cannot borrow as much as it wants. Broadly speaking, there are two methodologies for measuring household access to credit and credit constraints. The first and indirect method infers the presence of credit constraints from violations of the assumptions of the life-cycle or permanent income hypothesis, while the second collects information directly from household surveys on whether households perceive themselves to be credit constrained (Diagne et al., 2000).

2.3 Empirical evidence on the access to credit and its link to poverty

The extent and prevalence of poverty in Ethiopia has attracted a growing interest in recent research agenda. However, only few studies have been made on the link between access to finance and rural poverty in the country (e.g. Alemayehu, 2006; Bekele, 1996; Solomon, 1996).

Alemayehu et al. (2006), using a panel data collected by the department of economics of AAU. has attempted to establish the link between finance and poverty in Ethiopia using binary outcome model and found that access to finance is an important factor in consumption smoothing and hence poverty reduction. The study also found an evidence for poverty trap due to liquidity constraints that limits the ability of rural households from consumption smoothing. It has shown that availability of credit significantly and negatively affects the probability of being poor.

Another study by Bekele (1996) tried to see the role of credit in the informal sector for poverty alleviation using descriptive analysis of data collected from the branches of the Development Bank of Ethiopia and Grameen Bank of Bangladesh and showed that credit in the informal sector can promote the productive capabilities of the

informal sector poor and enable them to satisfy better their needs through participation in their own activities. He has also found that, in the process of carrying out their business, they will be able to progressively increase their income, savings and investments through self-employment.

In a study conducted in Debre Birhan Town (North Shoa), Solomon (1996) found that credit to the poor in the study area is found to be important and households engaged in small-scale but legitimate and viable investment ventures are denied access to institutional credit due to the high collateral and antiquated lending procedures of the formal banks and are forced to 'seek refuge' in the informal financial sector. The study found that there is little that finance can, on its own, do to assist poor households to uplift their living conditions. Access to credit cannot compensate for inadequate non-financial infrastructure. It should be accompanied by adequate non-financial infrastructure and coordinated complementary services to make it more productive. An improvement of this study over the previous ones is that, Solomon (1996) stressed the role of markets and their complementarities with credits in poverty alleviation.

3. Models, estimation techniques and data

3.1 Poverty profile

The poverty line estimated by the government of Ethiopia was taken for granted. The levels of real total per adult household consumption expenditure are ETB 1075.0, ETB 1343.8 and ETB 806.3 per adult equivalent per annum for poor, moderately poor and extremely poor respectively at 1995/96 national average constant prices. Following Duclos and Araar (2006) and to be consistent with DAD's procedure of estimation of poverty indices, we denote living standards by the variable **y** as an indicator of wellbeing in this study. Let P be the proportion of individuals in the population who enjoy a level of income that is less than or equal to y and is given by the function

$$P = F(y) \tag{1}$$

The first derivative of this cumulative distribution function gives the density function *[i.e f(y) =F'(y)].* Let's define a *quantile function Q(p)* as the inverse distribution function such that

$$F[Q(P)] = P \Rightarrow Q(P) = F^{(-1)}(P) \tag{2}$$

We can thus say that the quantile distribution function *Q (p)* indicates the living standard level below which we find a proportion p of the population. Let **z** denote the poverty line. The quantile distribution function censored at z is defined as.

$$Q^*(P;z) = \min\left[Q(P), z\right] \tag{3}$$

Censored quantiles are the income Q(p) for those in poverty (below z) and z for those whose income exceeds the poverty line. Then, the poverty gap at percentile, p, denoted by $g(p, z)$, is the difference between the poverty line and the censored quantile at p. It is the shortfall of living standard Q (P) from the poverty line and is defined as:

$$g(P;z) = z - Q^*(P;z) = \max\left(z - Q(P), 0\right) \tag{4}$$

Censoring income at z helps give attention on poverty, since the precise value of those living standards that exceeds z is irrelevant for poverty analysis and poverty comparisons (Douclos and Arrar (2006). The area between the poverty line and p is calculated using integral calculus.

$$Poverty\_Gap = \int_0^1 g(p;z)\,dp \tag{5}$$

Equation (5) helps us to derive the normalized (normalized at the poverty line, z) poverty gap given by:

$$Normalized\_Poverty\_Gap = \int_0^1 \left(\frac{g(p;z)}{z}\right) dp \tag{6}$$

A group of poverty measures called the Foster-Greer-Thorbecke (FGT) can then be defined. They base their measure on the poverty gap derived above (equation (6)). These measures are subsumed under the following formula.

$$P(z;\alpha) = \int_0^1 \left(\frac{g(p;z)}{z}\right)^{\alpha} dp \tag{7}$$

Alpha (α) is an ethical parameter which is considered to be greater than or equal to zero. For $\alpha = 0$, it is the head count ratio, for $\alpha = 1$, it is the poverty gap and for $\alpha = 2$, it is the squared poverty gap.

3.2 Models for regression analysis

3.2.1 Binary outcome model

The robustness of a poverty profile depends on the selection of a particular welfare indicator, the estimated poverty line, the type of data available and the poverty index chosen (Abebe and Bereket, 1996; Ravallion, 1994). But even if these criteria are fulfilled, this way of poverty analysis is a bi-variate analysis which compares the poverty status of households to each of the selected characteristics of households at a time. This exercise doesn't hold the ceteris paribus assumption of how a particular variable affects poverty conditional on other potential determinants. Moreover, correlation doesn't imply causality (Couduel et al., 2002; Fitsum and Holden, 2002; NEC et al., 2001; Ravallion, 1994). We want to see the probability of being poor when a household has access to credit relative to a household having no access to credit. This can be solved by a conditional multivariate binary outcome regression model.

An increasingly common approach is to construct a regression model of some poverty measure against a variety of household and community characteristics (Alemayehu et al., 2005; Alemayehu et al., 2006; Ravallion, 1996; Couduel et al., 2002; Bigsten et al., 2002b; Bigsten et al., 2005). A binary outcome model is specified using the latent variable approach where the probability of a household to be poor is determined by some underlying latent variable, y_i / z_i that captures the true economic status of the household where y_i is consumption level, and z_i is an exogenously given poverty line. This variable is then a function of a vector of observed household characteristics defined in linear form as $y_i / z_i = X'\beta + \varepsilon_i$.

While we 'pretend' not to observe this variable directly, we do observe a binary outcome w_i such that $w_i = 0 \; if \; y_i / z_i < 1 [i.e. y_i < z_i]$ and $w_i = 1$ otherwise. We then define for the variable $w_i = 0$ if the individual is poor (i.e. $y_i < z_i$) and $w_i = 1$ non-poor. The general binary outcome models can then be written as the conditional probability to be non-poor, i.e. $p(w_i = 1 / x_i)$, as follows,

$$p\left(w_i = 1/crt_i, x_i\right) = E\left(w_i/x_i\right) = F\left(crt_i, \chi_i, \beta\right) \quad (8)$$

In (8), crt_i stand for access to credit while the χ_i 's are a host of other explanatory control variables to be described below.

By specifying an appropriate distribution for ε, we can derive appropriate models for $F\left(crt_i, \chi_i, \beta\right)$. We assume ε follows a logistic distribution. If we define the logistic function $\Lambda(z) = \frac{\exp(z)}{1+\exp(z)}$, we can get the following logit model,

$$F\left(crt_i, \chi_i, \beta\right) = \Lambda\left((crt_i, \chi_i)'\beta\right) \quad (9)$$

The logit model has a relatively simpler form for its first order conditions and asymptotic distributions than the probit model. Moreover, the interpretation of coefficients in terms of log-odds ratio is an attraction of this model (Cameron and Trivedi, 2005).

The criteria for the identification of the determinants of poverty are guided purely by the general economic theory, correlates in the poverty profile and exogeneity of variables in the model. Moreover, in specifying the regression models we allow for zonal disparity in welfare status (a dummy for each zone). The logic behind the regional disparity in poverty is the fact that in areas characterized by geographical isolation, a low resource base, low rainfall, and other inhospitable climatic conditions, poverty tends to be higher. Annex 1 provides the list, description and expected signs of explanatory variables.

A Maximum Likelihood Estimation (MLE) is applied for the above model. The marginal effects on the probabilities of the model is given by,

$$\frac{\partial \Pr\left(y_i = 1/crt_i, mpxty_i, \chi_i; \beta\right)}{\partial \chi_{ij}} = \frac{\exp\left((crt_i, mpxty_i, \chi)'\beta\right)}{\left[1+\exp\left((crt_i, mpxty_i, \chi)'\beta\right)\right]^2}.\beta_j \quad (10)$$

We also make use of the marginal effects on the odds ratio. The probability of being non-poor, p, is given by,

$$p = \Lambda(z) = \frac{\exp(z)}{1+\exp(z)} \Rightarrow \frac{p}{1-p} = \exp(z) \Rightarrow \ln\left(\frac{p}{1-p}\right) = z = \left(crt_i, mpxy_i, \chi_i\right)'\beta_i \quad (4.13)$$

Odds ratio measures the probability of the household being non-poor relative to the probability of the household to be poor.

Any of the three tests from general MLE analysis—the Wald, Likelihood Ratio (LR), or Lagrangian Multiplier (LM) tests—can be used to test hypotheses of overall significance in binary response contexts. Since the tests are all asymptotically equivalent under local alternatives, the choice of statistic usually depends on computational simplicity (Wooldridge, 2002). The LR and Wald test are employed for this study. Moreover, we will use the standard normal table for critical points to test for single restriction.

3.2.2 Specifying the semi-log model

The above model enables us to see the probability that households are poor relative to the probability that they are not when they get access to credits (the odds ratio). However, as noted by Couduel et al. (2002) and Ravallion (1996), this model uses an artificial construct as the endogenous variable. Unlike the usual binary response models, the continuous latent variable is not latent at all. Much of the information about the actual relationship between consumption and determining factors is lost. The parameters can be directly estimated by regressing w_i on crt_i and χ_i ,where w_i is the ratio of consumption (y_i) and the poverty line (z) as defined above which is relevant and can be consistently estimable under weaker assumptions about the distribution of the error (Couduel et al., 2002; Ravallion, 1996). Moreover, for prediction purposes, linear regression should be used instead (Couduel et al., 2002; Ravallion, 1996). Following these arguments, we construct the following linear model.

$$Log\ (w_i) = (crt_i, mpxty, \chi_i)'\beta + \varepsilon_i$$

3.3 The source and nature of data

This study employs a cross-sectional and secondary data. The data are gathered from a survey conducted by the Ethiopian Technology Policy Studies Association (ETPSA). The survey was conducted in 2005 in five major coffee growing administrative zones of Oromia and Southern Nations, Nationalities and People's (SNNP) regions. The sampling frame of the study is coffee growing farmers. Five zones are included in the sample: Sidamo, Jimma, Illubabur, Wolayita, and West Hararge. Nine administrative woredas were selected from these zones. The sample

size stands at 1033 households. Nearly 100% of the sample households are coffee growers. Of the total sample, 64% comes from Oromia region, the largest coffee-growing regional state in Ethiopia. The rest, i.e. 36%, comes from SNNP, the second largest coffee-growing regional in the country.

The sampling unit in this study is the household. Some requirements were considered in order to make the sample more representatives of different groups of the samples. The household should, to the extent possible, be a coffee grower. Samples should also be evenly or proportionately distributed across sub-kebeles (or *gots*) or a given enumeration unit. In this way, it could be possible to minimize bias against households located far from roads. Female-headed households should be included in the sample. Finally, samples should be drawn from different age brackets and income groups (low, middle and high) within a village.

Female headed households constitute 23% while the rest is male headed households. Sidama and Jimma have equal weights in terms of the percentage shares (23%) they have from total. While Illubabur has 22% share, Wolayita and West Hararge respectively have 13% and 18% percentage share from the total sample households Among the principal wellbeing indicators collected were general household and community characteristics, income, consumption expenditure, information on participation of informal and semi-formal financial markets, proximity to markets, ownership of assets, utilization of productive technology and risk behavior of households.

4. Estimation results, analysis and interpretation

4.1 Rural poverty in coffee growing households

Poverty is prevalent in coffee growing households of SNNP and Oromia regions as in any other regions of the country. Table 4.1 shows the percentage of the poor from the total sample in the study area. As the table below shows, of the total, 36% of the households are poor. While the extreme poor constitute 14% of households in the sample, the moderately poor are 54% of the total households.

Table 4.1: Prevalence of Poverty in Coffee Growing Households of SNNP and Oromia Regions

	Moderately poor	Poor	Extremely Poor
Percentage of poor	53.5%	35.9%	14.4%
Poverty lines	1343.8	1075.0	806.3

Sample size: 1033; Poverty lines estimated by MoFED

As can be seen in Table 4.1, there is a high poverty incidence in the sample households (35.9%). However, this figure seems to be smaller than the rural and national estimates of the incidence of poverty which were 39.3% and 38.7% respectively. (See below for a more in-depth comparison). Table 4.2 shows the incidence (α =0), depth (α =1) and severity (α =2) of poverty with their standard errors. As we have just seen above, 36% of the total sample is below the poverty line.

Table 4.2: Prevalence, Depth and Severity of Poverty

FGT	Estimated value	Standard error
α =0	0.36	0.0149
α =1	0.08	0.0044
α =2	0.03	0.0019

Sample size: 1033; Poverty line= ETB 1075

The poverty gap ratio, which represents the depth of poverty, or the average deprivation, is 0.08. This measure captures the mean aggregate consumption shortfall relative to the poverty line across the whole population. The squared poverty gap, which takes into account the relative distance separating the poor from the poverty line, is 0.03.

Table 4.3 shows a comparison of the results of poverty estimates of this study with the officially estimated poverty measures. Since the survey for the official results was conducted in the same year as the survey of this study and both of these estimates are based on the same poverty line, it seems logical to compare these results. The head count ratio of this study (0.36) is clearly lower than MoFED's estimate of 0.39 for the rural areas. While the squared poverty gap ratios of both estimates are the same, the poverty gap ratio of this study (0.08) seems a little bit lower than the officially reported estimate of 0.09. To see whether these differences of the headcount and squared poverty gap ratios are statistically different, we used the fact that any of the poverty indices and the associated test statistics estimated by DAD in this chapter is asymptotically normally distributed. It is hypothesized that the FGT indices are not different from the officially reported measures [i.e. the null hypothesis, H_0= officially reported estimates]. A 95% significance level is taken. As can be seen in the 6^{th} column of Table 4.3, the p-values are found to be less than the 5% significance level for the headcount index.

Table 4.3: A Comparison of the Prevalence, Depth and Severity of Poverty of the Study Sample with MoFED's Rural and National Estimates

FGT	Study Area*	Rual (MoFED)**	National (MoFED)	Significance Level in (%)	P-Value	Result of the test
α =0	0.36	0.39	0.39	5.0	0.0388	H_0 is rejected
α =1	0.08	0.09	0.08	5.0	0.0864	H_0 is not rejected
α =2	0.03	0.03	0.03	5.0	0.1192	H_0 is not rejected

* The survey for this study was conducted in 2005

**The source for the national and rural measures of poverty is Ministry of Finance and Economic Development (MoFED)

As a result, the null hypothesis that the estimates are equal can be rejected and the difference between these estimates is found to be statistically significant. While the poverty gap ratio can be rejected at 10% significance level, the squared poverty gap is insignificant.

4.2 Spatial poverty comparison: A comparison between zones

We can make spatial poverty comparison across zones. By comparing the prevalence, depth and severity of poverty across zones, we can have some idea of policy direction as to which area needs more policy attention than others. As shown in Table 4.4, we can see that head count ratio for Jimma is the lowest as compared to other zones. Only 20% of sample households in Jimma are below the poverty line. While Sidama follows Jimma with head count ratio of 0.33, Wolayita and West Hararge are the highest in terms of the share of the poor below the poverty line which is 0.44 and 0.45 respectively. Their numerical inter-zone difference is clear from the table, but we have to test whether they are statistically different from each other. A test is made using estimated values and their standard errors from Table 4.3. The differences between most of these estimates are statistically different. There are exceptions however: the estimates of the indices for West Hararge compared with those of Wolayita and Illubabur are not statistically different. Moreover, headcount estimates between Wolayita and Illubabur are not statistically different.

Table 4.4: Prevalence, Depth and Severity of Poverty: Inter-zone Comparison

FGT	Po		P1		P2	
Zone	Estimated value	Standard error	Estimated value	Standard error	Estimated value	Standard error
Sidama	0.33	0.0306	0.08	0.0091	0.03	0.0041
Jimma	0.20	0.0259	0.04	0.0063	0.01	0.0024
Illubabur	0.43	0.0325	0.10	0.0105	0.04	0.0048
Wolayita	0.44	0.0433	0.11	0.0133	0.03	0.0058
West Hararge	0.45	0.0362	0.10	0.0108	0.03	0.0047

Sample Size: Sidama=238, Jimma=241, Illubabur=232, Wolayita=132, W. Hararge=191

What can we make use of this analysis? The fact that there is a big disparity in the incidence of poverty across zones provides us with information as regards which zones need more policy attention than other zones. Moreover, residential differences affects households' status of welfare means that, the different agro-ecological disparity among zones can be taken as an important correlates of poverty. This difference is quantified and more articulated using econometric model in section 4.5.

4.3 Poverty, rural finance and access to credits

Rural finance and its access to the poor are critical for the livelihood of the poor in rural areas. As shown in Table 4.5 below, households who borrowed from micro-finance institutions (MFIs) during the year constitute only 7.7% of the total sample. While the majority of households in the sample (77.2%) are members of *iddirs (a* traditional insurance schemes), only 8.5% of the total households in the sample are members of *iqqubs* (informal/traditional saving and lending financial institutions-an Ethiopian name for ROSCAs). Households were asked if they have borrowed at least ETB 20 birr (or more) during the year either from informal and semi-formal financial institutions. A significant number of households (493) have borrowed from either source.

This constitutes 47% from the total households in the sample. In an area where there are no formal banking system providing loans to the poor households, this means that 38% of households utilize the informal channel of getting credit.

Table 4.5: Summary of the Distribution of Households' Membership in Informal and Semi-Formal Financial Institutions and Access to Borrowing

Source of Finance		Number	Share from Total (%)
Informal	Member in *Iqqub*	88	8.5
	Member in *Iddir*	797	77.2
Semiformal	Those browed from MFI	80	7.7
Those who have borrowed at least ETB 20 birr during the year from both formal and semi formal institutions.		493	47.7

Sample Size: 1033

It was found that there is meager access to credit in the study areas. We can have an insight into the contribution of access to credit to the amelioration of the welfare status of households. Table 4.6 shows the incidence, depth and severity of poverty by classifying households based on their access to rural credit. Measured in terms of the headcount, poverty is more prevalent (0.38) with those households who do not access financial services than with those who access them (0.34). While poverty gap and squared poverty gap ratios are the same in the two groups, the incidence of poverty is different even statistically at 10% level of significance.

Table 4.6: Prevalence, Depth and Severity of Poverty and Access to Credit

Correlate	Households Having no credit access		Households having access to Credit		P-Values
FGT	Estimated value	Standard error	Estimated value	Standard error	
α =0	0.38	0.0209	0.34	0.0213	0.0698
α =1	0.08	0.0061	0.08	0.0065	0.4364
α =2	0.03	0.0027	0.03	0.0029	0.9509

Sample Size: 1033

This result is consistent with the literature that households' access to finance helps improve their wellbeing. But this result should be interpreted with care. This is simply a bi-variate analysis with no ceteris paribus assumption. Moreover, this difference might have come from an endogeniety problem of finance in the sense that households' access to credit happens just because they are rich and hence credit worthy; not because they are rich because credit is available. These caveats will be more articulated and solved using econometric analysis below.

In this section, we have seen the extent of poverty in the study area. With the simplest model of poverty analysis (save for its limitations), we have found that there

is a big difference in the in the incidence of poverty across zones. Moreover, access to finance significantly affects the welfare of households.

4.4 Determinants of poverty in coffee growing households

An econometric estimation result is provided in Annex 2. Before going directly to the results, however, the following points are worth noting. A test on hetroskedasticity and correlation was made. Due to the presence of hetroskedasticity, we used robust standard errors to avoid hetroskedasticity problem. The variance inflation factor (VIF) was found to be low (a maximum VIF of 1.28 with mean VIF of 1.42). Moreover, a test was made if there is a problem of endogenous variables. A case in suspect is access to credit which can be endogenous in the sense that probability of being poor declines with credit availability on one hand and availability of credit is determined by the poverty status of the household. It was found that credit was indeed an endogenous variable in the model. In finding an instrumental variable for credit availability, three candidates were identified: livestock, number of coffee trees and income from coffees sales because they show the repayment capacity of the household. Of these candidates, only livestock passes our criterion of selecting instrumental variable (i.e. the variable should be highly correlated with credit and uncorrelated with the assumption that it is not correlated with the error term).

We can see that factors strongly associated with the households' welfare include access to credit, proximity to markets, household size, age of the household, literacy of the household head, and characteristic of agro-ecological zones. The coefficient for age of the household indicates it increases, with declining probability, the chance of getting out of poverty. The bigger the household, the greater is the incidence of poverty. The positive sign for the square of the household size tells us that the decline in the probability of getting out of poverty increases with size of the household. Literacy of the household head is highly significant (at 1 per cent). It increases the probability of getting out of poverty. Literate households are less likely to be poor than those who are not literate. It was found to be significant at 1%. The odds of getting out of poverty for households who are literate are 1.1 times the odds of households who are not. Total holding of cultivated land doesn't seem to be important in both of the models. It might have been because production depends on the quality of land rather than the quantity (see also Alemayehu et al. 2005). Similarly, farming technology (using such things as chemical fertilizers, natural manure and irrigation technologies in farming) doesn't seem to be significantly affecting the status of wellbeing of households.

4.5 Agro-ecological zones as determinants of poverty

Differences in agro-ecological zones have different probabilities of being poor and non-poor. The bench-mark group is West Hararge. Whereas Jimma is significantly different (1%), this difference with Illubabur and Sidama is significant only at 5% and 10% significance level. Wolayita was not found to be significantly different from West Hararge. The difference in the effects on household welfare might be ascribed to the location-specific endowment of an area in terms of, among others, soil fertility, climate and access to natural resources. The results in this section are a little bit different from what was found in our descriptive analysis in that the difference between Illubabur and West Hararge is significant whereas it was not in our descriptive analysis. But for any policy implication drawn in the next section, we trust the econometric results. This is not surprising if we remember the assumption we made in the two analyses. Ceteris paribus assumption is held in this section while we didn't account for that in the previous analysis.

4.6 Rural finance and poverty in coffee growing households

When we come to our objective of examining the contribution of credit availability to household's welfare, we see access to credit significantly (at 1% significance level) affecting the probability of a household getting out of poverty. The marginal effects of the availability of credit were estimated (annex 2) which were evaluated based on the mean of explanatory variables. It is highly significant (1%). So, households who have an access to credit have more probability of getting out of poverty (2%) than households who don't have an access to it. Annex 2 shows estimates of the odds ratio of the probability of getting out of poverty against the probability of being poor. The odds of getting out of poverty for households who have an access to credit are 1.1 times that of the probability of getting out of poverty for those households having no access to credit. This is highly significant even at 1% level of significant. It can also be said that the difference in log (per adult household annual consumption) between a households to whom credit is available and those households to whom credit is not available is 0.014. This means that a household having an access to credit is predicted to consume 1.4% more. This is because credit or savings can provide capital for financing inputs, labor and equipment for income generation. Moreover, they can help households increase their capacity to bear risks or reduce cost of insurance and finally these financial services can potentially stabilize consumption of food and other potential goods efficiently (see for e.g. Zeller et al., 1997).

5. Concluding remarks and policy implications

A myriad of researches have been conducted on poverty analysis and related issues by using data collected from rural Ethiopia. Most of them have shown that the incidence and prevalence of poverty is high in rural areas. Some studies have indicated that the incidence of poverty is declining. With this backdrop, this study had the objective of trying to see whether households who have access to rural credit are better off than those who don't have such an access. The study used both descriptive and econometric analysis to accomplish this objective.

The results in this study confirm our prior hypothesis. The results also supported earlier researches that lack of financial markets can be bottlenecks in small holder farming system. It was found that 36% of the households in the study area are poor. However, this is much lower than the nationally estimates of the incidence of poverty and it was tested that the difference is significant. It was found that there existed a significant difference between the incidences of poverty across zones. Sidama, Illubabur and Jimma were found to have a significant different incidence of poverty compared with West Hararge. Residents in Sidama and Jimma were found to be less likely to be poor than West Hararge. These two areas have 9% and 20% respectively more probabilities to get out of poverty than West Hararge. But, residents in Illubabur have less probability (10.5%) of getting out of poverty than West Hararge.

The study has also found that, the incidence of poverty in households who have access to credit is significantly lower than in households who don't have credit facility. In terms of probability, households who have an access to credit are more likely to get out of poverty than households who don't have an access to it. The odds of getting out of poverty for households who have an access to credit are also 1.1 times that of the probability of getting out of poverty for those households having no access to credit. It was also found that there is significant difference consumption between these groups. A household having an access to credit is predicted to consume 1.4% more.

By way of conclusion, we can draw some policy implications based on these findings. Our comparative analysis on the incidence of poverty between zones has shown us that it matters whether households live in different areas as far as poverty is concerned. The fact that there a big disparity in the incidence of poverty among these zones under study means that policy should pay attention to areas where poverty is more prevalent. This study found Sidama, Jimma and Illubabur with 0.33, 0.20 and 0.43 incidence of poverty significantly different from West Hararge which has 0.45 incidence of poverty. Policies for poverty reduction efforts should be directed towards

West Hararge and Illubabur where the incidence of poverty is significantly relatively high. Moreover, availability of credit was found critical. Those having access to rural credit are better off than those who don't have access to it. Making credit accessible to the poor makes households finance the purchase of agricultural inputs and smooth their consumption in time when income is low. This improves the welfare of households. Making credit accessible to the small holder farming households can be done through microfinance-bank linkages. To increase the efficiency, capacity and coverage of micro financial institutions, banks may participate in MFIs through credit or equity contributions, outsourcing retail operations to MFIs, providing infrastructure and systems and other back office processing to the MFIs, and sharing or renting facilities of MFIs with banks.

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Annexes

Annex 1: List, Symbol, Description and Expected Sign of Independent Variables

No	Symbol	Explanatory Variables	Expected Sign
1	crt	Access to Rural Credit: Whether households borrowed from informal and semi-formal sources (Yes=1 and No=0)	(+)
2	mpxty	Proximity and Access to product market: Length of the travel time to a market place to sell their product	(-)
3	hhs	Size of the household	(-)
4	hhss	The square of the size of the household	(+)
5	hha	Age of the household	(+)
6	hhaa	Square of Age of the Household head	(-)
7	hhx	Sex of the household head (1= if male and 0=Female)	(+)
8	lcy	Literacy of the household head(1= if literate and 0=illiterate)	(+)
9	lnd	Total cultivated land	(+)
10	tech	Technology: whether households use farming technologies	(+)
11	lvsk	Total number of Livestock	(+)
12	agrzon	Area of Agro-ecological zones: 1=if household is in Sidama (SD) and=0 otherwise;1=if household is in Jimma (JM) and 0=otherwise; 1=if household is in Illubabur (IL) and 0=otherwise; 1=if household is in Wolayita (WL) and 0=1 otherwise. West Hararge is taken as the base group.	

Annex 2: Estimates of coefficients, marginal effects and odds ratio of the logit and coefficients of log-linear models

Explanatory Variables	Dependent Variable: poor=o; non-poor=1						Dependent Variable:Log of per adult annual Consumption					
	Coefficients of Logit			Marginal Effects of Logit			Odds Ratio of Logit			Coefficients of log-linear		
	Coefficients	z-Value	P>|z|	dy/dx	z-values	P>|z|	Odds Ratio	z-values	P>|z|	Coefficients	t-values	P>|t|
Availability of Credit	0.07	3.99	0.00	0.02	4.03	0.00	1.07	3.99	0.00	0.01	4.21	0.00
Distance to markets	-0.04	-1.92	0.05	-0.01	-1.93	0.05	0.96	-1.92	0.05	-0.01	-2.52	0.01
Household Size	-0.23	-2.91	0.00	-0.05	-2.92	0.00	0.79	-2.91	0.00	-0.19	-6.69	0.00
Square of household Size	0.01	2.03	0.04	0.00	2.04	0.04	1.01	2.03	0.04	0.01	5.61	0.00
Age of household head	0.06	2.89	0.00	0.01	2.89	0.00	1.06	2.89	0.00	0.02	4.20	0.00
Square of the age	0.00	-2.58	0.01	0.00	-2.58	0.01	1.00	-2.58	0.01	0.00	-3.31	0.00
Sex of household head	-0.42	-2.15	0.03	-0.09	-2.27	0.02	0.66	-2.15	0.03	0.03	0.65	0.52
Literacy of household head	0.53	3.68	0.00	0.12	3.68	0.00	1.70	3.68	0.00	0.12	3.41	0.00
Total cultivated land	-0.06	-1.10	0.27	-0.01	-1.10	0.27	0.94	-1.10	0.27	0.01	1.05	0.30
Farming Technology	-0.22	-1.48	0.14	-0.05	-1.47	0.14	0.80	-1.48	0.14	-0.07	-1.83	0.07
Sidama	0.42	1.93	0.05	0.09	2.02	0.04	1.52	1.93	0.05	0.13	2.61	0.01
Jimma	0.96	4.11	0.00	0.20	4.73	0.00	2.62	4.11	0.00	0.37	7.17	0.00
Illubabur	-0.45	-2.01	0.04	-0.11	-1.97	0.05	0.64	-2.01	0.04	-0.07	-1.26	0.21
Wolayita	-0.07	-0.27	0.79	-0.01	-0.26	0.79	0.94	-0.27	0.79	0.00	-0.03	0.98
Constant term	-0.19	-0.31	0.76	-	-	-	-	-	-	0.23	1.48	0.14
	No of observation		1033				No of observation		1033	No of observation		1033
	Wald chi2(14)		82.7				Wald chi2(14)		82.67	F(14, 1018)		14.39
	Prob > chi2		0.000				Prob > chi2		0.000	Prob > F		0.0000
	Log pseudo-likelihood		-623				Log pseudo-likelihood		-622.5	R-squared		0.2102
	Pseudo R2		0.077				Pseudo R2		0.077	Root MSE		0.5249

SOCIAL PROTECTION IN AFRICA: LESSONS FROM ETHIOPIA, KENYA AND MALAWI

Amdissa Teshome[1]

Abstract

Social protection is emerging as an important development agenda across Africa. Governments are increasingly realising that putting in place good policies and strategies and achieving economic growth are not enough to reach the most vulnerable groups in society particularly those unable to take advantage of the favourable economic environment due to age, disability or other social factors.

This paper used experience of Ethiopia, Kenya and Malawi to argue for long term social protection. Kenya and Malawi have social protection policies and strategies in place and are piloting various approaches with a view to scaling up and informing the policy process. The Ethiopia Productive Safety Net Programme is unique in that it is one of the largest in Africa designed to address chronic food insecurity. Although it is a short term intervention, the experience gained from implementing the programme is informing the path to long term social protection.

For the purpose of this paper, transfer rates and duration of transfers of the PSNP are used as a basis to provide social protection options and estimates of how much it would cost the government. Five options are presented (the first three for cost estimates):

- *focus on the current direct support and extend the duration to 12 months;*
- *focus on children with options of supporting different age groups and going for universal (all children) or poor only defined by the poverty line*
- *focus on the elderly (over 60 or over 70) and make it universal (all elders) or poor only*
- *focus on persons with disabilities estimated to be around 7.5 million*
- *focus on persons living with HIV/AIDS*

The paper concludes that Ethiopia should use the PSNP as a historic opportunity to move away from short term thinking to long term solutions. It should design and institutionalised social protection system that is administratively viable, financially affordable, and politically acceptable. Achieving this will require all stakeholders to make long-term resource commitments that amount to a 'social contract' with Ethiopia's vulnerable citizens. Kenya and Malawi are on the right track in the sense that they have social protection policies and strategies that guide interventions and most importantly they are testing/piloting schemes with a view to informing the policy process. Ethiopia should closely follow the outcome of the piloting and learn from the process. The UK Department for International Development, as a donor supporting both the Ethiopia and Kenya programmes, has the opportunity to encourage experience sharing between the two countries.

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1. What is social protection?

There are a multitude of concepts and phrases widely used (often interchangeably) in the academic as well as policy literature. These include, but not limited to, social security, social protection, social welfare, social safety nets, unemployment benefits, and pension schemes. Since the focus of this paper is on social protection, definitions provided by some of the well known international organisations and social protection researchers are reviewed below. Box 1 provides a range of definitions obtained from two sources. Definitions 1-5 are obtained from UNICEF's *Social Protection Strategy Paper* and definition 6 comes from Devereux and Sabates-Wheeler (2004).

Box 1: Definitions of social protection

Definition 1: According to the World Bank, social protection covers all interventions that are informal, market-based and public designed to assist poor individuals, households, and communities reduce their vulnerability by managing risks better.

Definition 2: The Department for International Development (DFID) defines social protection as interventions that strengthen the capacity of the poor to protect their consumption and to support household investment in the assets required to manage and overcome their situation.

Definition 3: The International Labor Organization (ILO) refers to social protection as mechanisms that provide access to health care and protect citizens against the stoppage or reduction of earnings resulting from sickness, maternity, employment injury, occupational diseases, unemployment, invalidity, old age and death.

Definition 4: The United Nations Development Program (UNDP) Poverty Center defines social protection as interventions from public, private, voluntary organisations and informal networks to support communities, households and individuals in their efforts to prevent, manage, and overcome a defined set of risks and vulnerabilities.

Definition 5: A Global Conference on Social Protection defined social protection as "a set of transfers and services that help individuals and households confront risk and adversity (including emergencies), and ensure a minimum standard of dignity and well-being throughout the lifecycle"

Definition 6: Devereux and Sabates-Wheeler (2004) define social protection as "... all public and private initiatives that provide income or consumption transfers to the poor, protect the vulnerable against livelihood risks, and enhance the social status and rights of the marginalised; with the overall objective or reducing the economic and social vulnerability of poor, vulnerable and marginalised groups".

Source: UNICEF and Devereux and Sabates-Wheeler (2004)

There is a great deal of commonality among these definitions. Three of the six definitions indicate that social protection is an intervention. The other three refer to it as mechanism, transfers or initiatives. At least three of the definitions indicate the source of the interventions or transfers.

The definitions also indicate the target audience for social protection. In this regard, the ILO definition is the most comprehensive - social protection is for citizens that have lost income as a result of sickness, maternity, unemployment, invalidity, old age and death. Devereux and Sabates-Wheeler (2004) use poor, vulnerable and marginalised groups as targets for social protection. The purpose of social protection is also stated in these definitions.

- To assist the poor manage/confront risk (World Bank; UNDP; UNICEF; Devereux and Sabates-Wheeler)
- To strengthen capacity of the poor protect consumption (DFID)
- To protect citizens against loss of earnings (ILO)
- To enhance social status and rights (Devereux and Sabates-Wheeler)
- To reduce economic and social vulnerability (Devereux and Sabates-Wheeler)

Others (e.g. Chisinga, 2007) also view social protection as one of the key ways of attaining the Millennium Development Goals (MGDs).

2. How social protection is perceived in the study countries

Available policy documents were reviewed to assess how the governments of Ethiopia, Kenya and Malawi perceived social protection. These are summarised in Box 2.

Box 2: Perception of social protection as documented in policy documents

Ethiopia: "Social welfare refers to all the activities being undertaken by community with a view to facilitating the economic and social conditions that are conducive to a healthy life and a sustainable development as well as activities designed to meet the common needs" (Developmental Social Welfare Policy, 1996:51).

Kenya:- "Policies and actions for the poor and vulnerable which enhances their capacity to cope with poverty, and equips them with skills to better manage risks and shocks." (National Social Protection Strategy, 2008)

Malawi: "Policies and actions that protect and promote the livelihood and welfare of poor and vulnerable people." (National Social Protection Strategy)

The Ethiopian definition clearly puts the community at the forefront of social welfare which is strongly influenced by the well-known Ethiopian traditional and extended family support system. The Kenyan and Malawi definitions refer to policies and actions which imply that the responsibility for social protection falls with the public sector.

3. Justifications for social protection

A UNICEF Strategy Paper cited above provides a powerful justification for social protection in Africa. It states that policies to promote broad-based economic growth are fundamental to overall social development. However, the benefits of growth do not automatically reach the poorest and most marginalized. Furthermore, despite increased investments in health, education and other basic social services in Africa, the poor and marginalised (e.g. persons with disabilities) don not often have access to these services. Therefore, direct interventions are required to reach the socially and economically excluded. Social protection programs among the interventions that can play a key role in ensuring social development among those citizens who cannot be reached through traditional sector approaches.

The UNICF paper underlines that strengthening social protection systems is increasingly becoming a priority area of work for governments, donors, United Nations (UN) agencies and non-governmental organizations in Africa. It is now considered part of the essential package of basic social services that the State ought to provide to its citizens.

There are also strong justifications for long term social protection in the three countries under study. For example, in Ethiopia, according to official figures, the proportion of persons living below the poverty line currently stands at 38.7% and projected to drop to 22% by the end of the current poverty reduction programme.

Although this downward trend in poverty is encouraging, it should be noted that there are 8.3 million chronically food insecure people benefitting from the safety net programme. About 1 million of these are on direct support with no other means of income/food and are generally regarded as not able to “graduate” from the PSNP. There is no long term social protection plan for these most vulnerable people when the PSNP ends. Furthermore, as the UNICEF paper indicated above there are millions of people who could not take advantage of the enabling environment for various reasons. For example, it is estimated that there are 7.5 million persons with

various types of disabilities[2] who have no access to education and health services and employment opportunities. For this group of people, social protection is not only livelihoods issues but also a human rights issue.

Similar trends are observed in Kenya and Malawi. In Kenya, about 46% of the population lives below the national poverty line of which 19% live in extreme poverty. Inequality in Kenya is high with the Gini Coefficient index is estimated to be 42.5 and the richest 20% of the population consume 49.1% of GDP (Kenya Social Protection Strategy, 2008). In Malawi, 52 % living under one dollar per day of which 22% are ultra-poor, living under USD 0.20 per day; 10% are not able to participate in productive activities. This group has largely been ignored and never been meaningfully targeted by any kind of social protection intervention, and as a consequence, experience severe destitution (Malawi Social Protection Strategy).

4. Legal, institutional and policy provisions

Social protection is by no means new in the three countries. Ethiopia introduced contributory pension law in 1963 covering the civil service; the military; and the police. However, the system remained limited in coverage and vision. More recently, the country has enshrined a clear provision for social protection in the 1995 Constitution. Article 41.5 states:

> *"The State shall, with available means, allocate resources to provide rehabilitation and assistance to the physically and mentally disabled, the aged, and to children who are left without parents or guardian."*

Furthermore, many of the social and economic policies have social protection elements or could form the basis for developing social protection policies and strategies. Examples of such policies and strategies and the responsible institutions are listed in Table 1.

The Developmental Social Welfare Policy (1996) in particular is the most relevant policy in the present context. According to the Ministry of Labour and Social Affairs, a number of action plans that outline protection mechanisms for children and older people have been developed following the promulgation of this policy. Both the policy and the action plans emphasize the need to sustain the existing traditional support mechanism and avoid dependency.

[2] This is obtained by applying the 10% global estimate of persons with disabilities to the population figure of 75 million.

Table 1: Examples of policies and strategies

Policies and strategies	Responsible Ministry or agency
Developmental Social Welfare Policy	Ministry of Labour &Social Affairs
Social Security Policy (formerly pension law)	The Social Security Agency
The Revised Family Law	Ministry of Women Affairs
National Women's Developmental Policy	Same as above
HIV/AIDS Policy and Strategy	Ministry of Health/HIV/AIDS Secretariat
National Youth Developmental Policy	Ministry of Youth and Sport

In Kenya and Malawi, the social protection discourse has existed since independence in the 1960s in various forms and guises. More recently, these countries have developed social protection policies and strategies that underlie the respective government's commitment to move toward long-term and developmental activities to reduce and ultimately alleviate poverty. The countries clearly recognize the state's responsibility to provide social protection for the most vulnerable citizens. Similarly, Malawi is in the process of moving towards more long term predictable social protection programming that helps poor households deal with risk and shocks through a more institutionalized and coordinated approach (Slater, 2007)[3]

Further to these legal, institutional and policy provisions, presently there is considerable momentum and impetus for social protection in Africa.

- Different stakeholders have increased their efforts to raise the profile of Social Protection in the policy and political arenas. For example, there are ongoing works in Africa towards developing national social protection policies and strategies. Example include the UNICEF Social Protection Strategy referred to in this paper and the AU/NEPAD Social Protection Framework for Africa which most African countries have signed up to;
- IGAD has recently established a Social Protection Platform for Ethiopia consisting of government and the major donors.
- Empirical evidence from Latin America and Southern Africa indicates that social protection can play a significant role in addressing poverty and vulnerability while achieving economic growth;

[3] However, Chisinga (2007) observed that from a policy process perspective, the development of the social protection policy in Malawi has not been as participatory as the issue would have required. He noted in particular that neither have the lower level government structures nor the grassroots been consulted or meaningfully involved in the process. Consultations with local government structures and the grassroots are planned for after the policy is finalized.

- Social protection interventions already exist but they are inadequate and need to be better coordinated in order to achieve greater impact;
- There is realisation that it is not enough to have good social and economic policies because there are millions who cannot access these policies. A social protection policy ensures that the disadvantaged citizens are entitled to social and economic services. It provides reliable social assistance, insurance, and services and contributes to breaking the vicious circle of poverty;
- In the context of Ethiopia there is public determination to change the image of the country as a nation of beggars. Funds have been raised to finance repatriation of beggars to their place of origin. These measures are ad hoc and not sustainable. The beggars take the money and are back to begging after a while!

5. Types of social protection interventions

5.1 Broad categories of interventions

Broadly speaking, there are four types of social protection interventions: *transformative*, *promotive*, *preventive*, and *protective*. There is considerable overlap between these interventions. Transformative interventions are the legal and legislative procedures that are in place to protect the rights of vulnerable groups. These may include home grown laws or adoption of internationally agreed conventions. An example of the former is Constitution of a country and of the latter is the Convention on the Rights of the Child (CRC). By and large, the three countries in this study are well covered in implementing transformative interventions. As presented above, Ethiopia has committed itself to provide social protection for the vulnerable citizens as expressed in the Constitution. It also has a number of policies and strategies that have elements of social protection. Kenya and Malawi also have similar provisions.

Promotive interventions are also very relevant to the Ethiopian situation. The country has aggressively promoted the expansion of technical & vocational training institutions to widen educational opportunities and skills training. Through the food security programme, efforts are being made to build household assets and promote livelihood development. The preventive interventions such as pensions for some segments of society, savings and credit schemes, disaster response and traditional burial societies are all available in Ethiopia. However, universal social pensions, universal child allowances and health insurance schemes are clearly missing. Feeding programmes, cash/food transfers, humanitarian relief and public employment schemes are available as protective measures.

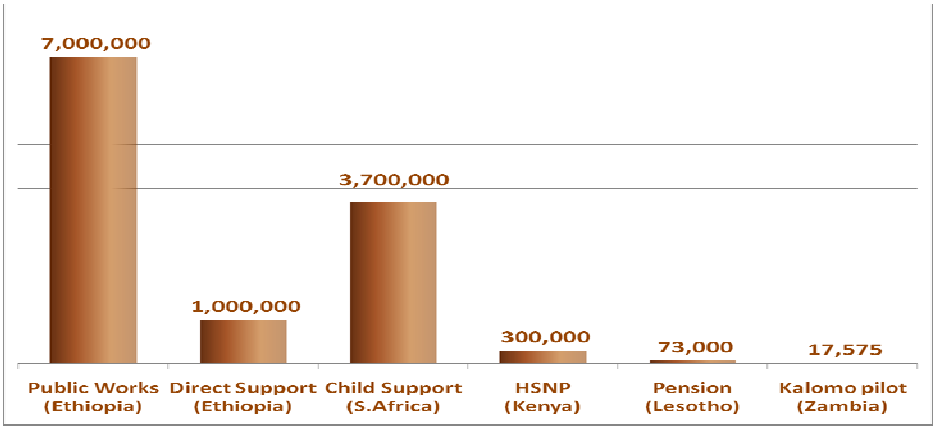
Table 2: Major types of social protection interventions

Transformative	Promotive	Preventive	Protective
• Social protection legislation • Legislative & regulatory reform • Sensitization campaigns • Social communication to promote behavioral change • Strengthening legal system for protection of vulnerable • Domestication of CRC • Overall social policy	• Second chance education Skills training • Integrated early childhood development • Conditional cash transfers • Asset building & livelihood development	• Contributory social insurance/social security (pensions, maternity, disability, etc.) • Universal social pensions • Universal child allowances • Health insurance • Savings and credit schemes • Burial societies • Disaster/crop insurance	• Public employment schemes • Feeding programs • Child protective services • Cash/food transfers • Fee waivers • Family support services • Humanitarian relief

5.2 Examples of social protection interventions

Presently, there is a multitude of “social protection” interventions by government, NGOs and donors in Ethiopia. Table 3 summarises social protection related activities by government and non-government institutions. The PSNP is one of the largest programmes in Africa designed to address chronic food insecurity. The programme, currently in its second phase, has been successful in transforming the country from a year-on-year emergency appeal to a multi-year and relatively predictable transfers to the chronically food insecure. The programme has a dual objective of protecting household assets and creating community assets. First, since targeted households are provided cash/food transfers for a period of six to nine months, they are not forced to sell their productive assets to feed themselves. Second, able-bodied households participate in public works constructing community assets such as roads, soil bunds, and schools. The labour poor households (e.g. elders, persons with disabilities) are “entitled” to direct support without work requirement. Figure 1 compares the Ethiopian safety net with selected programmes in Africa in terms of beneficiary numbers.

Figure 1: Ethiopia's PSNP as compared to selected programme in Africa



Source: Devereux and Amdissa (200)

Hunger and Safety Net Programme (HSNP) is government of Kenya programme that seeks to alleviate extreme hunger and poverty in northern Kenya through a targeted cash transfer mechanism that meets the needs of the poor and vulnerable people in the region. The Programme will also contribute to the development of national social protection policy and strategy in Kenya. The Programme is funded by the Department for International Development (DFID), United Kingdom.

The first 4 years of HSNP is a pilot designed to test various approaches and mechanisms of social protection. It will test three targeting approaches: universal social pensions, dependency ratio and community based targeting. It will also test mechanism of transferring cash to households using agents, point of sales devices and biometric smart cards. The process will be evaluated, documented and lessons learnt shared with stakeholders and used to inform social protection policy.

Malawi is implementing Social Cash Transfer Pilot Scheme aimed at families that are labour-constrained and found at the extreme poverty line. More specifically, these are families unable to have more than one meal each day or purchase essential non-food items like soap, clothing and school supplies. The programme is UNICEF supported.
The most common feature of the Ethiopian PSNP, the Kenyan HSNP and the Malawi social cash transfer is that they are all external donor supported which undermines their sustainability. With the exception of the Ethiopian PSNP, the other two are pilot.

Table 3: Profile of selected institutions working on social protection related activities in Ethiopia

Institution	Social protection related operations	Target group
Government		
Ministry of Agriculture & Rural Development (MoARD)	• Rural safety net programme (PSNP): resource transfers through (i) labour-based public works; (ii) direct transfers to most vulnerable groups; (iii) emergency response	• Chronic food insecure rural population; transitory food insecure rural population
Ministry of Labour and Social Affairs (MoLSA)	• Study and document social problems of elders and persons with disabilities • Facilitate the process by which communities can help elders to spend the rest of their lives happily and peacefully • Ensure equal participation of persons with disabilities in the struggle to combat disability and rehabilitate these persons	• Elderly persons; persons with disability; and victims of social problems
Social Security Agency (SSA)	• Determines pensions of government employees; collects pension contributions; pays out pension contributions; keeps register of active employees	• Pensioners (the civil service, the Police and the Army)
on-government		
Save the Children UK	• Emergency response; rural development; education and health	Children, persons with disabilities
Action Aid Ethiopia	• Implement poverty reduction programs; advocacy; capacity building for poor communities; assist efforts to control HIV and AIDS	Women, children and youth with disabilities
HelpAge International	• Poverty reduction, food security, awareness raising on HIV and AIDS	Organisations working on/with elders
World Food Program me	• Food for Education (formerly School Feeding); oil for girls	All school children in chronic food insecure communities or emergency affected areas.
Civic/informal organisation		
Patriots Association	• Financial support, clothing, food, health, transportation and shelter	Patriots (male and female)
National Associations for persons with disabilities	• Awareness raising; basic education and training; saving and credit scheme	Persons with disabilities (physical and mental)

Source: MoLSA, 2008

Table 4: Examples of Social Protection Schemes in Southern Africa

No	Country	Social Protection Scheme	Social Transfer Delivery Methods
1	Lesotho	Old Age Pension	Cash using post offices and other pay points
2	Mozambique	Food Subsidy Programme	Cash payment using team
3	Malawi	Public Works Programme	Cash or food ration paid for work units
4	Malawi	Dowa Emergency Cash transfer	Cash using smartcards and mobile ATMs
5	Zambia	Social Cash Transfers	Cash using pay points and smart cards
6	Zimbabwe	Urban Food Programme	Voucher (cash value) at supermarkets
7	Mozambique	Food Assistance Programme	Food rations for collection at health centres
8	Lesotho	School feeding	Food ration for primary school children
9	Swaziland	Neighbourhood care points OVC	Community caregivers, food rations OVC
10	Mozambique	Education Material Fairs	Voucher (cash value) for use at single fair
11	Malawi	Input Subsidy Programme	Coupons exchanged for inputs at depots
12	Zambia	Food Security Pack	Farm input packs delivered to villages
13	Mozambique	Input Trade Fairs	Voucher (cash value) for use at single fair
14	Swaziland	Chief's Fields for OVC	Enhanced access to land and inputs OVC
15	Zimbabwe	Small Livestock Transfers	Small stock transfer or via fairs ; 'pass-on'

Source: Ellis, et.al. (2009) page 56

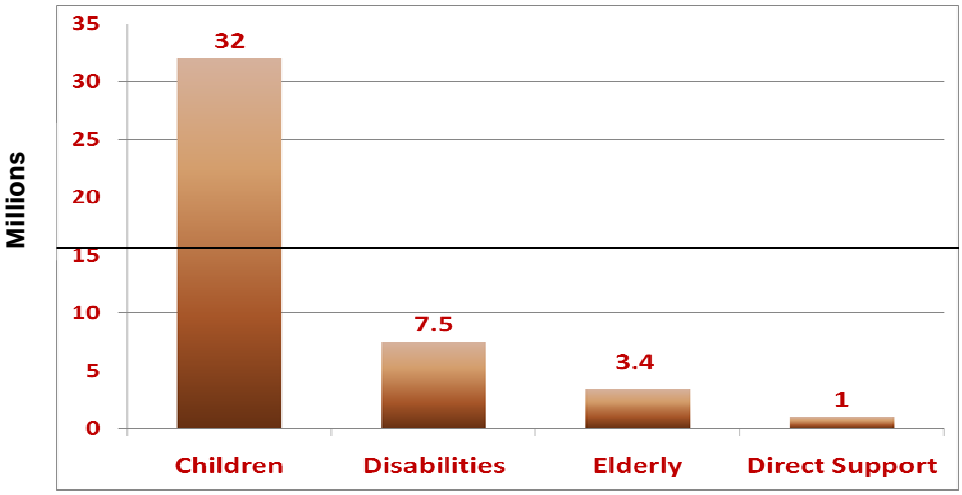
6. Vulnerable groups and options for social protection: A demonstrative exercise from Ethiopia

6.1 Who are the vulnerable groups and how many they are?

The first step in the design of social protection policy, strategy and intervention is to identify who the vulnerable groups. Children, persons with disabilities, the elderly and persons living with HIV and AIDS are generally considered as vulnerable. It is estimated that there are about 32 million children under-18 years of age; 7.5 million persons with various types of disabilities and 3.4 million elders of 60 years or above.

These estimates give us the potential not the actual vulnerable groups. Criteria must be devised to arrive at the actual vulnerable groups. For example, children may be divided into child headed, street children, and orphans collectively known as Orphan and Vulnerable Children (OVC). Age is also an important criterion for designing social protection interventions for children and the elderly. The next section provides some options for social protection using Ethiopia as an example. The population figures in Figures 2 and current PSNP transfer (payment and duration) norms are used to estimate transfer levels.

Figure 2: Selected vulnerable groups

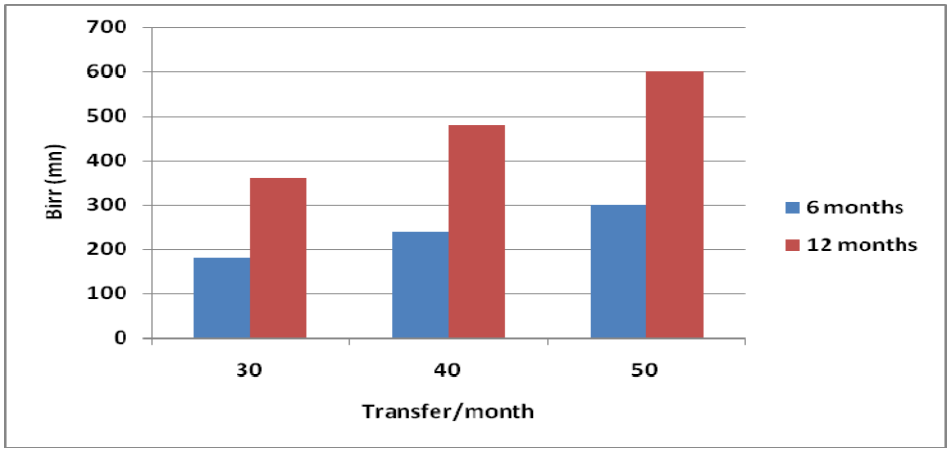


6.2 What are the options for social protection?

6.2.1 Option 1 –focus on current PSNP direct support

The first option is for the Government to continue to support the current PSNP direct support beneficiaries which are about 1 million. The government could extend the support from 6 months to 12 months. Using the current PSNP rates and duration, three scenarios are given in Figure 3. For example, if an individual is paid Birr 40/month (Birr 8/day/person for five days a month), the current 1 million direct support beneficiaries is estimated to cost Birr 240 million or Birr 480 million for 6 months or 12 months respectively.

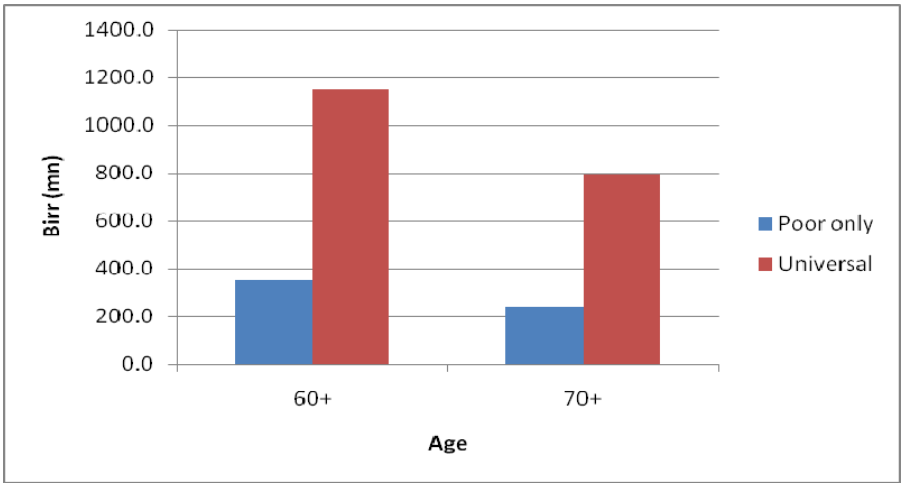
Figure 3: Option 1 – current PSNP direct support



6.2.2 Option 2 – focus on the elderly

The second option is to focus on the elderly and support either the 60 + the 70+ depending on resource availability and need. For this group, the government could design a universal social protection or for the poor only – poor defined as those below the country's poverty line. Figure 4 shows that this scheme may cost Birr 200 million per year for the poor elderly or nearly Birr 1.2billion for all the elderly over 60 years. The cost reduces as the age bracket increases – there are fewer over 70s than over 60s.

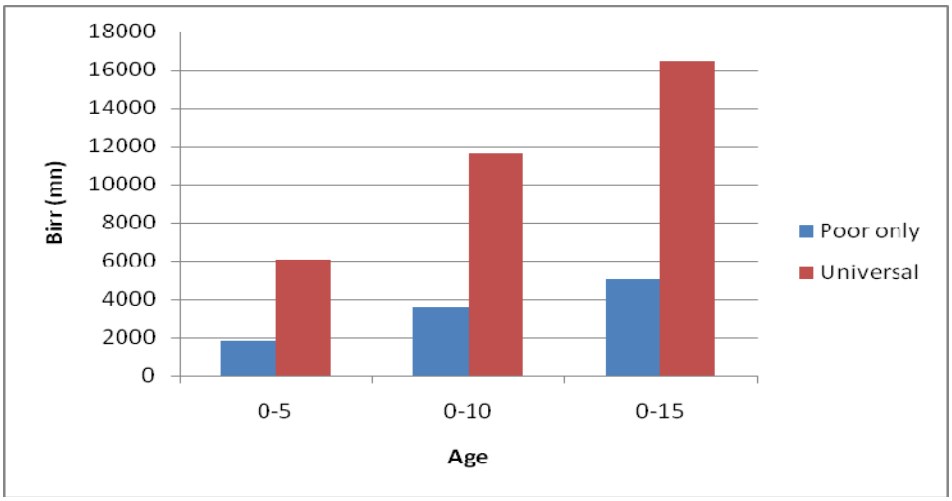
Figure 4: Option 2 – the elderly



6.2.3 Option 3 – focus on children

This option focuses on children. Three categories of children are considered – under 5; under 10 or under 15. The Government could support the poor only or provide universal social protection for all children in a given age group. As shown in Figure 5, for age group 0-5, at Birr 40 per month, it may cost the government Birr 6.0 billion per year if universal social protection is adopted. The cost will fall to Birr 2.0 billion if the poor only are supported.

Figure 5: Option 3 - children



6.2.4 Option 4 – focus on citizens with disabilities

It is estimated that there are about 7.5 million persons with various types of disabilities in Ethiopia – blindness, physical, and mental. Some NGO interventions (e.g. Save the Children UK disability project) have shown that these are among the most disadvantaged with little or no access to basic education and health services. These are citizens who can hardly take advantage of favourable economic environments. In many rural villages, they are considered shame to the family and hidden away from public view.

In this option, the Government may decide to support persons with various types of disabilities. Given resource availability and need, this group may be divided into four groups: (i) the most severe disabilities; (ii) children with disabilities, (iii) women with disabilities; and (iv) elderly citizens with disabilities.

6.2.5 Option 5 – focus on citizens living with HIV and AIDS

HIV/AIDS is now recognised by the international community as the most challenging health issue of the 21st Century. For developing countries like Ethiopia still suffering from old age diseases such as Malaria, HIV and AIDS poses greater challenges. If not checked, this pandemic could undermine all economic gains.

The Government has taken this challenge seriously and devised policies and strategies which are implemented in collaboration with development partners, non-government organisations in particular. It is recognised that while preventing is a key strategy, protecting the livelihoods of those affected is equally important. Therefore, increasing number of affected orphans and poor adults are getting access to drugs and income support. Recent media reports show that awareness level about the disease is rising and this is contributing to the slowdown in the rate of transmission. As a social protection option, the government may focus on all children living with HIV/AIDS, poor only children; all women living with HIV/AIDS or female headed households only. Similar cost scenarios as the previous categories could be constructed.

7. Conclusion and recommendations

7.1 Conclusions

Social protection of one form or another is not new in the three countries. Formal pension schemes were in place in the early 60s (Ethiopia) and social protection has been the subject of discourse during about the same time in Kenya and Malawi. However, efforts in the three countries suffered from fragmentation and lack of coordination and unsustainability. The coverage is also very low compared to the need. Except for the contribution-based pensions, the other forms of social protection are funded from external sources.

The three countries are at different stages of development when it comes to institutionalizing social protection. Ethiopia, despite having the one of the longest running pension schemes and also the largest safety net programme today, has lagged behind in terms of designing a long term social protection policy and strategy for its citizens. It has maintained its short term intervention approach to social protection. Even the acclaimed PSNP is a short term programme initially designed for five years but extended by another five years forced by circumstances.

Kenya and Malawi have designed long term social protection policy with a clear vision. They are piloting innovative ways of reaching the most vulnerable including the use of the latest money transfer techniques (e.g. smart cards, mobile ATMs).

The paper has also highlighted the increased momentum towards long term social protection in Africa – almost a point of no return! African Governments have committed themselves to providing social protection for the vulnerable citizens through the AU/NEPAD Social Protection Framework. The Southern Africa Countries are advancing and realising the economic and social benefits of social protection.

Social protection is by no means cheap. Using the PSNP experience of Ethiopia, the paper provided a number of options that African Governments could consider in the design of social protection policy and strategy.

7.2 Recommendations

Ethiopia should use the PSNP as a historic opportunity to move away from short term thinking to long term solutions. It should design an institutionalised social protection system for all vulnerable Ethiopians that is permanent, administratively viable, financially affordable, politically acceptable, and has a sustainable financing strategy. Achieving this will require all stakeholders – government, donors and civil society – to make long-term resource commitments that amount to a 'social contract' with Ethiopia's vulnerable citizens.

Ethiopia should also identify and strengthen the most appropriate institutional arrangements to coordinate social protection measures both existing and emerging ones.

The formation of IGAD Social Protection Platform consisting of government and the major donors is an encouraging initiative. This should be extended to the regions. The government should also build on this initiative and establish a Social Protection Fund which could be used to develop a system for managing social protection and pilot some innovative practices in social protection.

Kenya and Malawi are on the right track in the sense that they have social protection policies and strategies that guide interventions and most importantly they are testing/piloting schemes with a view to informing the policy process. Ethiopia should closely follow the outcome of the piloting and learn from the process. DFID as a donor supporting both the Ethiopia and Kenya programmes has the opportunity to encourage experience sharing between the two countries.

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DETERMINANTS OF CHILD HEALTH STATUS: EMPIRICAL EVIDENCE FROM RURAL ETHIOPIA[1]

Degnet Abebaw[2, 3] and Assefa Admassie[4]

Abstract

Diarrheal disease is one of the major causes of child morbidity and death in Ethiopia. Using survey data, this paper investigates the determinants of diarrhea incidence among under-five age children in rural areas of the country. A probit model was applied for our empirical analysis. The estimated results indicate that child diarrheal disease incidence is explained not only by household economic status and village level infrastructure but also by biological characteristics of the child. More specifically, the probability of falling sick due to diarrhea is significantly and inversely related to household wealth status. A child in lowest wealth quintile has a six percentage point increase in diarrheal disease incidence compared to those in the highest wealth quintile. Children in households accessing clean water and practicing composting solid waste have significantly lower probability of diarrheal disease. Similarly, children who reside in villages with access to credit and saving association experience significantly lower risk of contracting the disease. In contrast, children in ethnically diverse villages are more prone to diarrhea morbidity. Furthermore, infants and younger children experience higher incidence of the disease. Thus, development interventions at the child, household and village levels play an important role to promote child health in rural areas of Ethiopia.

Keywords: preventive health care; diarrhea; probit; Ethiopia

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1. Introduction

Improving child health is one of the main development priorities around the world. In 2000, member states of the United Nations adopted the eight Millennium Development Goals (MDGs) which include a call to reduce under-five mortality by two-thirds between 1990 and 2015. Evidence shows that this indicator has gradually improved in all regions (Hanmer *et al*., 2003). However, the irony of the problem is that avoidable diseases remain a major threat in developing countries. According to recent estimates over 50% of the under-five deaths are, for instance, caused by preventable diseases including diarrhea, pneumonia, malaria, measles and HIV/AIDS (Bokhari *et al*., 2007). [5]

Being no exception, Ethiopian children have for long suffered widespread incidence of preventable infectious diseases. The Ethiopian government has taken several measures to overcome this problem. In particular, the government aims to attain universal access to primary health services to its population. Recent official government statistics show that the government has spent an increased amount of resources on preventive facilities and as a result proximity to health care facilities has improved (FMoH, 2006).Nevertheless, most child deaths in the country are still caused by avoidable diseases. For example, diarrhea causes 24% of under-five deaths in Ethiopia (World Bank, 2005 p. 21). This raises the question whether access to health infrastructure does matter for child morbidity and death and/or whether there are important factors outside the health sector which determine child health. From a policy perspective these are important to be answered. Despite these concerns, there is limited micro-econometric study of the determinants of child health status in Ethiopia. Indeed, econometric evidence from studies in other developing countries show that factors influencing child health are complex and varied and relate to the individual, household and parental and community apart from the medical inputs obtained from health care system (see e.g. Attanasio *et al*., 2004; Foster, 1994). Foster (1994, p.1) particularly outlines that some aspects of health such as "illness is affected by exposure to pathogens, something over which individual households may have little control." Jalan and Ravallion (2003) also show how one factor determines the likely impact on child health status of another factor. In particular, Jalan and Ravallion demonstrated that the effect on child health of access to piped water is limited by poverty and low level of education at the household level.

[5] Around 90% of the over 11 million annual child deaths which occur in the developing world are among children under five (Bokhari *et al*., 2007).

Against this backdrop, the main objective of this paper is to shed some light on the determinants of child diarrheal disease incidence in rural Ethiopia. A number of factors make the Ethiopian case an important area for inquiry. First, the level of child mortality in Ethiopia is among the highest in the World (World Bank, 2009) despite increased investment on preventive health infrastructure in the country. In 2003, the government introduced the family and community based health extension program with the primary aim of delivering preventive health care (FMoH, 2005).[6] Second, despite the recent rapid economic growth in Ethiopia, the country's human development index (HDI) is among the lowest in the world. Third, there is a dearth of quantitative analysis of socio-economic factors influencing childhood morbidity in rural Ethiopia.

The paper asks several research questions to meet its objective. The first is whether or not reported illness for a child varies by the child's age and sex. Female child receive less health inputs than male child in many parts of South and East Asia, the Middle East and North Africa. Sauborn *et al* (1996) using cross-sectional household data find age bias but no gender bias for health care in rural Burkina Faso. The second question relates to whether relative wealth and maternal education matters for child health in a resource limited setting. Third, the study questions whether differences in proximity to health facility and access to clean water and sanitation have created differences in child health status.

The findings of this study would inform policy makers who opt to reduce the burden of child morbidity and death in Ethiopia. In particular, the study will identify relevant demand side and supply side health and non-health variables to reduce child health problems.

The paper is divided into six sections. Section 2 briefly describes background information about Ethiopia's health care system and basic socio-economic status. Section 3 presents the methodology in which econometric procedure and data sources are specified. Section 4 presents the results and discussion of the paper. Finally, section 6 concludes the paper.

2. Background

Ethiopia is the second populous country in sub-Saharan Africa, next to Nigeria. According to the UNDP (2006), the country ranks 170th out of 177 countries in terms of human development index. Close to 40% of the country's population live below the

[6] It is believed that 60-80% of the country's health problem is due to preventable causes (FMoH, 2005).

national poverty line (MoFED, 2006). The country has several health problems and the health infrastructure is still insufficiently developed. Official government estimates indicate that about 60-80% of the country's health problems originate from preventable infectious diseases (FMOH, 2006). The major causes of child morbidity and mortality are infectious diseases which include diarrhea, ARI, malaria and other vaccine preventable diseases (FMOH, 2006).

In trying to improve the health of its population, the country faces both supply-side and demand-side problems. On the supply side, the country still has a few trained medical doctors, nurses, and mid-wives. The national coverage of medical doctors is one doctor for 37,996 inhabitants, and nurses is one for 4,725 inhabitants (FMoH, 2008).[7] The country's health physical infrastructure remains weak despite improvements in the construction of hospitals, health centers, and health posts.

On the demand side, at the macro-level Ethiopia faces insufficient utilization the health facilities and services. In other words, despite the high disease burden, inhabitants' utilization of modern health services is low and even worse this indicator has not shown any improvement over the last ten years. Per capita outpatient visit, for example, had declined to 24% in 2007/08 from 32% in 2006/07 (FMoH, 2009).

3. Methodology

3.1 Econometric procedure

Following Grossman (1972) we can depict child health status using a health production function (h_i) as follows:

$$h_i = \beta' x + \in$$

where, x is a host of variables at the level of the individual, the household and the village, β is a vector of unknown parameters to be estimated, and $\in$ is an independently and identically distributed error term with a constant variance σ^2. Suppose a child's observed health status (y_i) is a discrete variable in which $y_i = 1$ if he/she is reported sick over two weeks preceding the interview and $y_i = 0$

[7] The World Health Organization (WHO) standard is 10,000 and 5,000 inhabitants per medical doctor and nurse, respectively.

otherwise. Thus, the relationship between the health production function and the observed child health status can take the following form:

$$y_i = \begin{cases} 1 \, if \; h_i < h_i^* \\ 0 \, otherwise \end{cases}$$

where, h_i^* is a threshold value on the health production function. Along this line, the probability that a child is reported ill can be specified as a probit model, which takes the following form:

$\Pr ob(y_i = 1 \mid x) = \Phi(\beta' x)$. The coefficients of the probit model cannot be interpreted directly (Greene, 2003). As such, we estimate marginal effects in addition to these coefficients.

3.2 Data sources

Our empirical analysis in this paper is based on data collected from 3137 children aged 0-60 months. These children are obtained from a random sample of 3095 households residing in 125 villages in three regions, namely, Amhara, Oromia, and Southern Nations Nationalities and peoples regions. The data collection was conducted by the Ethiopian Economics Association for its study on impact of health services extension program in Ethiopia (see Admassie *et al*., 2009 for details). The survey was done between May and December 2007 in these regions. The survey gathered rich dataset which included child health and maternal health indicators. The survey used two types of questionnaires. The first is the household questionnaire which gathered data on household and individual demographic characteristics, utilization of health care and health status, asset ownership, and access to infrastructure such as roads, schools, water sources, sanitation facilities and energy sources, health facilities and markets. Information on the occurrence of diarrhea disease among children over two weeks preceding our interview was collected using a separate module.

The second is the village questionnaire which elicited village level information through interviewing a group of five people (four elders and a village leader). The main topics included in this questionnaire health infrastructure and major health problems, water and sanitation, demography, road, education and literacy, and agro-ecological features.

4. Results

4.1 Descriptive statistics

Table 1 presents summary statistics of our sample. Overall, 15% of the children in our sample were reported to be ill due to diarrhea over two weeks preceding our survey. Around 16% of the children in the sample have mothers who have primary education or above. During the time of our field survey approximately 50% of the children reside in villages which receive health extension services. The average literacy rate in villages from which the samples are drawn is 38%. Access to safe drinking water and sanitation is a major health problem in our study areas. Our descriptive results also reveal over two-thirds of the children's households obtain their drinking water from unsafe sources. Proportionally more children reside in households without a sanitary toilet. Most children in our sample live in households with both biological parents. Table 1 also contains measure of household wealth status as defined by an asset index. This index has been derived by using a factor analysis based on households' responses regarding ownership of 19 different assets.[8] We retained the first factor component to define wealth quintiles. In terms of location, 48, 25 and 27% of the sample children reside in Oromia, Amhara, and Southern Nations Nationalities and Peoples Region, respectively.

[8] These assets are consumption assets (watch, radio, tables, chairs, beds, tape recorder, kerosene lump, *gas medeja*, corrugated iron roof, floor made of mud, gold) and business assets (bicycle, cart, plough, axe, sickle, machete, spade, hoe).

Table 1: Variable definitions and summary statistics (n=3137)

Variables	Definitions	Mean	Standard deviation
Dependent variable			
Diarrhea incidence	=1 if child had diarrheal disease in last two weeks	0.145	0.352
Independent variables			
Age of child			
Age1	=1 if child is 0-12 months age	0.212	0.409
Age2	=1 if child is >12-24 months age	0.212	0.409
Age3	=1 if child is >24-36 months age	0.201	0.401
Age4	=1 if child is >36-48 months age	0.215	0.411
Age5	=1 if child is >48-60 months age	0.16	0.367
Sex	=1 for boys	0.499	0.50
Bio-parents	=1 if both biological parents live in the same household	0.942	0.233
Household characteristics			
Education of mother	=1 if mother has primary education or above	0.161	0.367
Household size	Number of persons in the household	6.423	2.097
Asset index:			
Q1 (poorest)	=1 for households in lowest asset quintile	0.207	0.405
Q2	=1 for households in the second lowest asset	0.201	0.401
Q3	=1 for households in the middle asset quintile	0.198	0.398
Q4	=1 for households in the fourth asset quintile	0.197	0.397
Q5 (richest)	=1 for households in the highest quintile	0.197	0.398
Water source	=1 for safe drinking water source	0.285	0.451
Latrine	=1 for improved latrine	0.495	0.500
Solid waste	=1 for composting	0.645	0.268
Village characteristics			
Health extension	=1 if village has health extension service	0.498	0.500
Literacy	Village literacy rate	37.917	16.767
Ethnicity	Number of major ethnic groups	2.051	1.126
Landscape	=1 if village has lowland	0.392	0.488
Health center	Distance from nearest health center (km)	16.473	11.402
All weather road	Distance from nearest all weather road (km)	30.339	29.951
Access to credit	=1 if village has credit and saving association	0.101	0.301
Oromia	=1 for Oromia region	0.491	0.499
Amhara	=1 for Amhara region	0.254	0.435
Southern region	=1 for Southern region	0.255	0.435

Source: Own survey data 2007.

Table 2 presents the descriptive results on the reported incidence of diarrhea among the sample children. Using Pearson chi-squared statistic we find that there are substantial differences in diarrheal disease incidence across different socioeconomic groups village attributes.

Table 2: Self-reported illness incidence, by selected characteristics

Variable	Diarrhea incidence	χ^2 test
Child's sex		
Boy	14.58	
Girl	14.31	0.048
Child's age		
0-12 months	17.52	
13-24 months	19.52	
25-36 months	14.44	
37-48 months	11.41	
49-60 months	7.74	44.579***
Both bio-parents present		
Yes	14.28	
No	15.92	0.414
Mother has primary education or above		
Yes	16.05	
No	14.18	1.239
Asset index (quintiles)		
Q1 (poorest)	16.37	
Q2	14.40	
Q3	14.42	
Q4	15.73	
Q5 (richest)	11.26	8.288*
Safe drinking water		
Yes	12.77	
No	15.15	3.128*
Pit-latrine		
Yes	14.29	
No	14.60	0.062
Households uses solid waste composting		
Yes	13.81	
No	15.63	1.992
Village has a health extension program		
Yes	15.34	
No	13.54	2.143
Village landscape includes lowlands		
Yes	13.61	
No	14.96	1.135
Village has access to credit and saving association		
Yes	13.15	
No	14.96	0.562

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Source: Own survey data.

Our estimate here is lower than the national estimate (18%) obtained using data from the Ethiopia's Demographic and Health Survey (EDHS, 2005) for 2005. Diarrheal disease incidence shows a marked differentiation by household wealth status. Households in the lowest asset quintile face 1.5 times higher risk of diarrheal disease incidence for children. Child's own biological character also has a strong association with the likelihood of contracting diarrheal disease. In particular, our descriptive analysis reveals that the incidence of diarrheal disease is significantly larger for infants and younger ones. Interestingly, sex of a child does not determine the likelihood of contracting diarrheal disease in our sample. Similarly, diarrheal disease incidence and maternal education are not significantly related.

As anticipated, the descriptive results show diarrhea incidence is larger among the children residing in households who do not have the access to safe drinking water source.[9]

4.2 Econometric estimates of child diarrhea disease incidence

Table 3 presents the probit model results of the reported illness among the sample children. A range of child, parental, household and village characteristics were used for estimating the model. The estimation was done with Stata 9.0. In the estimation, the cluster option available in STATA was applied to control intra-village inter-dependence across the observation units. Furthermore, the Huber/White/sandwich estimation procedure was followed to obtain standard errors of the regression coefficients which are robust to the problem of heteroscedasticity.

Using the variance inflation factor test we found that there is not serious multicollinearity problem among the explanatory variables. We also checked whether or not the health extension program variable is an endogeneous variable. For this test, we applied a procedure suggested by Rivers and Vuong (1988) and later applied in the health economics, among others, by Latif (2009), Bollen *et al*. (1995) and Nanda (1999) to detect the presence of endogeneity problem in their models. The test result in our case indicates that health extension program placement at the village level is not endogeneious to reported incidence of diarrhea illness at the

[9] Following the Ethiopian Ministry of Health (MOH, 2004), we categorize the sources of drinking water in our sample into safe and unsafe drinking water sources. In particular, water obtained from a pipe (private/public), public tap, borehole/protected well, and tanker is regarded as safe for drinking whereas water from river, spring, unprotected well, and pond as "unsafe".

individual level. Thus, we proceed to use the observed values of village health extension program variable to explain reported illness of children.[10]

The probit model generally provides a good fit for the data. The Wald chi2 (df=24) is statistically significant and this suggests that the joint significance of explanatory variables in explaining the dependent variable. Moreover, 74.04% of the values of the dependent variable were correctly predicted. Most variables operate in the expected direction and they are also significant. The results in Table 3 show that the likelihood of diarrhea disease incidence is jointly influenced by household, village and child characteristics.

At the individual level, child age is significantly related to incidence of diarrheal disease. The estimated marginal effect shows that an infant has a 13 percentage points higher probability of contracting the disease compared to a child in the 49-60 months age group. This finding corroborates with Pokher (2007) in Nepal and Borooah (2004) in India. As pointed out by Borooah (2004a) the association of age and the probability of contracting disease has a strong biological basis in the sense that babies and young children are vulnerable to infectious and communicable diseases as their immune systems are not yet adapted to the environment.

Contrary to our anticipation and the findings of many previous studies (see e.g. Lee, 2005; Borooah, 2004b) the influence of the child's gender on reported illness is not statistically significant. In fact, our finding here is consistent with a previous one for Ethiopia on childhood vaccination (Ababaw, 2009) and for Malawi on risk of diarrheal disease for children (Kandala *et al*., 2009).

Although not significant statistically, a child who lives with both bio-parents is less likely to be reported ill. On the other hand, maternal education does not have a strong effect on the reported illness of the child. Perhaps, the lack of significant effect of maternal education on observed child health in our sample may be due to small variation of maternal education in our sample.

Ceteris paribus, household economic status related variables show statistically significant effect on reported illness of the child. Reported diarrhea illness is generally higher among the relatively poor. For example, children who reside in the lowest asset quintile (poorest group) have a six percentage point higher probability of being reported ill. Similar results have been reported by Borooah (2004) in India immunization against diseases particularly for girls. As expected, water and sanitation

[10]Substituting the observed value of the health extension program variable by its predicted value also gives similar results.

related variables are jointly significant. Children in households whose main drinking water source is supposedly 'safe' are significantly less likely to contract diarrhea. In this regard, access to safe drinking water source reduces the likelihood of reported illness by three percentage points. This is consistent with the findings of Jalan and Ravallion (2003) who found a significant and positive effect of access to piped water on reduction of diarrheal illness among children in rural India. Similarly, solid waste composting tended to have a significant and negative effect on the probability of child diarrhea incidence. This finding is consistent with Smith (2002) for Honduras.

Another economic variable of interest is to our explanation of diarrheal disease incidence is the presence of financial institution in a village. The estimated result demonstrates that incidence of diarrhea is significantly lower if a village operates credit and saving association. In this respect, the estimated decline in reported diarrheal illness is around 5%.

The effect of village literacy rate is statistically significant but the coefficient has unexpected sign. Two explanations may be suggested for this unexpected effect. One is that literate population may have better knowledge of the symptoms of the disease and be faster to report the disease upon its occurrence. On the other hand, larger incidence of reported diarrheal illness may be due to limited child care which could arise as a result of high opportunity cost of labor in more literate populations. However, due to the limited availability of opportunities for wage employment in rural areas of Ethiopia, the former explanation may be more realistic. Children residing in Amhara region experience a nice percentage point higher likelihood of contracting diarrheal disease.

Distance from the nearest health center and presence of health extension service in the village do not have significant effect. On the other hand, we found that child diarrhea is inversely related to a villages' ethnic diversity. Using Kenyan data, Miguel and Gugerty (2005) reported similar relationship between ethnic diversity and investment in local public goods such as water wells. Similarly, the high incidence of diarrheal morbidity in diverse villages may be due to limited cooperation to invest on relevant health and health related facilities to enhance child health. However, the impact of ethnic diversity on child health status needs further examination.

Table 3: Probit estimates of diarrhea morbidity

Variables	Coefficient	Robust Std. err	Marginal effects
Child characteristics			
Aged 0-12 months	0.511***	0.111	0.127
Aged 13-24 months	0.593***	0.105	0.152
Aged 25-36 months	0.389***	0.104	0.094
Aged 37-48 months	0.231**	0.110	0.053
Aged 49-60 months	Ref		
Sex (boy=1)	0.012	0.056	0.003
Both bio-parents present in same household	-0.094	0.113	-0.021
Household characteristics			
Mother has primary education or above	0.065	0.073	0.014
Household size	0.012	0.015	0.003
Asset index			
Q1 (poorest)	0.245**	0.123	0.057
Q2	0.166	0.108	0.038
Q3	0.163*	0.093	0.037
Q4	0.226**	0.105	0.053
Q5 (richest)	Ref		
Water source	-0.136**	0.071	-0.028
Latrine	0.002	0.072	0.0004
Solid waste	-0.367*	0.201	-0.079
Village characteristics			
Health extension	0.058	0.068	0.013
Literacy	0.007***	0.002	0.0014
Ethnicity	0.057*	0.032	0.012
Access to credit	-0.256*	0.137	-0.049
Landscape	-0.131	0.091	-0.027
Health center	-0.004	0.003	-0.001
All weather road	-0.001	0.001	-0.0001
Southern region	Ref		
Oromia	0.061	0.108	0.013
Amhara	0.371***	0.105	0.088
Intercept	-1.731***	0.301	
Percent correctly classified	74.04%		
Number of observations	3137		
Log pseudolikelihood	-1240.91		
Wald chi2 (24)	115.78***		
Pseudo R2	0.04		

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

6. Conclusion

Using a probit model this paper finds that the likelihood of child diarrhea incidence is associated with a combination of factors operating at various levels. These factors are generally grouped into child, household and village level determinants. At the child level, we found that the probability of child diarrhea incidence is significantly reduced as the child grows older. This implies that infants and younger children should be given increased health care attention to prevent the incidence of diarrheal disease. However, sex of the child does not have significant effect on incidence of diarrhea suggesting that health care services are not discriminately allocated for children on the basis of sex.

The estimated results also show that household economic status is important for child health. The probability of diarrhea incidence is greatly reduced as household wealth increases. For instance, children who belong to the top wealth quintile face six percentage point lower probability of contracting the diarrheal disease compared to those in the lowest wealth quintile. From a policy perspective, this relationship implies that reducing household asset poverty is an important contributor to better child health outcomes in rural Ethiopia. Similarly, expanding access to safe drinking water in rural Ethiopia is an important factor for improving child health. Moreover, the probability of diarrheal disease incidence is substantially lower among children whose households usually use composting for managing solid waste. Thus, expanding access to clean water and sanitation should merit greater priority in public resource allocation and policy making to reduce child morbidity. The findings on proximity to health center and to an all weather road do not turn out to be important to decrease diarrheal disease incidence. This implies that children do not receive preferential health inputs as a result of their closer geographic distance to these facilities.

At the village level three factors stand out as significant. Children in villages with credit and saving association have significantly lower incidence of diarrhea disease. In contrast, children in villages with ethnically heterogeneous population face higher incidence of the disease. Perhaps the inverse relationship between child health outcome and ethnic diversity may be due to the low level of investment on local public goods in villages composed of multi-ethnic villages (see Miguel and Gugerty, 2005). Yet, this relationship is less clear and deserves further research.

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EFFECT OF INDIVIDUAL, HOUSEHOLD AND VILLAGE CHARACTERISTICS ON CHILD IMMUNIZATION IN RURAL ETHIOPIA

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Abstract

Despite its key role to avert childhood morbidity and death, immunization coverage in Ethiopia still remains low. Using data collected from three regions of Ethiopia this paper reports the effect of child, household and village characteristics on differential immunization uptake among children aged 12-60 months residing in rural areas. Estimation results of a generalized ordered logit model show that increased immunization coverage is associated with the presence of a health extension worker in the village, proximity to district capital, housing quality, and proximity to primary school. Region of residence also has a significant influence on immunization coverage. The age of the child is significantly related to immunization but we have not found any statistically significant gender gap in immunization coverage in our sample. The result also shows that the likelihood of immunization is significantly lower in ethnically diverse than homogeneous villages. The paper suggests to the Ethiopian government to strengthen its program on accelerated expansion of primary health care service and to take additional measures to overcome demand side barriers to immunization.

Keywords: Immunization; Child health; Generalized ordered logit; Ethiopia

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1. Introduction

Immunization is the most cost effective route to prevent child morbidity and death (WHO and UNICEF, 2005). Indeed, this role has long been well-recognized by many national governments and international institutions such as WHO, UNICEF, and the World Bank. In 1974, the WHO initiated its Expanded Program on Immunization (EPI). The EPI recommends that each child be given three DPT (diphtheria, pertussis, tetanus) vaccines, three polio vaccines, a BCG (tuberculosis) vaccine and a measles vaccine and many countries have incorporated the EPI initiative into their national health systems. Available evidence shows that the global immunization program has generally succeeded in saving many lives from preventable and fatal childhood diseases (UNICEF, 2008; Clements *et al*., 2008; Lee, 2005; Brockerhoff and Derose, 1996). However, immunization gaps and challenges still persist. Over 26 million children around the world still do not receive the full schedule of routine vaccine every year (UNICEF, 2008). As a consequence, up to 10 million children under the age of five die each year from vaccine preventable diseases in the developing countries (Jones *et al*., 2003). The outcome for sub-Saharan Africa is more sobering as over half of these deaths occurred in the countries of this region (United Nations, 2006).

Evidences from emergent empirical literature on the determinants of childhood immunization in developing countries of Asia (e.g., Bondy *et al*., 2009; Lee, 2005; Borooah, 2004; Jamil *et al*., 1999), and Latin America (e.g., Barham and Maluccio, 2009; Acosta-Ramirez *et al*., 2005) indicate the reasons for inadequate immunization coverage are context specific and cannot be generalized from one country to another country. However, similar empirical studies in sub-Saharan Africa remain quite limited (Brugha and Kevany, 1995; Agadjanian and Prata, 2003; Kiros and White, 2004).

This paper is an attempt to bridge this gap. In this paper we are interested in explaining the differential immunization status among children aged 12-60 months in rural Ethiopia. In particular, the paper tries to address the question why some parents immunize their children fully with available vaccines while others obtain incomplete or no immunization. Unlike most previous studies (e.g., Xie and Dow, 2005; Borooah, 2004; Kiros and White, 2004; Agadjanian and Prata, 2003) we disaggregate the dependent variable into three categories rather than two. The paper finds a generalized ordered logit is more appropriate for explaining the dependent variable than does the benchmark ordered logit model, which is used in most of the previous studies (e.g., Lee, 2005; Pande, 2003)

A number of reasons can make Ethiopia's context an interesting one for this type of study. First, the proportion of children who are fully vaccinated against the six-major childhood illnesses stands at about 60%. This may be regarded as an encouraging performance given the country's poor immunization coverage until recently. However, it is far below the goal of the 90% minimum immunization coverage that the WHO and UNICEF jointly aim to achieve in all their member states by the end of 2010 (WHO and UNICEF, 2005). Secondly, available secondary data show that immunization dropout rate is high and as a result many children receive only partial immunization against common childhood illnesses (FMoH, 2008; CSA, 2006). Third, the country has one of the largest vaccine preventable child morbidity and mortality rates in the world (World Bank, 2005; Black *et al*., 2003). Fourth, as a result of these and other socio-economic problems Ethiopia has one of the lowest human development indexes in the world. According to the 2009 Human Development Report of the United Nations, the country ranks 171st in human development index among 182 countries (UNDP, 2009).

The paper is structured as follows. Next we briefly describe Ethiopia's vaccination program. The conceptual framework of the paper is presented in Section 3 followed by the econometric method in Section 4. Section 5 presents data sources and measurement of relevant variables of the paper. The results and discussions of the paper are in Section 6. Finally, the paper concludes with a summary of the main findings, outline of policy implications and suggestions for future research.

2. Ethiopia's vaccination program

Several steps have been taken to increase immunization coverage in Ethiopia. In 1980, the former government adopted the WHO's EPI to increase childhood immunization services. At that time, the plan was to increase immunization coverage by 10% every year and reach complete coverage in the country by 1990 (Kiros and White, 2004). However, this objective had not been met as immunization coverage continued to remain below 20% till the late 1990s. The main reasons for this gap included shortage of vaccines, lack of proximity to health facilities, war and political instability (Streefland *et al*., 1999). During the period of the Military regime (1974-1991), the government was the sole provider of modern health care in general and immunization services in particular.

In May 1991, the current government took over power and as a result the country abandoned a central-planning economic system. The change in government has resulted in *inter alia* the adoption of the market-based economic system in the country. The reform permitted the participation of the private sector in various

economic activities such as health sector development. The current national health policy, which has been adopted since 1993, places high attention to an increased access and equitable distribution of health services throughout the country. In 2003, the government initiated the family- and community-based health extension program to deliver preventive health services including vaccination for children and pregnant women. Indeed, vaccination service has been mainly provided by the government particularly in rural areas. Both routine and campaign methods have been followed for the delivery of services for a long time.

3. Analytical framework

Our purpose is to explain observed differences in immunization status among children. Getting a child immunized can be conceptualized as the demand for a preventive care under uncertainty (Mullahy, 1999). In making a decision on immunization parents are confronted with several sources of uncertainties. First, at the time of decision making, it is uncertain whether or when the child will be exposed to fatal diseases such as tuberculosis, polio, diphtheria, whipping cough (pertussis), tetanus, and measles. Secondly, the parent does not have a perfect knowledge of how the severity of these diseases will be if the child will be infected with them. Third, the parent is uncertain about the effectiveness of the vaccines to protect the child against such diseases.

Let w_v and w_n denote welfare states with immunization and without immunization, respectively. In this respect, immunization is undertaken if the expected w_v is larger than the expected w_n. In other words, the parents' decision problem is to maximize the expected utility over leisure, market purchased goods, and home-produced goods such as child health subject to three constraints namely, a budget constraint, a time constraint, and a health production function constraint.

A reduced form demand (D_i) for child immunization can be specified as follows:

$$D_i = f(x_i, x_h, x_v, \varepsilon)$$

where $x_i, x_h, \text{and } x_v$ are child characteristics, household characteristics and village characteristics, respectively, and ε is an identically and independently distributed random error term.

4. Estimation method

The dependent variable (y_i), which we are interested to explain, is child's immunization status against six fatal diseases. In this regard, we construct that the dependent variable takes three mutually exclusive discrete outcomes, namely 0 if a child is not immunized at all, 1 if partially immunized and 2 if fully immunized. A child who has received three DPT vaccines, three polio vaccines, BCG vaccine and measles vaccine is regarded as completely or fully immunized. A child who has received any of these vaccines but not fully immunized is defined as partially immunized. As these values have a natural ordering, we use an ordered logit model for our data analysis (Greene, 2000). We find, however, that the proportional odds/parallel lines assumption does not hold for our dataset. As a result, we apply a generalized ordered logit model to relax this assumption as suggested by Boes and Winkelmann (2000). In this case, a generalized ordered logit model (Long and Freese, 2006) is estimated as follows:

$$P(y_i > j) = exp(\alpha_j + X_i\beta_j)/1 + exp(\alpha_j + X_i\beta_j),$$

where $j = 0, 1$ is the ordered required immunization level (full immunization category omitted). In the generalized ordered logit model the estimated coefficients reveal the effect of explanatory variables on the likelihood of higher valued outcome categories. In the results and discussion section, we present the estimation results of the ordered logit model along with the results from our preferred model for comparison.

5. Data sources and measurement of variables

5.1 Data sources

The empirical data used for this paper came from cross-sectional surveys which were conducted by the Ethiopian Economics Association (EEA) in three regions of Ethiopia, namely Amhara, Oromia, and Southern Nations, Nationalities and People's Regions (SNNPR) (Admassie *et al*., 2009). The surveys were done between May and December 2007 in these regions. The final dataset we used for this paper consists of 2691 children (1329 boys and 1362 girls) aged 12-60 months from randomly sampled 3095 households located in 125 villages in the three regions. The data used in this paper were collected using two of the three structured questionnaires which were administered in the entire survey. One is the household questionnaire which gathered data on several household and individual demographic characteristics, utilization of health care and health status, asset ownership, and access to infrastructure such as

road, markets, schools, and health facilities. Data on child immunization coverage refer to six fatal diseases, namely tuberculosis, diphtheria, whooping cough (pertussis), tetanus, polio and measles; were collected on a separate module in the household questionnaire. Immunization data were derived from both a mother's/guardian's recall and a vaccination card. The second questionnaire is the village questionnaire which was aimed to obtain geographic and other village endowments that affect health. In particular, a host of village characteristics including population density, literacy rate, proximities to road, schools, market places, district capital, and health facilities, major human diseases, sanitation and hygiene, source of drinking water supply, and other agro-ecological features were collected through this questionnaire. These data were collected through interviewing a group of five people (four elders and a village leader) from each village. The third type of questionnaire was used to collect detailed data about village health posts (where available).

5.2 Definition of variables and summary statistics

The empirical data used in this paper refer to children aged between 12 to 60 months and their maternal, household and village characteristics. Data on vaccinations against the six childhood diseases (polio, tuberculosis, diphtheria, pertusis, tetanus and measles) were elicited from both vaccination cards and the mothers'/care-givers' recall. A child's immunization status is then post-coded as 0 if he/she has not immunized at all, 1 if partially immunized, or 2 if fully immunized.

We employed a host of child, household, and village level explanatory variables of immunization for this study. Table 1 presents the definitions of these variables together with their summary statistics (means and standard deviations). As noted in the table, children in our sample are equally divided between the two genders. On average, a child in the sample is aged 36 months. The mothers of nearly 15% of the children have primary schooling and above. On the other hand, about 42% of the children in our sample live in households who own a radio. In rural areas of Ethiopia, radio is the main source of public information on health and other social and economic matters. Access to other mass media (e.g. Television, news papers, etc.) is very limited. Interestingly, the descriptive results also show that nearly half of the children in our sample are living in villages served by a health extension worker, who is the grass-root level workhorse of Ethiopia's health extension program.

6. Results and discussion

6.1 Descriptive analysis

Table 2 presents immunization status of children disaggregated by some selected qualitative characteristics. As the table indicates, around 60% of children were fully immunized. As portrayed in Figure 1, the remaining are either partially immunized (25%) or not at all immunized (15%). A closer examination of the descriptive statistics indicates substantial immunization disparities in our sample. The immunization rate is larger for children who live in wealthy households and have relatively better educated mother. Immunization rate also has a strong regional dimension. Moreover, the likelihood of immunization varies across different disease types (Table 2). The highest and the lowest immunization performances are observed for polio and measles vaccines, respectively.

As indicated in Table 3, children in our sample also experienced high immunization dropouts for vaccines with multiple doses. Indeed, the highest dropout rate is observed for between polio 1 and polio 3. The dropout rates are slightly higher among boys than girls. Unfortunately, we do not have data to explain the reasons for this phenomenon. However, theoretically both supply side and demand side factors may be blamed for this outcome. On the supply side, for instance, there may be shortage of vaccines, or service providers do not reach out needy clients located in remote locations with immunization (Kloos, 1998). On the demand side, parents may not have sufficient knowledge about the importance of receiving a complete dose of a given vaccine for their children. From a public health point of view, failure to take complete dose of specific vaccines leaves children vulnerable to outbreak of epidemics (Geoffard and Philipson, 1997). Using empirical data from rural India, Lee (2005) has shown child mortality rate for fully immunized children is 16 percentage points less than for partially immunized children. Lee (2005, p. 186) has also reported that “the crude death rate of non-vaccinated children is about six times as high as that of fully vaccinated children and three times as high as that of partially immunized children.”

6.2 Estimation results

Table 4 provides estimation results. Our estimations were done using both an ordered logit and generalized logit models. As stated earlier, the former model assumes that there are no category specific parameter estimates. In other words, all explanatory variables have equal coefficients across response categories. However, the estimated value of likelihood-ratio (LR) test statistic is 48.68 with a P-value of

0.0001, which rejects the null hypothesis of the proportionality of odds across the ordered immunization categories. We also performed a series of specific Wald tests as suggested by Williams (2006) to identify coefficient/s for which the assumption of proportional odds ratio is violated. This test was conducted by specifying "autofit lrforce' option available in Stata 9. Accordingly, statistically significant differences among coefficients were identified for HEW, DISTPRIS and DISTCITY variables. For the remaining variables, interpretation of coefficients can be done the same way as we do in the ordered logit.

All estimations were carried out with STATA 9. As the significant Wald tests indicate the explanatory variables of each model are jointly important determinants of child immunization status. The observations are assumed to be independent across the villages but not within the villages. As such, we applied the Huber/White/sandwich estimation procedure to compute the standard errors of our regression models. We chose to report the odds ratios rather than the actual coefficients for ease of interpretation (Greene, 2000). In this case, a value of odds ratio larger/smaller than unity implies that the variable associated with it has a positive/negative influence on the dependent variable.

As expected, child immunization coverage is strongly associated with the variables at the child, household and village levels. At an individual level, age of child (AGEC) has a strong and non-linear relationship with immunization coverage. This implies that children born recently have greater likelihood being immunized (partially/fully) compared to those born about five years ago. Interestingly, the sex of a child (SEX) does not exert statistically significant effect on the child's immunization status. This result corroborates with an earlier finding by Kiros and White (2004) who also reported no sex bias in childhood immunization in the southern region of Ethiopia. However, our current finding contradicts with the common pattern observed for the countries of Southeast Asia where a strong son-preference has resulted nutritional and medical services discrimination against girls (e.g., Borooah, 2004; Jamil *et al*., 1999).

At the household level, we found that immunization coverage is directly and significantly associated with whether or not a child lives in corrugated iron-roofed house (HOUST), which is our proxy variable for a good quality house and wealth status. The odds of being partially or fully immunized versus not being immunized are 33% higher for children living in households who possess corrugated iron-roofed house. However, this variable does not help us differentiate fully immunized children from the rest (partially/not immunized). As anticipated, maternal education (EDUCMOM), ownership of a radio (RADIO) and size of landholding (LAND) have a

positive relationship with a child's immunization status albeit the effect remains statistically insignificant.

The effect of village characteristics is also worth noting. Immunization coverage is strongly associated with physical availability of public infrastructure (e.g. schools, health facilities), location and other community-level factors. In particular, the presence of a health extension worker in the village (HEW) has a positive and statistically significant effect on immunization coverage as anticipated a *priori*. Coefficient estimation of this variable deserves additional attention as it was estimated through an instrumental variable approach. Previous studies (e.g., Admassie *et al*., 2009) and our auxiliary regression results in Appendix 1 indicate that the placement of HEWs to the villages has been systematically influenced by village characteristics. In particular, villages far away from health centers are more likely to get the HEW. *Albeit* insignificant, villages with a higher human disease incidence were also more likely to receive the HEW. Thus, we applied an instrumental variables approach to address an endogeneity problem resulting from purposive placement of HEW. Our procedure is similar to Linnnemayr *et al*. (2008) and Alderman *et al*. (2006) who, respectively, study the effect on child malnutrition of village health post in Senegal and the Partage (feeding post) program in Tanzania. The instrumental variable we choose is village distance from nearest secondary school. This variable fits the criteria for a good instrument (Bound *et al*., 1995). That is, it is highly correlated with the HEW variable (see Appendix 1) but does not directly affect our dependent variable (i.e., child immunization status) in the second stage. For the latter proof, we included our instrument variable into the "immunization equation" and found that its effect has a 0.27 P-value (result not shown here to save space) suggesting that it does not have a direct influence on our dependent variable and that the exclusion restriction is valid.

Child immunization coverage also has a strong regional dimension. Children residing in Oromia region are more likely to receive full immunization. As the result indicates, the odds of being fully immunized as against partially or not immunized are 1.71 times larger for children living in Oromia compared to the South region. However, the region dummy variables do not have statistically significant effect on the odds of partial/full immunization vs. non-immunization. These results imply the existence of similarities among regions in terms of initiating essential immunization services to children and of heterogeneity in ensuring complete immunization.

As anticipated, the effect of most of distance variables on child immunization is significant and also takes their expected signs. Proximity to primary school (DISTPRIS) appeared to increase immunization coverage significantly. There might

be several reasons for this direct effect. First, distance to primary school may serve as a proxy for distance to immunization site since schools sometimes serve as temporary stations during immunization campaign. Second, schools may be important channels through which information about the benefits of immunization is transmitted to the population.

The results also show that immunization coverage is statistically smaller for children residing in ethnically more heterogeneous villages. But, this relationship is difficult to explain. Perhaps, the negative relationship may be explained indirectly through insufficient availability of social capital, which is a salient feature of a heterogeneous community (Bolin *et al.*, 2003; Miguel and Gugerty, 2005). In the health literature, Bolin *et al*. (2003) report the beneficial role of social capital for health outcomes. In particular, the authors underline the health benefits of social capital in many ways. As they note, first, social capital enhances the flow of information among members of a community. Second, it also helps to mobilize and coordinate common efforts in the community. Third, in communities where the state of social capital is large, community members could reach consensus and collective decision easily. Along this line, Miguel and Gugerty (2005) find an inverse relationship between ethnic diversity and investment in local public goods in Kenya.

7. Conclusion

Immunization has long been recognized as the most cost-effective mechanism to prevent childhood morbidity and death. However, its coverage in Ethiopia still remains below the desired level despite the country's aggressive efforts to achieve universal immunization. Using data collected from rural Ethiopia this paper sheds light on the main determinants of variation in immunization coverage among children aged between 12 to 60 months.

The paper has examined the proportion of children who received three doses of DPT3, three doses of polio, one dose of BCG and one dose of measles vaccines before the first birth day. The descriptive results indicated that 40% of the sample children have either not been immunized or only partially immunized. Descriptive results also reveal that dropping out doses has been a common phenomenon contributing to children's partial immunization status.

The paper sought to link differences in immunization outcomes (non-immunization, partial immunization, and full immunization) to observed characteristics at the child, household and village levels. As such, the dependent variable which we want to explain has ordered categorical outcomes and an ordered logit model is regarded as

an appropriate tool for data analysis. However, the ordered logit model poses proportional odds assumption on the coefficients of the explanatory variables. The likelihood ratio test rejected this assumption in our dataset and, thus, we applied a generalized ordered logit model to relax it.

Our estimation results reveal suggestive evidence that immunization coverage is strongly associated with a host of factors. The presence of a health extension worker in the village significantly increases a child's likelihood of immunization. Increased immunization status also has strong relationship with proximity to district capital and to primary school. The results also indicate that immunization status and village ethnic diversity are negatively correlated. Moreover, region of residence has a significant influence on childhood immunization status.

The estimated results also reveal that children living in a good house, as proxied by the variable corrugated iron-roofed house, have higher immunization status. Interestingly, the effect of a child's gender is not significant implying that there is no gender bias in immunization. Maternal education and exposure to mass media, as proxied by the ownership of a radio, have beneficial roles to immunization but their effect remains statistically insignificant.

To conclude, besides continued effort to strengthen its program on the accelerated expansion of primary health coverage, the Ethiopian government should seek mechanisms to overcome demand side barriers to uptake of immunization. In particular, specific vaccination strategies may be needed to reach out children who are vulnerable to miss out immunization opportunities available to the public. To this effect, service providers should give high attention to children in poor households, remotes locations and villages with diverse ethnic origins. In this direction, the author calls for additional research in at least two areas. First, further research is needed to better understand the main causes of high immunization dropout. Second, additional research is also required to explore the pathways through which ethnic diversity inhibits immunization uptake.

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Appendix 1

Determinants of placement of health extension worker into the village.

Variable[a]	Coefficient	Robust standard error
Region of residence is Oromia	-0.885	0.588
Region of residence is Amhara	0.855	0.637
Distance from nearest primary school	0.191*	0.107
Distance from district capital	0.003	0.016
Distance from nearest secondary school	-0.023**	0.011
Distance from nearest health center	0.060***	0.024
Malaria had been a major human health problem	0.015	0.460
Water-borne disease had been a major human health problem	0.683	0.461
Village has lowland areas in its territory	-0.512	0.556
Agricultural extension agents present in the village	0.291	0.493
Number of observations	127	
Log likelihood	-77.72	
LR chi2 (10)	19.66**	

***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.
[a]All variables are village level characteristics.

Figure 1: Children's immunization status.

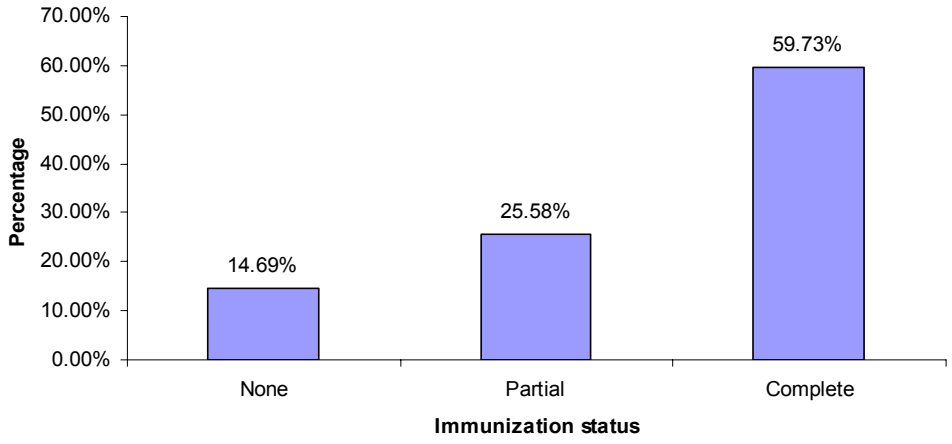

Table 1: Definitions of explanatory variables and summary statistics.

Variable	Definition+	Mean	Standard Deviation
Individual characteristics			
SEX	1= if the child is male; 0= otherwise	0.494	0.501
AGEC	Age of the child in months	35.954	15.018
AGESQ	Age of the child in months squared	1518.187	1102.429
Household characteristics			
EDUCMOM	1= if the child's mother has primary schooling and above; 0=otherwise	0.152	0.358
FAMSIZE	Number of persons in the household	6.458	2.085
HOUST	1= if the household has house roofed with corrugated iron sheet; 0=otherwise	0.419	0.493
RADIO	1= if household owns a radio; 0=otherwise	0.421	0.494
LAND	Land holding size in hectares	2.073	10.809
OROMIA	1= if region of residence is Oromia; 0 = otherwise	0.495	0.501
AMHARA	1= if region of residence is Amhara; 0 = otherwise	0.255	0.436
SNNPR	1= if region of residence is SNNPR; 0 = otherwise	0.25	0.436
Village characteristics			
HEW	1 = if village has a health extension worker; 0 = otherwise	0.49	0.49
LITERACY	Village literacy rate (%)	37.988	16.895
ETHCOMP	Number of ethnic groups in village	2.063	1.126
TOPGAPHY	Topography, 1 if village has lowland in its territory	0.393	0.488
DISTPRIS	Natural logarithm of village distance from nearest primary school	0.533	0.711
DIST_HC	Natural logarithm of village distance from nearest health center	2.597	0.844
DISTCITY	Natural logarithm of village distance from district capital	2.904	0.786
DISTTARMAC	Natural logarithm of village distance from nearest all weather road	2.976	1.107

+ all distance variables are measured in kilo meters.

Source: Author's computation based on EEA's data (Admassie *et al*., 2009).

Table 2: Vaccination coverage of children, by some selected qualitative characteristics.

	Percentage vaccinated					
	BCG	**Polio3**	**DPT3**	**Measles**	**All**	**None**
Total (percentage)	***75.9***	***78.01***	***74.4***	***65.9***	***59.7***	***14.7***
Child's sex						
Boy	77.1	77.2	74.1	66.1	60.3	14.7
Girl	74.95	78.9	74.66	65.8	59.1	14.6
Roof of house						
Corrugated iron	81.24	81.68	78.8	71.55	65.5	10.6
Other	72.3	75.6	71.3	62.0	55.7	17.6
Household has a radio						
Yes	77.5	80.4	76.2	67.8	61.3	12.5
No	74.9	76.4	73.1	64.6	58.6	16.3
Mother has primary education or above						
Yes	78.9	81.2	78.0	67.4	62.8	14.6
No	75.5	77.6	73.8	65.7	59.2	14.7
Region of residence						
Oromia	77.5	75.6	72.6	64.4	59.0	16.2
Amhara	83.5	81.5	78.9	70.5	67.1	10.0
SNNPR	66.3	79.4	73.4	64.3	54.3	15.6

Source: Author's computation based on EEA's data (Admassie *et al*., 2009).

Table 3: Dropout rate (%) for vaccinations with multiple doses.

	Dropout rate for DPT			Dropout rate for Polio		
	Between dose I and II	**Between dose II and III**	**Between dose I and III**	**Between dose I and II**	**Between dose II and III**	**Between dose I and III**
Boys	2.7	5.8	8.3	3.5	6.1	9.4
Girls	1.6	3.2	4.7	1.5	3.7	5.2
Total	2.2	4.6	6.6	2.5	4.9	7.3

Source: Source: Author's computation based on EEA's data (Admassie *et al*., 2009).

Table 4: Odds ratio of child immunization coverage.

Variable	Ordered logit	Generalized ordered logit	
Individual characteristics			
		Partially immunized	**Fully immunized**
SEX	1.037 (0.086)	1.037 (0.086)	1.037 (0.086)
AGEC	1.074*** (0.014)	1.074*** (0.014)	1.074*** (0.014)
AGECSQ	0.999*** (0.001)	0.999*** (0.001)	0.999*** (0.001)
Maternal and household characteristics			
EDUCMOM	1.078 (0.131)	1.091 (0.131)	1.091 (0.131)
FAMSIZE	0.987 (0.023)	0.987 (0.023)	0.987 (0.023)
HOUST	1.193* (0.124)	1.197* (0.124)	1.197* (0.124)
RADIO	1.119 (0.108)	1.114 (0.107)	1.114 (0.107)
LAND	1.002*** (0.003)	1.002 (0.003)	1.002 (0.003)
OROMIA	1.663** (0.434)	1.599* (0.419)	1.599* (0.419)
AMHARA	1.035 (0.285)	1.08 (0.301)	1.08 (0.301)
SNNPR	Reference	Reference	Reference
Village characteristics			
HEW^{+}	8.779*** (4.828)	19.275*** (10.645)	5.913*** (3.286)
LITERACY	1.004 (0.005)	1.004 (0.005)	1.004 (0.005)
ETHCOMP	0.757*** (0.069)	0.753*** (0.068)	0.753* (0.068)
TOPGAPHY	1.038 (0.194)	1.002 (0.183)	1.002 (0.183)
DISTPRIS	0.722* (0.096)	0.627*** (0.0.083)	0.778* (0.105)
DIST_HC	0.876 (0.107)	0.892 (0.108)	0.892 (0.108)
DISTCITY	0.956 (0.118)	0.759** (0.091)	1.029 (0.132)
DISTTARMAC	0.884 (0.084)	0.879 (0.085)	0.879 (0.085)
/cut1	-0.658 (0.528)		
/cut2	0.785 (0.531)		
Constant		2.598* (0.568)	0.405* (0.491)
Number of observations	2691	2691	
Log pseudolikelihood	-2401.94	-2387.26	
Wald chi^2	93.9***	132.11***	
(df)	(18)	(21)	
Pseudo R^2	0.04	0.05	

Robust standard errors in parentheses. $^{+}$Variable is endogenous and its predicted value is employed in the estimation.

*** Significant at 1%.

** Significant at 5%.

* Significant at 10%.

SOCIOECONOMIC DETERMINANTS OF INFANT AND CHILD MORTALITY IN RURAL ETHIOPIA

Fitsum Zewdu Mulugeta[1]

Abstract

Infant and child mortality rates are used as summary indicators of social development, quality of life, overall health, maternal health and welfare. Childhood deaths are mainly caused by preventable and communicable diseases and poor coverage of health, especially in the case of underdeveloped countries. This implies the socioeconomic nature of the issue besides its intrinsic health nature. Ethiopian infant and child mortality rates stand at 111 and 161 deaths per 1000 live births respectively, which is higher even compared to other Sub-Saharan African countries with average rates of 97 and 141 for infant and child mortality respectively. The main purpose of this study is to identify the poverty dimension of the problem, by taking environmental, social and economic conditions as determinants, and provide policymakers with additional alternative policy options to tackle the problem and advance to meeting the millennium development goals. The data used for analysis is the 2004 version of the Ethiopian Rural Household Survey. Probit model is fitted to explain the event of death of a child before the age of five. Explanatory variables used include household income, household size, availability of sanitary facilities, access to clean water and education. The main finding of the study is that the non-food consumption expenditure (which was used as proxy for ability to pay for healthcare) and access to clean water to have significant depressing effect on chances of childhood mortality. Based on these finding the study indicates policy directions for effectively targeting the much needed reduction of infant and child mortality in Ethiopia.

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1. Introduction

Poverty is defined as a situation where a person's income is too low to enable him/her buy the amount of food, clothing and shelter that are deemed necessary to meet his/her basic needs (Pass et.al 2005). One of the implications of this definitions is a household's or an individual's ability to pay for health and related services. In addition to ability to pay for health services, poorer families face poor housing, poor sanitation and poor supply of drinking water, hence higher exposure to illness.

Among the indicators of health and socioeconomic conditions, infant and child mortality rate is one that is most frequently used. This indicator is becoming more popular and is commonly quoted on the agendas of public health and international development agencies. It owes its renewed attentions to the United Nation's Millennium Development Goals (MGDs) (Mutunga 2007).

Infant and child mortality is a socioeconomic issue besides its intrinsic health nature. There is a visible correlation between the level of development of a society and the infant and child mortality rates. For instance, ten million infants and children under the age of five die each year with large variation in under five mortality rate across regions and countries; developing countries having the highest, according to Espo 2002 (as cited by Mutunga 2007). Mutunga (2007) claims that the main causes of such deaths are diarrhea, respiratory infections, malaria, measles and other immunizable childhood infections.

Coming to the case for Ethiopia, it has one of the worst performances in terms of child mortality even compared to the poorest regions of the world, Sub-Saharan Africa (SSA), according to the Ethiopian Economics Association's annual report on Ethiopian Economy for 1999/2000 (EEA 1999/2000). For instance the infant mortality rates for Ethiopia and SSA are 111 and 97 respectively. Further, the child mortality rate is 161 for Ethiopia, while that of SSA is 141. The rates of childhood mortality are expressed as the number of deaths before the age of five per 1,000 live births. For the case of child mortality the rates represent the number of deaths of children under-five, who survived to age one, per 1,000 children. According to the Ethiopian Demographic and Health survey (DHS), childhood mortality rates are customarily defined as follows (CSA 2005):

- Neonatal mortality: the probability of dying within the first month of life
- Post neonatal mortality: the difference between infant and neonatal mortality
- Infant mortality: the probability of dying between birth and the first birthday
- Child mortality: the probability of dying between exact ages one and five

- Under-five mortality: the probability of dying between birth and the fifth birthday[2].

These higher rates for Ethiopia show that the country has high childhood mortality rates, which calls for attention to be given to the issue, should Ethiopia meet the MGDs (i.e., to reduce the level of child mortality to two-thirds of what it was in the year 1990 by the year 2015). Furthermore there is a large discrepancy *within* the country. The under-five mortality rate for urban Ethiopia is 98 while that of rural is 135 (CSA 2005). These numbers could be reduced since the main causes of health problems in Ethiopia are preventable, communicable diseases and poor coverage of health (EEA 1999/2000). According to Iram and Butt (2008) about 70 percent of the deaths before age five are caused by a disease or a combination of diseases and malnutrition that could be prevented in a high-income country.

Statement of the problem

Infant and Child mortality rates are used as summary indicators of social development, quality of life, overall health, maternal health and welfare (Iram and Butt, 2008).

As mentioned above, Ethiopia is performing poorly in reducing childhood mortality, despite the fact that most of the causes of early childhood deaths are preventable diseases. Improving the living standard and environmental conditions could easily prevent incidence of these diseases and significantly reduce deaths. On the other hand, a neglected environment is a threat for health of both children and adults. According to Iram and Butt (2008), root of infant mortality is in the uneven distribution of resources or lack of resources.

Poverty also influences health because it largely determines an individual's environmental risks, as well as access to resources to deal with those risks (Mutunga 2007). Households with better income are able to afford better health care as well as housing and sanitary conditions, such as clean water and toilet facilities. Bearing this in mind the present study tries to identify major determinants of under-five mortality in rural Ethiopia. Several studies have been done on the issue taking different countries' cases but have based their analysis on Demographic and Health Surveys (in most cases) focusing on the clinical determinants only. The gap that this study is attempting to fill is to study the causes of childhood mortality from a socioeconomic perspective. And the severity of the problem in the rural part of the country calls for special attention to that particular region.

[2] The term Childhood Mortality is used to refer to under-five mortality hence forth

Objective of the study

The general objective of this study is to identify the socioeconomic determinants of child mortality in rural Ethiopia. The specific objectives are:

- To identify and quantify the relative importance of socioeconomic factors on childhood mortality.
- To identify the direction on influence of living environment on childhood mortality in rural Ethiopia.

Hypothesis

Children are at higher risk of dying if they are 'poor' (Iram and Butt, 2008). This study will test this statement by breaking it into the following hypothesis:

- Safe drinking water and childhood mortality have an inverse relation.
- Better sanitation and childhood mortality have an inverse relation and
- Income has a negative impact on the likelihood of childhood mortality

Research methodology

To address the aforementioned objectives the research relies on the 6th round of the Ethiopian Rural Household Survey (ERHS hence forth) data collected in 2004. A cross-sectional analysis of the data will be conducted. The dataset covers fifteen villages from Tigray, Amhara, Oromiya and Southern Nations and Nationalities Peoples Region (SNNPR) regional states. The choice of analyzing the data with either cross-section or panel data analysis considered the fact that the nature of the research question deals with children under the age of five. This takes panel data analysis out because children under the age of five in the 5th round of 1999 (say for example) would be above the age of five in the current (2004's) round, making them all out of the sample. On the other hand those included in the 6th round would not be included in the 5th round since they were not born by then.

This study used a discrete choice model since we are to studying the contribution of several household characteristics to the probability of a child's survival or death. As this study is believed to be one of the first based on the ERHS data, we start by fitting one the basic models and leave the much more complicated models of survival analysis for further studies.

Limitation of the study

The study being based on ERHS, is limited to the villages covered by the survey and the population of villages which can be represented by those in the sample. The sample contains fifteen villages from four regional states (see Dercon 2004). Even though the covered regions are large regions, there still remain regions not touched by the survey. Those regional states not covered in this survey, such as Somali and Afar, have different socioeconomic characteristics from those covered. Hence, the results should not be considered nationally (at least in the rural context) representative. Another limitation is that the survey covered a wide range of matters, which makes it lack details with regard to the question at hand. As a result the results and conclusions drawn should be no more than informative and stimulate further investigations.

Organization of the paper

The following section presents the findings of other studies on childhood mortality and related issues. The studies reviewed cover studies in Kenya, Eritrea, India, China and Pakistan. Following the literature review the different aspects of the data are discussed in Section 3. The discussion on the data includes the background of the dataset used for analysis, sampling techniques and limitations with regard to the study question of the present study.

Section 4 starts by presenting some descriptive statistics. In this part attempts have been made to describe the sample population with respect to attributes relevant to child safety and mortality. Following the description model specification and estimation results are also presented in subsequent sub-sections of the same section. Finally Section 5 will conclude the study by forwarding policy implications and outstanding issues.

2. Review of previous works

Mutunga (2007) set the theoretical framework for analysis of childhood mortality as health production function following Schultz (1984). This function captures the structural relationship between health outcomes and the household's behavioral variables, such as nutrition, breastfeeding, child spacing, etc. In the framework of health production function, childhood mortality risks depend on both observed health inputs and unobserved biological endowments on frailty.

Socio-economic variables such as cultural, social, economic, community and religion factors are considered to be exogenous. Biomedical factors like breastfeeding patterns, hygiene, etc. are modeled as endogenous and as having direct effect on health outcomes, while that of socio-economic ones as indirect as they work through the biomedical factors (Mutunga 2007)

Several socioeconomic factors have been found to be associated with infant and child mortality in the developing countries. However, the relative importance of these socioeconomic factors varies from society to society based on their level of development (Iram and Butt 2008).

Empirical literature

Iram and Butt (2008) used a sequential *probit* model to analyze the relative importance of socioeconomic factors on the probability of childhood mortality in Pakistan based on Pakistan Integrated Household Data (PIHD). They assumed the unobserved variables follow a multivariate normal distribution. They used a simple sequential model, the sequences being live births, survival during infancy period and survival till the fifth birthday.

Their analysis found that mothers' education has strong negative effect on childhood mortality, meaning that more educated mothers having more healthy children. Mothers' employment was found to be positively related to childhood mortality. They tried to explain this by the fact that working mothers spend less time to care for their kids (care including breastfeeding). Another maternal factor is mothers' age at marriage. Children born from women married at early age or very late ages tend to have a higher chance of dying before the age of five. In contrast with the widely accepted view of higher male neonatal mortality than female, the study found that a female child is more susceptible to under-five death, despite the biological disadvantage of the boys.

Apart from the biomedical variables, Iram and Butt (2008) found that health seeking behavior during pregnancy and during delivery are also important determinants. This behavior is measured using vaccination dummies, which reported a strong negative impact on mortality of a child. Other household variables such as improvement in environmental (sanitation) and socioeconomic condition tend to reduce the chance of death of children of age below five, hence inversely relates. It was also found that safe-water has negative and significant effect on neonatal mortality but surprisingly it was found to be positive and insignificant in the case of child mortality. The study also

found that there is a strong negative relation between household income and infant mortality.

A study by Mutunga (2007) analyzed the environmental determinants of child mortality in Kenya using Kenyan Demographic and Health Survey (KDHS). The analysis was done in a hazard rate framework using the parametric Weibull model and the semi-parametric Cox model. In general all the variables in both models are significant and had the expected signs. The variables child sex (male dummy), dummy for twins and square of the maternal age turned out to be positive while household size, maternal age, mothers' education, access to safe-water, having sanitary facilities, use of less polluting fuels and income (rich dummy) gave negative signs with their relation to child mortality.

Ladusingh and Singh (2006) studied place, community education, sex and child mortality in north-east India using a multi-level logistic model. Based on their findings mother's education is significantly and negatively related to child mortality. The study also considered the role of community elders' education, which is important since they are the ones responsible for the fulfillment of infrastructures like safe water and sanitary facilities. Again an inverse relation was found between community elders' education and child mortality. Regarding the sex of the child, the study's finding is in line with the common view that a male child is more likely to die than a female child due to biological disadvantages.

Ladusingh and Singh (2006) concluded that children born from working mothers have eighteen percent higher chance of dyeing given the harsh working conditions of north-east India. The findings also show that the younger the mothers are when giving birth, the higher the chances are for the newborn to die. A proxy variable was used to represent the hygiene statues of the household. This proxy was presence and type of a toilet. Presence of toilet has negative impact on child mortality while flush toilets further reduce the odds of child death by more than that of pit latrines. The study assessed the impact of poverty on child mortality using standard of living index (SLI). Higher SLI households have relatively lower odds ratio of child mortality than low SLI households.

Jacoby and Wang (2004), using the 1992 China national health survey made a competing risks model analysis on child mortality in rural China. They found that access to safe-water has the largest and most significant impact on child survival. Universal primary education for female also had a significant impact on reducing under-five mortality. The study also controlled for the impact of cooking fuel and sanitation, even though no interpretation had been given regarding them.

The paper by Klaauw and Wang (2004) using a flexible duration model framework, which allows for frailty at multiple levels and interactions between child's age and individual, socioeconomic and environmental characteristics. They used the 1998/1999 wave of Indian National Health Survey (INHS) for their analysis. The findings are that socioeconomic and environmental characteristics have significantly different impacts on mortality rates at different ages. The main recommendations of the study after some policy experimenting using the estimated models were that child mortality could be reduced substantially by improving the education of the mother and reducing indoor pollution caused by cooking fuels. Provision of sanitation facilities and electricity can reduce under-five-years mortality substantially.

Gebremariam (2001) on his study of diarrheal (which is major cause of morbidity and mortality of children in many developing countries) morbidity among young children in Eritrea found that environmental and socioeconomic conditions of the population to be significant determinants of diarrheal morbidity. The study used DHS survey of Eritrea. The study also found a strong association between age, the younger the more prone to diarrheal morbidity, and household size. Large households were found to be associated to higher prevalence of such morbidity. The method used by this study was logistic regressions as the outcomes are dichotomous. In the study the probability of having diarrhea is higher for households with dirt floor as compared to non-dirt, the probability is higher for those who dose not have toilet than their counterpart, and children of educated mothers have lower chance of infection than those having mothers with no education. It is also observed that the chances are higher in rural areas than urban. Surprisingly medium income families have the least probability of suffering diarrheal morbidity as compared to low and high income families.

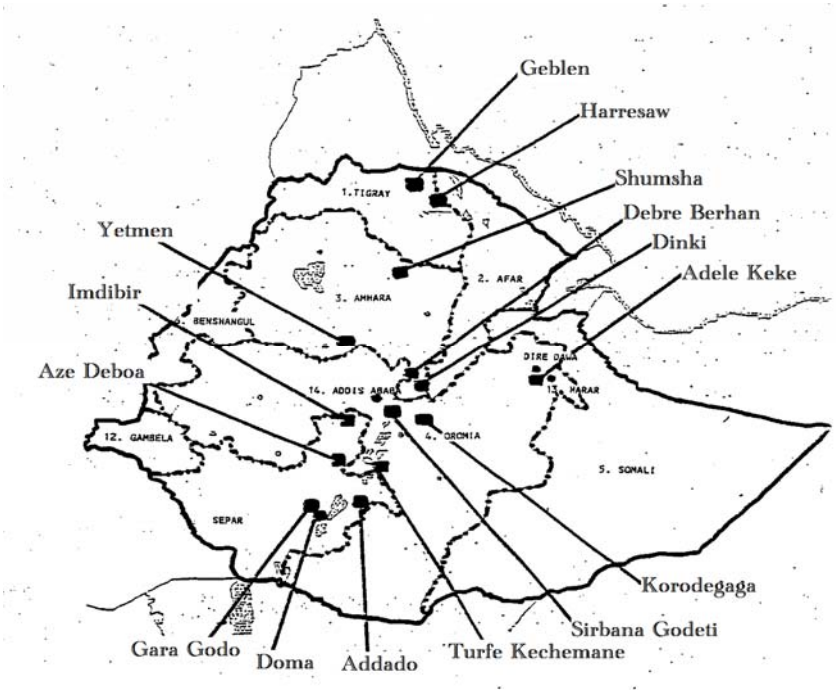
Overview of the literature

As noted above health outcome is a result of different socioeconomic inputs. The results of the studies reviewed confirm this claim as well as the role of these socioeconomic factors in determining the disease causes of child death, diarrhea. The empirical literatures show that socioeconomic and environmental conditions are very important in explaining infant and child mortality in many developing countries. In almost all cases the role of mother's education is important. The other important attributes of a household with respect to childhood mortality are sanitation (represented by availability of toilet), access to safe drinking water, economic status of the household (income) and location of the household (urban versus rural). The gender of the child was also considered to be important factor of child mortality in some of the studies despite contradicting results.

3. Data

The dataset employed for the purpose of analysis in this study is the 6th round of the Ethiopian Rural Household Survey (ERHS), collected in 2004. The data set is part of the longitudinal household survey started in 1989. According to Dercon (2004) initially it covered seven villages, out of which six were farming villages and one semi-pastoralist area. The geographic coverage of the survey includes the central and southern Ethiopia. Since 1994, nine additional villages were incorporated to the six farming villages while the semi-pastoralist village was disregarded due to violent conflicts, turning ERHS to be a survey of fifteen villages across the country.

Figure 1: Geographical Distribution of the Sample Villages



Source: Village Studies (Ayalew et. al. 1996)

Dercon (2004) further documented that department of Economics; Addis Ababa University (Economics/AAU), the Center for Study of African Economies (CSAE), University of Oxford and International Food Policy Research Institute (IFPRI), Washington DC supervised the survey. The initial survey conducted in 1989 by IFPRI collected household data on consumption, asset and income on about 450 households to study responses of households to food crises.

According to Dercon (2004) the sampling scheme was first to stratify the villages/peasant-associations (PAs)[3] into main agro-ecological zones and sub-zones. The areas mainly selected in the first round were those suffered from 1984-1985 famine and other droughts that followed between 1987 and 1989. Figure 1 above shows the geographic distribution of these sampled villages while Table 1 presents their list along with some of their characteristics. In the second stage of sampling households were selected by using lists of households kept by PAs for administrative propose to serve as sampling frames.

[3] The smallest administrative unit in Ethiopia is kebele or peasant association (PA)

Table 1: Study sites with some of their characteristics

Survey site	Location	Background	Main crops
Haresaw	Tigray	Poor and vulnerable area.	Cereals
Geblen	Tigray	Poor and vulnerable area; used to be quite wealthy.	Cereals
Dinki	N. Shoa	Badly affected in famine in 84/85; not easily accessible even though near Debre Berhan.	Millet, teff
Debre Berhan	N.Shoa	Highland site. Near town.	Teff, barley, beans
Yetmen	Gojjam	Near Bichena. Ox-plough cereal farming system of highlands.	Teff, wheat and beans
Shumsha	S.Wollo	Poor area in neighbourhood of airport near Lalibela.	Cereals
Sirbana Godeti	Shoa	Near Debre Zeit. Rich area. Much targeted by agricultural policy. Cereal, ox-plough system.	Teff
Adele Keke	Hararghe	Highland site. Drought in 85/86	Millet, maize, coffee, chat
Korodegaga	Arssi	Poor cropping area in neighbourhood of rich valley.	Cereals
Turfe Kechemane	S.Shoa	Near Shashemene. Ox-plough, rich cereal area. Highlands.	Wheat, barley, teff, potatoes
Imdibir	Shoa (Gurage)	Densely populated enset area.	Enset, chat, coffee, maize
Aze Deboa	Shoa (Kembata)	Densely populated. Long tradition of substantial seasonal and temporary migration.	Enset, coffee, maize, teff, sorghum
Addado	Sidamo (Dilla)	Rich coffee producing area; densely populated.	Coffee, enset
Gara Godo	Sidamo (Wolayita)	Densely packed enset-farming area. Famine in 83/84. Malaria in mid-88.	Barley, enset
Doma	Gama Gofa	Resettlement Area (1985); Semi-arid; droughts in 85, 88,89,90; remote.	Enset, maize

Source: Community survey ERHS, Ayalew et. al. (1996), as sited by Dercon (2004).

Further stratification of households was done in order to have a fair representation of female headed households and landless households, then households were selected at random. “Sample size in each village was governed on attempt to obtain a self-weighting sample, when considered in terms of farming system” as put by Dercon (2004). Addition of nine villages since 1994 gave North and Central highlands of the country more representative coverage.

Ethiopian rural household survey in childhood mortality context

As mentioned above the dataset of ERHS is a survey of household characteristics. At the very beginning, the questions of the survey were consumption, asset and income which were intended to study the living standards of the household. Eventually the coverage of the survey questions has grown to cover a wide range of additional issues. Even though childhood mortality was not the main focus in the survey, it had been given some attention. This is perhaps due to the longitudinal nature of the survey which calls for the registration of every vital-statistics (demographic changes) including births, deaths and migration for the sake of monitoring attrition.

Due to the lack of focus on childhood mortality, the data suffers from absence of data on some important variables for our current problem. In addition, some of the variables are not usable due to technical limitations. For example, as noted in the empirical literatures the educational attainment of the mother has significant influence on the survival of her newborn (see for example Iram and Butt (2008), Mutunga (2007), Ladusingh and Singh (2006)). When attempting to include this important variable, we noticed that it is impossible to uniquely identify the mother for the case of a significant number of households. This is because of missing ‘Mother ID Code’ (about twenty-seven) and inconsistent relation specified among those available.

To illustrate the inconsistency with example, let us take the household identified as *paid*[1]=1 and *hhid*[2]=9. The individuals in this household are given ‘ID codes’ 1, 2, 3, and 4. For the same household (*paid*=1, *hhid*=9) we found that two births took place in the last five years in another data file where birth related information is recorded. Surprisingly the ‘Mothers ID Codes’ for these new babies were 601 and 602, which is way beyond the range 1, 2, 3, and 4 mentioned above. This and many more such cases made it impossible to merge the files and obtain the very important maternal variables. According to the literatures reviewed, such maternal variables as mothers’

[1] *paid* is an identification code given to the peasant associations (PAs) in the sample.
[2] *hhid* is an identification code given to each household *within* the PAs.

educational level, mothers' work status, maternal age, breastfeeding patterns, etc. are important determinants of probabilities of child deaths in the countries the studied. In spite of the fact that the problems mentioned above, attempts are made to obtain the best information out of the available information. For further rounds of the ERHS surveys to come, it is important that attention should be given to avert this problem, should the survey tell us about childhood mortality.

4. Analysis and findings

Descriptive statistics[3]

Based on the studies reviewed earlier, the educational attainment of the mother has been found to have a strong negative influence on childhood mortality. Even though empirical assessment could not be done using mother's education attainment for the technical reasons mentioned in the previous section, we can assess the level of educational attainment of the communities as a whole. The composition of the societies surveyed with respect to their educational attainment is reported below in Table 2.

Table 2: Grades of schooling completed (for Ages>15)

		Frequency	Valid Percent	Cumulative Percent
Valid	Did not complete any schooling	1710	50.1	50.1
	1st to 6th Grade	996	29.1	79.2
	7nd to 12th Grade	390	11.4	90.6
	Incomplete higher education(not university	7	0.2	90.8
	Complete higher education, not university	5	0.1	91.0
	Incomplete university education	3	0.1	91.1
	Adult literacy program participation	211	6.2	97.2
	Other literacy program	30	0.9	98.1
	Some Church/Mosque school	58	1.7	99.8
	Other	6	0.2	100.0
	Total	3416	100.0	
Missing	System	2121		
Total		5537		

[3] The descriptive statistics reported below are author's computations based on the ERHS dataset collected in 2004 unless specified otherwise.

Half of the people above the age of fifteen have never attended any schooling. Considering only the formal education, about thirty percent attended primary education (grades one to six) and only ten percent attended grades between seven and twelve. A good portion of the populations studied, about eighty percent, attended grades six and below including those who have never attended school. Higher education attainment is almost negligible; it stands at less than one percent, including all completed and incomplete educations beyond high school.

Non-food consumption expenditure is expected to show the welfare status of the household. The choice of 'non-food' is particularly made since it is believed to include expenditure on sanitization and healthcare. The results show that the average per-head expenditure on non-food consumption is 100.8 ETB[4] with standard deviation of 119.02. This expenditure ranges between zero and 1490.5 ETB which has a large variation as indicated from the standard deviation. The result indicates the very wide gap between households ability to spend.

Table 3 gives the summary of the main sources of drinking water. The proportions of households depending on Stream or River water, hole and spring as main sources of drinking water are 26.9%, 25.9% and 23.7% respectively. Only 19.5% of the households have access to piped water. If we assume piped water and spring water as clean source of drinking water, they make about 43.2%. This shows a fair portion of the households have access to clean water, for a rural village. It is also found that 67% of the households do not boil water, whether for drinking or other purpose, 25.9% boil water for purposes other than drinking. Only about 7% practice boiling water for proposes including drinking (see Table A1 of the Appendix).

Table 3: Main sources of drinking water?

		Frequency	Valid Percent	Cumulative Percent
Valid	Pond or dam	18	1.9	1.9
	Stream or river	251	26.9	28.8
	Spring	221	23.7	52.5
	Well	242	25.9	78.4
	Borehole	15	1.6	80.0
	Rainwater	5	0.5	80.5
	Piped water (not in house)	182	19.5	100.0
	Total	934	100.0	
Missing	System	475		
Total		1409		

[4] Ethiopian Birr

Looking at the sanitary environment in which children are brought up, it is believed that households having sanitary facilities such as toilet have better sanitary conditions. In other words, having a toilet implies the positive attitude of the respective household towards hygiene as well as the household's ability to afford to have a toilet. With this argument about 65.3% of the households do not qualify for good sanitary attitudes. Looking at Table 4, we can see that majority of the sampled households do not have toilet of any form. Table 5 shows the distribution of the different types of toilets owned or used by the households.

Table 4: Presence and absence of toilet facility

		Frequency	Valid Percent	Cumulative Percent
Valid	No toilet	611	65.3	65.3
	Have toilet	324	34.7	100.0
	Total	935	100.0	
Missing	System	474		
Total		1409		

Among the 34.7% of the households which have toilets, most (i.e. 24.3% out of the total sample) own a pit latrine on their own, while 6.3% out of the total sample use a shared pit latrine.

Table 5: Form of toilet owned by households

		Frequency	Valid Percent	Cumulative Percent
Valid	Flush toilet shared	13	1.4	1.4
	Flush toilet private	20	2.1	3.5
	Pit latrine shared	59	6.3	9.8
	Pit latrine private	227	24.3	34.1
	Pan/bucket	5	0.5	34.7
	No toilet	611	65.3	100.0
	Total	935	100.0	
Missing	System	474		
Total		1409		

Sleeping in the same room with livestock is also believed to impose some health risks related to sanitation. Among the households in the valid sample, some 47.3% report sharing the same room as their live-stock. Summaries of other sanitation related variables could be found on Tables A2, A3 and A4 of the Appendix.

Tables A5 to A9 of the Appendix show different attributes of households with respect to knowledge and attitude towards major killer diseases of children, with the exception of HIV/AIDS. The main cause of diarrhea was rightly identified as Water/dirty food/feces/flies by about 73% of the respondents. Only 43.8% said to give more liquid to their children in the incidence of diarrhea, which is a call for concern. It was also found that 6.7% have never heard about HIV/AIDS. Proper knowledge about this disease could help in the reduction of its transmission in general and its vertical (mother to child) transmission and subsequent deaths in the child mortality context. Malaria, another major disease causing child mortality is rightly identified as being caused by Mosquito bites by 67.3% while 10.3% failed to know its cause at all.
According to this study the childhood mortality rate is found to be 4.51%. In line with the definition of DHS (CSA 2005), this means 45.1 children out of 1000 live births died before the age of five, which is way less than what is reported by CSA (2005) on a nationally representative sample. According to CSA (2005) the under five mortality for rural is 135 and that of urban is 98 deaths per 1000 live births. The source for this discrepancy between what is reported by CSA (2005) and calculations from ERHS could be the sample, or be a concern in terms of reporting/measurement error.

Model specification

Based on the nature of the dependent variable, which is a dichotomous with value one when a child dies before the age of five and zero otherwise, the binary choice model is used. The model was specified so that the probability of childhood mortality is a function of household socioeconomic attributes. The outcome that the child is alive or not is the one that is observed in the data, but the threshold level of household conditions that determines death of a child could not be observed. Therefore this threshold level is the underlying latent variable. The latent variable is presumed to take the form

$$y_i^* = x_i'\beta + \varepsilon_i \qquad \textbf{(4.1)}$$

Where y_i^* represents the latent variable defined above, $x_i'\beta$ represents the linear combination of household condition and ε_i the residual, which is assumed to have identically and normally distributed as well as independent of $x_i s$ (adapted from Verbeek 2002).

The research problems could be modeled by using the specification,

$$mort_i = \beta_1 + \beta_2 consperhd_i + \beta_3 hhsize_i + \beta_4 toil_i + \beta_5 cleanwtr_i + \beta_6 noeduc_i + \beta_7 childmale_i + \beta_8 sleeplivs_i + \varepsilon_i \quad \textbf{(4.2)}$$

which could be estimated using either *probit* or *logit* models. The dependent variable $mort_i$ is a dummy variable for childhood mortality. Its value is one if a child dies before the age of five and zero otherwise. The explanatory variable $consperhs_i$ is the expenditure on non-food consumption per head to proxy for income. It is often argued that the robust positive correlation between health and income observed in either cross-country or household-level data can be interpreted in two ways, "wealthier is healthier" or "healthier is wealthier". According to Wang (2002), Pritchett and Summers (1996) have carried out a thorough and extensive econometric analysis using a range of valid instrumental variables that could be found and they conclude that there exists strong evidence in favor of a causal and structural relationship running from income to health outcomes. Filmer and Pritchett (1999) as cited by Wang (2002) found no evidence supporting the two-way causation between health outcomes and public health spending based on DHS data. These conclusions have direct implication for the current estimation technique.

The variable $hhsize_i$ is the number of people in each household. $noeduc_i$ is a dummy variable for whether the household head attended any education or not. Its value is one when the head attended no education at all. This inclusion was made due to the technical unavailability of that of the mother. The remaining explanatory variables $toil_i$, $sleeplivs_i$, $cleanwtr_i$ and $childmale_i$ are dummy variables for ownership of toilet, sleeping in the same roof with live stocks, access to clean water and a male child dummy.

Empirical results

The model specified by (4.2) using *probit* model yielded a very small Pseudo R^2 of 0.0526. The estimation results of the model are reported on Table 6.

From the tables in the discussion of the descriptive statistics it can be seen that missing observations are substantial, which largely undermine the explanatory power of the model. The discussions to follow should take this limitation of the model into consideration. Non-food consumption expenditure per head and access to clean water are found to be significant at 5% significant level and have the expected negative signs. Based on our assumption higher spending on non-food consumption, which includes healthcare expenditures, indicates the well-being of the household. In

line with the studies by Mutunga (2007) and Ladusingh and Singh (2006) we found that better ability to spend on non-food items reduce the probability of death before the age of five. The implication of this result is that the more poor [households], who spend most of their earnings on food, are more prone to childhood mortality. Based on this study, interventions targeting reduction of childhood mortality should attempt to increase the income of the household since poverty significantly increase the chance of mortality before the age of five.

Table 6: *Probit* model estimates of equation (4.2)

Variables	Marginal probabilities/Coefficients	(s.e.)
Constant	-0.7928	(0 .3221)
Consumption per head	-0.0002**	(0.0011)
Household size	-0.0071*	(0.0546)
Toilet dummy	-0.0132	(0.2032)
Access to clean water dummy	-0.0225**	(0.1319)
No Education dummy for the head of the household	-0.0254*	(0.1730)
Male child dummy	0.0003	(0.1769)
Dummy for sharing room with livestock	0.0086	(0.1821)
Pseudo R^2 = 0.0526		

** 5% significance level and *10% significance level with two-tailed tests.
Source: own computation (data from 6th round of ERHS collected in 2004)

Regarding safe drinking water, we found similar results like that of Mutunga (2007) and Jacoby and Wang (2004), who found that safe-drinking water to have negative and significant impact on childhood mortality. The implication of this result is that improving the access of a household to safer drinking water, which means reducing the chance of child infections by water-borne diseases, will reduce the chances of childhood mortality. With only about 7% of the households practicing boiling water for purposes including drinking (see Table A1) encouraging households to boil water especially for drinking purposes could pay in terms of reduced childhood mortality.

The impact of household size is found to be negative and significant at 10% significant level. This result is surprising and in direct contradiction with that of Gebremariam (2001). According to Gebremariam (2001) diarrheal morbidity in Eritrea (remember that diarrhea is one of the major disease cause of child mortality) is associated with larger family sizes. But in this study it was found the other way round, larger families are less prone to child mortality. The possible explanation for this result is that the more people that there is in the household, the more the family is able to care for the child. For example if grandparents are living in the same house,

they could take care of the children while the birth parents are engaged in either in-house or outside work. There is also possibility in Ethiopian context for older children to look after their younger siblings. In another attempt to find explanation for this result, we analyzed the correlation between the wealth indicator, the non-food consumption expenditure, and household size. The correlation is found to be small but positive, i.e. 0.2431, which indicates that larger households are on average wealthier, and wealth has a negative influence on child mortality.

It was surprising to find that chances of children dying to decrease with uneducated household heads than the educated ones. The expectation was that households with educated household heads to have less chance of childhood mortality. The results show that the no-education dummy (value=1 when the head never attended any sort of education and value=0 otherwise) was found to be significantly negative at 10% level of significance. In contrast most of the empirical literatures show that education especially that of the mother, have strong positive impact in reducing child mortality. This could be due to the minimal role of men, who are the household heads in most cases of rural Ethiopia, for the upbringing of children; or just because we aggregated all kinds of education of the household heads, including traditional and basic literacy, as being educated.

Finally the remaining variables in the model failed to significantly explain chances of childhood mortality. Toilet and sharing rooms with animals were included to control for sanitary factors while sex of the child was there to control for biological factors related to gender.

5. Conclusion

The aim of this study was to identify major determinants of infant and child mortality in rural Ethiopia. The main objective of the paper was to identify these determinants from socioeconomic perspective in rural Ethiopia to the extent the data is representative. The survey data of Ethiopian Rural Household Survey (ERHS) of round six, which was collected in 2004, was used for this cross-sectional analysis. This data set covered fifteen villages in four regions of the country. A binary discrete choice model was used to identify the main determinants of childhood mortality. The model employed was a *probit* model but it should be noted that the model did not have a strong prediction power; hence results and conclusions should be considered as indicative rather than strong evidence.

Given the extent of nationwide representation of the sample and limited power of the model, we found that poverty, educational background of household heads (in an

expected way), access to clean water and size of the household are found to be important determinants of childhood mortality. This finding suggests that infant and child mortality rates are results of many social and economic factors than simple health crisis. This makes under-five mortality rates 'good' indicators of social welfare. The higher this rate is the poorer the welfare. The current higher figures of childhood mortality in Ethiopia, especially in the rural part, call for immediate attention of all concerned bodies, which might include federal and regional governments, NGOs and multinational organizations. Should the stakeholders plan and implement interventions, they must consider conducting specific studies so that they can intervene more efficiently.

Based on the results of this study, reduction of poverty and access to safe drinking water should be given priority in order to reduce child deaths, hence improve welfare. Helping peasants to engage in the production of cash crops and introduction of other income generating activities will help alleviate the problem by increasing the income of the household. Intervention to improve safety of household's drinking water will significantly reduce childhood mortality. Such interventions could be provision of clean water access, at least at community level, as well as educating the communities on the usefulness of boiling water used for drinking and related purposes. Education had unexpected outcome. This could be because of aggregation of formal education with religious and basic adult literacy programs. Based on the experience of countries like Kenya, Eritrea, Pakistan, India and China universal coverage of female education could reduce deaths of children significantly. Household size was also found to reduce chances of childhood mortality. The possible reason for this as explained earlier could be the child care support extended by other family members of the household and the relative wealth of larger families. This should not imply that having larger family size be put as a recommendation; rather we recommend that important family values and social ties that contribute for better child care to be encouraged.

Finally further studies by making use of the previous rounds of ERHS (rounds one to five in addition to the round six used in this study) data and making a pooled-cross-section analysis might improve the model by compensating for the missing observation and with all the benefits of large sample size.

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Appendix

Descriptive Statistics:
The tables below are author's calculations based of the 6th round of ERHS collected in 2004.

Table A1: Do households boil water for drinking or other purposes?

		Frequency	Valid Percent	Cumulative Percent
Valid	For drinking and most other purposes	19	2.0	2.0
	For drinking only	47	5.0	7.1
	For other purposes only, not drinking	242	25.9	32.9
	No	627	67.0	99.9
	5.00	1	0.1	100.0
	Total	936	100.0	
Missing	System	473		
Total		1409		

Table A2: How do households dispose garbage?

		Frequency	Valid Percent	Cumulative Percent
Valid	Household dumps at well	115	12.3	12.3
	Burned	66	7.1	19.4
	Used as green manure	620	66.4	85.8
	Buried	52	5.6	91.3
	Periodically collected from household	47	5.0	96.4
	Periodically collected from specified dumping point	34	3.6	100.0
	Total	934	100.0	
Missing	System	475		
Total		1409		

Table A3: Households' habit regarding washing hands before preparing food

		Frequency	Valid Percent	Cumulative Percent
Valid	Yes	910	97.5	97.5
	No	23	2.5	100.0
	Total	933	100.0	
Missing	System	476		
Total		1409		

Table A4: Households' habit regarding washing hands before eating

		Frequency	Valid Percent	Cumulative Percent
Valid	Yes	931	99.4	99.4
	No	6	0.6	100.0
	Total	937	100.0	
Missing	System	472		
Total		1409		

Table A5: Summary of responses to "What is the main cause of diarrhea?"

		Frequency	Valid Percent	Cumulative Percent
Valid	Mosquito bites	67	7.2	7.2
	Water/dirty food/feces/flies	683	73.0	80.2
	Spirits/witchcraft/ancestors	26	2.8	83.0
	God/fate	9	1.0	84.0
	Teething	52	5.6	89.5
	Do not know	90	9.6	99.4
	Total	935	100.0	
Total		1409		

Table A6: Responses regarding liquid consumption of infants sick with diarrhea

		Frequency	Valid Percent	Cumulative Percent
Valid	Same	182	19.7	19.7
	More	405	43.8	63.5
	Less	288	31.1	94.6
	Cannot remember	50	5.4	100.0
	Total	925	100.0	
Missing	System	484		
Total		1409		

Table A7: Summary of responses to "Have you heard about HIV/AIDS?"

		Frequency	Valid Percent	Cumulative Percent
Valid	Yes	871	93.3	93.3
	No	63	6.7	100.0
	Total	934	100.0	
Missing	System	475		
Total		1409		

Table A8: Summary of responses to "What is the main cause of Malaria?"

		Frequency	Valid Percent	Cumulative Percent
Valid	Mosquito bites	574	67.3	67.3
	Water/dirty food/feces/flies	180	21.1	88.4
	Spirits/witchcraft/ancestors	6	0.7	89.1
	God/fate	5	0.6	89.7
	Do not know	88	10.3	100.0
	Total	853	100.0	
Missing	System	556		
Total		1409		

Table A9: Summary of responses to "What is the main cause of HIV/AIDS?"

		Frequency	Valid Percent	Cumulative Percent
Valid	Mosquito bites	5	0.6	.6
	Water/dirty food/feces/flies	1	0.1	.7
	Spirits/witchcraft/ancestors	1	0.1	.8
	God/fate	11	1.3	2.1
	Sexual intercourse/exchange of body fluids	751	85.5	87.6
	Cutting with dirty instruments/dirty needles	58	6.6	94.2
	Do not know	51	5.8	100.0
	Total	878	100.0	
Missing	System	531		
Total		1409		

A PRELIMINARY ASSESSMENT OF THE SOCIAL AND ENVIRONMENTAL IMPLICATIONS OF AGROFUELS DEVELOPMENT IN ETHIOPIA AND THE NEED FOR SOCIAL AND ENVIRONMENTAL STANDARDS

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Abstract

Interest around agrofuels at the international level has exploded over the past few years. The increased interest in agrofuels has been fuelled not only by the rising price of oil and the volatility of the market, but also with regional instabilities and the strained political relationships between oil exporting countries and the West. In addition, several African and other developing countries have engaged in agrofuels development for domestic consumptions as well as export. Ethiopia, meanwhile, is attempting to position itself in the dynamics around agrofuels with a particular concern about maintaining a balance between food and energy security and supporting sustainable development in the country. This position is motivated by the country's strong demographic growth, the urgent need for the improvement of access to energy and, more broadly, by the need for reducing poverty and achieving economic growth.

However, much of the shift toward the development of agrofuels in Ethiopia is occurring without careful consideration of the social, economic, and environmental implications of such systems. The good intentions of the government as stipulated in the biofuel strategy document gives due recognition and special attention to food security, community participation and the protection of agricultural and forest lands, biodiversity and local populations. The main issue is that agrofuels development, if targeted at degraded or marginal lands, and designed with appropriate social, economic and environmental safeguards, and in consultation with affected communities, could provide benefits in the form of land rehabilitation, generation of local employment and improved income and social development. However, improved planning and law enforcement is absolutely essential to ensure biofuel development does not take place at the expense of farming and pastoral communities and the grazing areas and forestlands these communities depend on for their livelihoods and socio-cultural manifestations.

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Thus, it is important to revisit the limited experiences Ethiopia went through in the development of agrofuels so as to avoid the social, economic and environmental impacts of ongoing biofuel (agro-fuel) projects and make appropriate corrections and preparations for the proper implementation of the strategy. However, current progress in the production of energy crops call for Ethiopia to learn from the experiences of other African and Latin American countries and from previous experiences within the country. This will help in the development of a holistic view of agrofuels based on policy and production techniques which takes into account the multifaceted effects of biofuel production.

The current production of biofuels inputs in Ethiopia is not well understood and coordinated. There is urgent need for new levels of cooperation across a wide range of disciplines to help decision makers in the realm of biofuels to best evaluate the local, regional, and global impacts of their actions. On the other hand, the country's limited experience so far is evidence of the gap between the biofuel strategy and on-the-ground implementation. Good coordination and understanding between federal and regional organs, careful monitoring of implementation practices and harmonization of the interests of various stakeholders is crucial. There is also need for understanding the potential gender-differentiated risks of agrofuels production and including them in the biofuel strategy document. This would also ensure the consistency of the biofuel strategy with other important policy objectives, such as sustainable rural development, gender equality, and adaptation to climate change, strengthening the potential synergies – and reducing the risk of trade-offs – between them. In order to achieve the stated objectives, Social and Environmental Impact Assessment (SEAs) of projects need to be considered as a prerequisite for land allocation and project implementation with focus in the future on small-scale productions on carefully selected areas to avoid land use conflicts, displacements and forest destructions.

1. Background

Recent developments in the sphere of alternative energy sources and newspaper reports and media headlines warning of rising oil and food prices and the link to energy crops production have stimulated considerable discussion and research into the opportunities and impacts of bio/agro-fuels. Such developments destined biofuels to become high on the agenda for major multilateral institutions, regional agencies, national governments, corporations, development agencies, scientists, economists and environmentalists. Over the last few years, national governments around the world have instituted new incentives for biofuels production, and private investment in the sector has increased dramatically. Recent international agreements and forums involving influential countries, major regional organs and actors likely will further spur

the expansion of the global production and trade on biofuels (Kojima et. al, 2007; OECD, 2006; IEA, 2006; Heinimö et. al, 2007).

Following the surge of interest in agrofuels, however, one of the big questions being asked is whether agrofuel production is a panacea for the energy crisis facing the world today as many of its proponents often claim. Or will extensive plantation of energy crops help solve only one problem while opening up so many other socio-economic and environmental problems. It also remained an open question whether radical transitions of the kind needed to secure freedom from imported oil and energy insecurity can be left to work largely through market forces or whether they should be managed and guided through more interventionist policies and precautionary measures.

In sub-Saharan Africa, agrofuels development has emerged as a top priority as countries faced the triple challenge of ensuring energy security, food security and sustainable development. Massive efforts to expand agrofuel production and use are being initiated or are underway in many sub-Saharan African countries, including Ethiopia, Kenya, Zimbabwe, Malawi, Ghana, South Africa, Senegal, Nigeria, Benin, Guinea Bissau, and Mozambique This surge and interest in liquid agrofuels in the sub-region follows suit with the renewed interest in biofuels investments and the development of renewable energy roadmaps in Europe and the USA mainly as a response to the significant rise and volatility of oil prices and the uncertain geopolitical conditions in main oil producing and supplying countries (Seedling, 2008; African Biodiversity Network, 2007). The push for agrofuels in Africa, however, is putting many countries at a crossroad of reconciling the 'new' development with the many complex and deep rooted challenges that the large and growing populations in the continent are currently facing-poverty, insecurity, loss of biodiversity, erosion of cultural and human rights, and marginalization of indigenous and local communities (Jank et.al, 2007; Biofuelwatch, 2007)

1.1 Problem statement

In late 2006, Ethiopia formalized the adoption of the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) as its official five-year development plan (2005/06-2009/10). Taking the country's potential for biofuels development into consideration, the Ministry of Mines and Energy has prepared a biofuels development and utilization strategy developed on the assumption of the availability of huge labor, favorable climate and ample land resources for investments and the selection of Jatropha curcas as a principal feedstock for biodiesel production, together with Castro bean (for biodiesel) and sugarcane (for bioethanol). Assessment

of a potential bioethanol industry was undertaken in March 2007 and received endorsement from the Council of Ministers in August/September 2007. Following this, preparation was finalized and allocation of land for biofuels crop plantations is underway (mainly oil palm and Jatropha crops) in some parts of the country (in Oromiya, Gambella, SNNPR, Benishangul Gumuz and Amhara regions). However, much of the shift toward biofuels systems in Ethiopia is occurring without prior and careful consideration of the social, economic, and environmental implications of such systems.

While the expansion of investments in agrofuels promises to bring jobs and economic vitality to rural communities in Ethiopia, it is also creating dilemmas for small farmers, pastoralists, agro-pastoralists and local governments in weighing the benefits of promised social and rural development against land encroachment, social and economic marginalization, increased environmental pollution, degradation and safety risks (Gebremedhin, 2008). Presently, there is little empirical knowledge about the socio-cultural and economic impacts of agro-fuels development on rural communities in Ethiopia. There is an urgent need to understand the many potential implications of large-scale agrofuels plantations in Ethiopia through appraising the country's experience so far, researching future implications of the agrofuels revolution and drawing lessons and experiences from other developing countries. This piece of work aims to provide a better understanding of the socio-economic and environmental implications of agrofuels development for rural communities, and to contribute to the development of more informed policy and precautionary implementation strategies regarding biofuels/agro-fuels in Ethiopia.

1.2 Conceptual descriptions: Biofuels or agrofuels?

Though there are different forms of bioenergy, the interest of this paper is on liquid agrofuels/biofuels (ethanol and biodiesel) produced for oil substitution purposes. The general term biomass refers to a wide variety of non-fossil material of biological origin, such as energy crops, agricultural and forestry wastes and by-products, manure or microbial biomass. Though biomass in the form of wood, agricultural residues and animal waste is still used by billions of people in the world, this is primarily non-commercial energy used by the poor for household purposes such as cooking and heating.

In 2007, biomass contributed 10 per cent of the world primary energy demand. Commercial biomass, which includes use for electricity and heat production along with production of biofuels for transport, only equate to around 1 to 2 percent of the

global energy demand (Best et. al, 2008). Despite this, recently it has had a considerable impact globally.

Biofuel refers to any fuel produced directly or indirectly from biomass such as fuel wood, tree branches, charcoal, bioethanol, biodiesel, biogas (methane) or bio-hydrogen. Thus the term biofuel has a much wider meaning which includes not only fuels produced from ethanol or biodiesel but also vegetable oil and animal fats and traditional sources of energy such as wood fuel, dung cakes and branches of trees and bushes which has been in use since the discovery and use of fire in the history of humankind. Bio-energy in all its forms is energy produced from biomass, non-fossil material of biological origin including forest and agricultural plants, wild or cultivated as crops. Bioenergy can be harnessed from biomass in several ways. It can be processed and used in solid, liquid or gas forms. Solid biofuel includes fuel wood, pellets, and charcoal. Liquid biofuel mainly includes bioethanol and biodiesel. Biofuel in the form of gas includes methane. Liquid biofuel is mainly produced as ethanol or biodiesel. The feedstock for ethanol are mainly sugar cane and maize, and to a lesser extent wheat, sugar beet and cassava. The feedstocks for biodiesel are oil-producing crops, such as rapeseed, palm oil, Jatropha, soybean and coconuts.

Though a variety of biofuels exist, liquefied biofuels, such as ethanol and biodiesel, have garnered the greatest attention as they can be used in the transportation sector. They are considered “first-generation” because the crops are grown specifically for the purpose of transformation into these fuels. “Second-generation” biofuels are not commercially viable at this stage though have the potential to increase energy yields and reduce environmental impacts significantly. “Second-generation” production involves using waste materials (algae, grasses, woody plants and residues from the agriculture and forestry sectors) and transforming these into oil products (The Royal Society, 2008).

Increasingly, the term agrofuel is being adopted and used in place of “biofuels”. Many activists and agencies employ the term agrofuel in their discussion and reports to show the use of industrial agribusiness models in the production of energy from crops and also because of the increasing diversion of food crops away from people into vehicles. Through out the paper the term biofuel is more often employed to refer to small-scale production of energy crops on marginal and unused lands targeted at rural and social development through generation of rural incomes and energy security. The term agrofuel is used when referring to large-scale plantations of fuel crops on forest, arable and/or rangelands with severe impacts on local communities, economies and ecosystems.

1.3 Recent developments in the agrofuel industry

Although biofuels have long been used as domestic sources of energy in Asia, the Pacific Islands and Africa, it was Brazil who pioneered the production of liquid agrofuel well before World War II, using parts of its vast sugar cane plantations for the production of ethanol initially to help reduce the dependence on fossil fuels but later for trade. Following Brazil, the United States is a major producer starting its production of ethanol from maize in the 1980s. Later on, the EU started to become involved, mainly using rapeseed and to a lesser extent soybean and sunflower oil for biodiesel production (Eide, 2008; International Food and Agricultural Trade Policy Council, 2007; International Institute for Sustainable Development, 2007). These producers consume the whole of their own biofuel production internally. France, Sweden and Germany are also among the world's leading producers of agrofuels. Many other countries including India, China, Colombia, Japan, Canada, Thailand, South Africa followed the path.

The scale of current and anticipated global agrofuels production and consumption threatens not only the availability of crops for food and feed, but also the survival of indigenous and local communities and biodiversity globally. Alongside subsidies, it is the amount of mandatory targets for transport fuels from energy crops that is the main driver to the rush for agrofuels (Worldwatch, 2006; European Commission, 2007). In this regard the following can be mentioned:

- In early 2007, the EU endorsed a 10% target for agrofuels in transport fuels by 2020. This almost doubled the target established in the 2003 Biofuels Directive (5.75% by 2010);
- China has already made E10 blends mandatory in five provinces that account for 16% of national passenger cars. The government plans to cover 15% of the country's fuel demand by 2020 by agro-fuels;
- India has set target of securing 20% of its diesel fuel from energy crops by 2012.
- Brazil has set target that all diesel fuel must contain 5% biodiesel by 2013;
- Columbia mandates the use of 10% ethanol in all gasoline sold in cities with populations exceeding 500,000;
- The Canadian government aims for 45 % of the country's gasoline consumption to contain 10% ethanol by 2010;
- Asia as a whole has a set target of replacing 10% of energy demand by energy crops by 2020;
- In South Africa, the government's plan for 2010 is to cover 10% of the country's energy demand from locally produced fuel from energy crops;

- Several other countries in Latin America (such as Venezuela, Bolivia, Costa Rica, Guatemala, Argentina, Mexico, Paraguay, and Peru), South East Asia (Thailand, the Philippines, Malaysia, Indonesia.) and Africa (including Ethiopia, Ghana, Kenya, Malawi, Nigeria, Senegal and Zimbabwe) have planned to aggressively expand agrofuels production and use in the future.

However, the United States and the EU cannot by far meet their own targets of consumption by own production as the targets far exceed their agricultural capacities. For example, the EU would need to plant 70% of its farmland with fuel crops in order to reach its targets. On the other hand, the entire corn and Soya harvest of the US would need to be processed as ethanol and biodiesel (Oxfam, 2008; Eide, 2008). They will therefore be increasingly dependent on import from developing countries. This situation has motivated substantial production also in other countries. Major oil companies and commodity traders are already planning significant expansion into the biodiesel infrastructure in Africa.

2. Advantages and disadvantages of the production of biofuels

2.1 Advantages of biofuels

2.1.1 Potential to enhance energy security

Throughout history, the fluctuations of supply and demand, energy policy, political tensions and military conflict and environmental considerations have all contributed to a highly complex and volatile market for energy and fuel. In the same manner, rising oil prices and regional instabilities in major oil producing and exporting regions in recent years have sent political leaders and businesses scrambling to enhance and secure energy supplies. In many of the industrialized countries the transport and industrial sectors are in the main dependent on imported crude oil. In the Global South, out of the 47 poorest countries, 38 of them are net oil importers, and 25 of these import all of their oil (Worldwatch Institute, 2006). Thus, agrofuels should help industrialized and least developed countries escape from the dilemmas of energy insecurity by ensuring security of supply from alternative sources.

However, currently agrofuels can only marginally enhance energy security in many of the oil dependent countries because domestic harvests of feedstock crops meet a small part of the demand for transport fuels, with few exceptions (for example, ethanol in Brazil). In 2006/07, around one-fifth of the U.S. maize harvest was used for ethanol but it substituted only about 3 percent of gasoline consumption. The same applies to the EU: At present, 47 % of its oilseed production goes to biodiesel and yet

it serves only a very tiny percentage of European transport needs. It is now increasingly clear that agrofuels will not provide a comprehensive energy security (European Commission, 2008).

2.1.2 Potential for poverty reduction (employment generation)

At the heart of the increasing optimism and political support among governments in developing countries is that the development of agrofuels could help reduce poverty through increased employment, broader economic growth multipliers (in the form expanded investments and promotion of export markets) and energy price effects. According to a World Bank report, agrofuel industries require about 100 times more workers per unit of energy produced than the fossil fuel industry (Worldwatch Institute, 2006). There are also claims that agrofuels cropping in poorer tropical and sub-tropical countries could stimulate gainful employment, either by reversing the downward trend in production and gainful employment in the areas with recorded history of low productivity and declining carrying capacity or opening up marginal or unused lands into the cultivation of energy crops. There are also hopes that increased investment in agrofuels will increase rural incomes in both developed and developing countries.

However, the biofuel/agrofuel industry is a very 'fragile' industry whose impacts on poverty reduction and employment generation are heavily dependent on the scale and mode of production, selection of feedstock and type of land use. Generally, the impact on poverty is reduced where feedstock production tends to be large scale, or causes pressure on biodiversity or scarce agricultural and rangeland resources. The employment generation potential for agrofuels production in poorer countries should also be weighted against the greater number of people who are or will be evicted or marginalized as a result of expansions of agrofuel plantations.

2.1.3 Benefits to smallholders and rural areas (improved incomes)

By substituting agrofuels for imported oil, developing countries hope to invest their scarce capital in their own farms and industries rather than exporting it to rich oil-producing nations. If that reinvestment can be made in ways that help reduce poverty without affecting their lands, environment and economies, biofuels could contribute to equitable economic development, energy self-reliance and reducing greenhouse gas emissions into the atmosphere. There are also hopes that agrofuels offer high prices and large new markets for agricultural produce. Agricultural policy encouraging growth of energy crops in marginal rather than prime agricultural and forest areas would serve the dual purpose of meeting national energy and food needs. It would

also require investing in soil and water conservation practices and infrastructure to support rural development. In this way, carefully planned and executed agrofuels can benefit rural areas and communities through employment generation and higher rural incomes but the direction and scope of these impacts is likely to remain largely limited and dependent on the type of land used, feedstock selected and the management of natural resources around plantations. The economies of scale associated with large agribusiness will also do little to help small-scale farmers.

2.1.4 Environmental benefits

In general, proponents of agrofuels development argue that since most energy crops are Carbon neutral they have the potential to reduce GHG emissions because such crops can sequester carbon in the soil as they grow. They claim that since GHG emissions in the transport sector is a major environmental problem, agrofuels should be encouraged for their contributions in the fight against climate change in addition to economic advantages. There is also an emerging argument by proponents of agrofuels that all common agrofuels contain more useful energy than is required to produce them. However, the conversion of forests and use of agricultural and industrial chemicals as inputs can increase GHG emissions and fuel the problem of global warming (Crutzen et.al, 2007). Greenhouse gases, such as methane, carbon dioxide and nitrous oxide, are emitted along the entire supply chain and are affected by various practices and processes, including fertilizer use, agronomy, harvesting, conversion and distribution (Arneth et al, 2007). Studies show that the burning of agrofuels derived from rapeseed and maize and conversion of rainforests, range and savanna lands in the US, Brazil and South East Asia creates “biofuel carbon debt’ by releasing more CO_2 than the annual greenhouse gas reductions these agrofuels provide by displacing fossil fuels. However, the production of fuel from waste biomass grown on marginal lands planted with perennials produce has no or very little Carbon emissions (Crutzen et.al, 2007).

The greenhouse gas (GHG) balance of agrofuels varies dramatically depending on such factors as feedstock choice, associated land use changes, feedstock production system, and the type of processing energy used (Searchinger et. al, 2008; Righelato et.al, 2007).

Perhaps most importantly, since large-scale food and nutrition insecurity already exists, and will likely be exacerbated by on-going and future changes in climatic conditions, the focus of national governments in the least developed countries and partnering bilateral and multilateral agencies should remain on increasing the productivity and resilience of agricultural production systems and natural ecosystems.

2.2.1 Economic impacts

2.2.1.1 Impacts on price of food, food security and the right to food

The production of agrofuel feedstock has serious impacts on the economy of many developing countries because the market for agrofuels and non-energy agricultural products are closely related (Doornbosch and Steenblick, 2007; Schmidhuber, 2006), and the rising demand for agrofuels is translating in to higher market prices for some agricultural products (IEA, 2006, UNEP, 2008, UNCTAD, 2007). According to forecasts by OECD-FAO (2007), in their joint publication Agricultural Outlook 2007-2016, the rapid expansion and growth of the agrofuel industry is likely to keep food prices high and increasing throughout the next decade at least. Such primary commodity price increases can have ripple effects on related goods. For instance a sharp rise in soybean prices in mid 2006, caused by the replacement of soybean cultivation with corn cultivation for agrofuel production in the US, led to higher prices for animal feed and meat (UNCTAD, 2007). A confidential World Bank study also estimated agrofuels had forced global food prices up by 75%. Other reports coming out of Europe and the US also hint that the EU and the US drive for agrofuels had by far the biggest impact on food supply and prices (for specific projections, see Table 1).

Table 1: Projected rise in food prices due to the competition from agrofuels

Selected food crops	Projected rise in prices of food crops (%)	
	2010	2020
Wheat	20	41
Oil seeds	26	76
Maize	20	41
Sugar beet	7	25
Sugar cane	26	66
Casavva	33	135
Manioc	33	135

Source: Adopted from Rosegrant M. W. et. al (2006)

More generally, increased commodity prices can have serious consequences for the weakest and poorest segments of the international community-food importing and aid dependent countries in the Global South. In the first place, the production of agrofuels tends to favor large scale and industrial agricultural practices, and small-scale farmers practicing traditional agricultural methods may be effectively excluded from the production of biofuel feedstock (UNEP, 2008). Secondly, the technologically intensive and mechanized nature of the production system may displace local producers. Third, land use conflicts and displacement of indigenous communities may aggravate the situation of food and food insecurity thereby violating the human and

land use rights of these communities. Fourth, in many developed countries a variety of incentives and policies are currently in place to directly and indirectly support domestic production of agrofuels through border protection, such as import tariffs, excise and sales taxes and volumetric subsidies. For example, OECD countries, which produce ethanol, also apply tariffs which increase the cost of imported ethanol by at least 25% (Doornbosch and Steenblick, 2007). Such trade-distorting domestic subsidies limit trade between developing and developed countries (Dufey, 2006; Steenblik and Simon, 2007).

Food security is a "situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2008). The right to be free from hunger has been defined as a fundamental human right in international human rights law, to be given the highest priority both in national and international policies regarding food and agriculture. Most States have recognized that everyone has a right to adequate food and a fundamental right to be free from hunger (Covenant on Economic, Social and Cultural Rights, Article 11, 1966). However, the impact of shortage of food because of the displacement of food crops and/or soaring food prices on the enjoyment of the right to food for poor people is devastatingly high. Even before the dramatic rise in the cost of food, millions of people in the developing countries were food insecure because they did not have economic or physical access to enough food. It is true that many factors are responsible for the rising cost of food in recent years. These factors include drought, increasing global grain consumption, flooding, escalating conflicts and other social and political reasons. But, there is no doubt that agrofuel production has had a substantial impact on the increasing cost of food, though opinions differ on the degree of the rise caused by agrofuels and its related factors. In May 2008 the UN food adviser reported that about 100 million people were either food insecure or at risk of being food insecure due to food price increases linked to agrofuels.

2.2.1.2 Impacts on livelihoods

The allocation of huge tracts off land for agrofuel investments and the subsequent clearance of critical ecosystems, such as forests, rangelands and wetlands to make way for agrofuel plantations have rightly raised serious concerns from environmental activists. But many communities and millions of people also face displacement from their land and main livelihood sources as the scramble to supply intensifies. Those most at risk are some of the poorest and most marginalized in the world. The chair of the UN Permanent Forum on indigenous issues recently warned that 60 million indigenous people worldwide face clearance from their land to make way for agrofuel

plantations. The experience in Indonesia, the Philippines and Colombia shows the forceful expulsion of rural communities from their ancestral lands through unlawful and forceful measures. The experience in some African countries (Tanzania, Uganda, Benin, and Ghana) is not different as many vulnerable rural communities are being forced aside to make way for agrofuel plantations (ABN, 2007). Land alienation and the curtailment of access rights can destroy rural livelihoods, undermine traditional cultures and lead to a loss of traditional knowledge (Dufey, 2006, UNDP, 2007, Marti, 2008).

2.3 Social impacts

2.3.1 Indecent work for employees and bad deals for out-growers

Labor standards on agrofuel plantations can be horrific. Sugarcane plantation workers in Brazil are paid according to how much sugarcane they cut – they may earn a little over one dollar per tone (Oxfam, 2006). Plantation workers can live in squalid conditions without access to clean water, and may be forced to buy their food and medicine from the plantation at inflated prices. In some cases, as in the oil palm plantations in Indonesia, women and children may often be drawn into unpaid work in order to help their husbands meet production quotas (FAO, 2008). For most women, this comes in addition to other responsibilities such as child care, food production, and collecting firewood and water, which, due to the sheer scale of plantations, they must travel much further to find. Indonesian women workers are also routinely discriminated against: estates often pay them lower wages than men simply because they are said to have easier work. In Malaysia, women make up about half the workforce on plantations, and are typically recruited as sprayers of dangerous herbicides and pesticides. All too often, proper training and safety equipment are lacking, with serious implications for long-term health.

Sometimes, smallholders or migrant workers are forced into slave labour due to debts bondage to plantation companies either from credit for starting cost for smallholders, or from transportation and rent costs for migrant workers (Oxfam, 2006). There are also a series of issues like health hazards, poor housing, low wages, as well as inequalities between permanent and daily labours. Since the bargaining power of unions or workers are so weak that foreign companies often ignore their requests. In Indonesia, in 2007 a palm-oil company fired over 700 union members in retaliation for a strike, forcibly evicting the workers and 1,000 family members from their homes, and expelling their children from school (Marti, 2008; MOPIC Report, 2007).

Massive private agrofuel plantations are not the only models of energy production in the developing world. There are attempts to develop the sector through supporting

small-scale family out growers. The experience so far in Africa, however, is not promising. For example, some private investors in Zambia who choose to grow crops such as Jatropha through huge numbers of out-growers use contracts that last up to 30 years. These contracts serve to transfer control over production from the farmer to the company, using a system of loans, numerous extra charges and service payments, and prices determined by the company. Under such a system of dependence, farmers are likely to increase their indebtedness to the company, until they may be obliged to hand over their land altogether.

2.3.2 Land conflicts

Development of large-scale agrofuel plantations in developing countries frequently entails local communities being displaced from their land. Human rights and labor rights are also sometimes violated. The UN's Permanent Forum on indigenous issues recently reported that the expansion of palm oil in Asia "comes with serious social and environmental costs which adversely impact on indigenous peoples, forest-dwellers and the tropical rainforests"(UNPFII, 2007:7). In Indonesia, since indigenous people and other rural communities rarely have formal land rights, palm oil companies have taken over large tracts of customary right lands and community forest, which traditionally provide a livelihood to 40 million people. Such developments often lead to numerous, persistent and often violent conflicts between local communities and companies (Friends of the Environment, 2005). In Colombia, estimates shows that between 1.87 and 3.83 million of people have been displaced by violence such as murder or massacres, threats, kidnapping and torture. Their lands are seized and some of those are now planted with oil palm (Mingorance, 2006).

2.3.3 Environmental health impacts

Pesticides and herbicides used in the production of mono-crop industrial agrofuel plantations may lead to water and soil contamination with serious health risks to local communities. According to some sources (Machado, 2006; Semino, et.al, 2006), in soy plantations in Brazil and oil palm plantations in Papua New Guinea, the herbicide Paraquat is often used to kill weeds and other plants. Paraquat is banned in many countries due to its toxicity and is classified as a "Restricted Use Pesticide" in the U.S., requiring special license to purchase and apply the chemical. With the advance of genetically modified soy in the Amazon, the toxic herbicide Roundup is also widely used. In the U.S., Roundup is applied directly to the root of the plant to avoid toxic exposure. In the Amazon and other areas where Roundup Ready soy is planted, Roundup is sprayed aerially. Drift from this spray is extremely damaging to all life forms, including people.

2.3.4 Gender issues

The development of bio/agro-fuels and the socio-economic and environmental transformation prompted by the growing global demand for agrofuels might have different impacts on men and women in developing countries. Men and women within the same household as well as male- and female-headed households could face different risks, particularly with regard to their access to and control of land and other productive assets, their level of participation in decision-making and socioeconomic activities, employment opportunities and conditions, and their food security. This reflects men's and women's different roles and responsibilities within rural economies, as well as pre-existing socio-economic inequalities between them. Both the nature and the magnitude of the gender-differentiated impacts of agrofuels production will depend on the specific technology and on the socio-economic and policy context considered.

Large-scale agrofuel plantations require large tracts of land and modern agricultural technologies and inputs for economies of scale, competitiveness and profitability. This may entail a process of land concentration, monoculture and eviction or marginalization of communities who have traditionally lived and owned or used the land and other natural resources. Such a process is more likely to have a particularly negative impact on women's role in agriculture and pastoralism. In many developing countries, women have the most important role both in production and preparation of food for their households and feed for their animals. According to a recent analysis of the gender-related risks associated large-scale production of feedstock for agrofuels, women and female-headed households may face socio-economic marginalization in several ways (FAO, 2007). Firstly, large-scale plantations for such production require an intensive use of resources and inputs to which smallholder farmers; particularly female farmers traditionally have limited access. Secondly, if so-called 'marginal' land is converted into agrofuel plantations, women will be denied access to water, food, fodder, fuel wood, building materials and other locally important resources.

There are also some policy dilemmas. Many governments in Africa and other developing countries who faced serious dilemmas between food security and energy security have developed their biofuel strategies and policy directives to use so-called marginal lands for planting energy crops. This is because of the perception of "marginal" lands as "wastelands", unused or unproductive areas. However, these lands represent an integral part of the livelihood of rural poor, to which they supply essential commodities such as food, fodder, fuel wood, medicines, building materials, and so on (Rajagopal, 2007). So-called marginal lands provide therefore key subsistence functions, particularly to the most vulnerable (GBEP, 2007). These

marginal lands are particularly important to women. There is evidence, for instance, that in several Sub-Saharan African countries, women are often allocated low quality lands by their husbands or local administrators who are usually men (Dey Abbas, 1997; Saito et al., 1994). On marginal lands, women have traditionally tended their animals, fetched their water and grown crops for household consumption, rituals and medicinal uses. The conversion of these lands to plantations for agrofuels production might therefore cause the partial or total displacement of women's pastoral and agricultural activities towards increasingly marginal lands, with negative repercussions for women's ability to meet household and community obligations, including traditional food provision and food security. Furthermore, if land traditionally used by women switches to energy crop plantations, the roles men and women play in decision-making concerning household agricultural activities may be altered. In particular, women's ability to participate in land-use and animal husbandry decision-making may be reduced, as the amount of land they control will decline (FAO, 2004a; FAO, 2004b; Wooten, 2003).

The potential loss of biodiversity from the expansion of biofuel plantations might affect men and women differently. The removal of wild edible and medicinal plant species would have negative repercussions on poor rural households, who are largely dependent on natural resources and biodiversity for their food security and livelihoods, particularly in areas prone to food shortages (FAO, 1999). The loss of such plant species would also threaten the knowledge and skills associated with the collection and the utilization of such species, particularly among women, who are often responsible for their collection, preparation and consumption and thus have a more highly specialized knowledge than men of wild plants used for food, fodder and medicine (FAO, 1999). The potential biodiversity loss associated with agrofuels production might also lead to a "narrowing of future options", through the loss of genetic information and genetic material (and of the associated knowledge) that could be introduced into domesticated crops and stock through breeding (IUCN/DFID, no date). On the other hand, the potential depletion (or degradation) of natural resources associated with agrofuels production may place an additional burden on rural farmers' work and health, in particular on female farmers. If agrofuels production competes, either directly or indirectly, for water and firewood supplies, it could make such resources less readily available for household use. This would force women, who are traditionally responsible, in most developing countries, for collecting water and firewood, to travel longer distances, reducing the time available to them to participate in decision-making processes and income generating activities (Lambrou and Laub, 2006).

2.3.5. Environmental impacts

2.3.5.1 Land use change, biodiversity and climate change

One of the most commonly noted environmental impacts of biofuel (agrofuel) production is land-use/cover change. Given the rising demand for agrofuels globally and that this demand is expected to continue to increase over the next decade (Steenblik, 2007) increasing amounts of land will likely be devoted to agrofuel production. For example, it is estimated that a 10% substitution of petrol and diesel fuel would require that 43% and 38% of current cropland in the US and Europe, respectively, be devoted to feedstock production (IEA, 2005), or that the production of feedstock increases overseas. The choice of feedstock, the place where it is grown and the cultivation practices used all play a significant role in determining if the production of certain energy crops will have negative or positive impacts on the environment and the magnitude of those impacts.

If crops are grown on degraded or abandoned land, such as previously deforested areas or degraded agricultural and grazing lands, and if soil disturbances and water pollution are minimized, the production of feedstock for biofuels could potentially have positive impacts on the environment in comparison to annual monocultures or arable land. If, on the other hand, the production of biomass for agrofuels replaces other land uses the net impacts could be negative.

Among some African and OECD (Organization for Economic Cooperation and Development) member countries, the increasing demand for oilseed has already begun to put pressure on areas designed for conservation (Steenblik, 2007). Similarly, the rising demand for palm oil has contributed to excessive deforestation in parts of South-East Asia (Rajagopal and Zilbermann, 2007; Koh, 2007). Further, as biomass feedstock can be produced most efficiently in tropical and sub-tropical regions, there are strong economic incentives to replace natural ecosystems with high ecological services and biodiversity values with energy crop plantations (Doornbosch, and Steenblik, 2007).

Land use change associated with the production of energy crops would also affect carbon dioxide emissions. If energy crop plantations are established on degraded sites, the sequestration of carbon could be increased, thereby reducing the impacts of climate change. Similarly the use of low input agricultural practices and high diversity systems on degraded lands could result in carbon being sequestered as a result of rising soil organic matter (Tilman, Hill and Lehman, 2006). On the other hand, if energy crop plantations are established on forested or carbon rich soils any reduction achieved through the use of agrofuels could be negated or even greatly out-weighed

by the release of greenhouse gases stemming from land use change and the production of feedstock. Processes such as draining wetlands and cleaning land with fire are particularly detrimental with regard to greenhouse gas emissions and air quality (Fargione et. al, 2008).

2.3.5.2 Impacts on water availability and quality

Water availability is regarded as a major challenge to sustainable development and is a component of the Millennium Development Goal 7 (Ensure Environmental Sustainability). Agrofuels development affect water resources in at least two ways: water use for the irrigation of crops used as feedstock for biodiesel production; and water use in the production of biofuels in refineries, mostly for boiling and cooling.

In addition to the potential impacts of land use change, the production of energy crops can also have impacts on water availability and quality. This aspect is a serious concern as the loss of biodiversity in inland water ecosystems is occurring almost twice faster than in any other major ecosystem (Comprehensive Assessment of Water Management in Agriculture, 2007). Several studies emphasize that the production of energy crops could have a negative impact on water resources, especially when annual crops with high water requirements and relatively low water use efficiency such as are palm oil, sugar cane and maize are used (Berndes, 2002, De Fraiture et. al., 2007; Rajagopal and Zilberman, 2007). Further some cultivation practices such as growing tree crops without under growth and planting species that do not generate adequate litter, can reduce the ability of precipitation to penetrate the soil and replenish ground water supplies (Kartha, 2006). The practice of draining wetlands and widespread use of pesticides (as in the case of Soya bean farms in Brazil) threatens the health of ecosystems and down-stream water users (WWF, 2003).

3. The Ethiopian experience

3.1 Context and background

3.1.1 Biophysical and demographic characteristics

Ethiopia is land of contrast. With a total area of 1,127,127 km² and a population of 74 million, increasing by some 2.9 percent per annum, it is the second most-populous country in Sub-Saharan Africa (CSA, 2008; EMA, 1988). Yet with a very feeble economic bases and fragile agro-climatic conditions, it is among the bottom of the least-developed countries in the world. Its per capita income is among the lowest of the least-developed countries, and its reliance on small-scale family based agriculture

(crop and livestock production) among the highest in the group: 85 percent of the population is rural. Population density is varied and follows altitudinal and agro-ecological lines. The highlands (humid or dega areas) are the most densely populated, while the lowlands (arid and semi-arid or kolla areas), which hold the largest percentage of landmass and livestock populations, have the lowest population densities.

Ethiopia's tropical location (3° N and 15°N latitudes and 33°E and 48°E longitudes) and its varied topography and altitude have produced a variety of microclimates. The national mean annual rainfall ranges from 2000-mm over some pocket areas in the southwest highlands to less than 250-mm in the southern and northeastern lowlands. An important characteristic of Ethiopian rainfall is that it exhibits high variability in time and space. This variation is largely due to global temperature rises, orographic effects and to other weather extremes affecting the country. On the other hand, mean annual temperature in Ethiopia is estimated to range between 10°C on the mountains of the northwestern and southeastern highland areas and 35°C in the northeastern lowlands. The highest mean maximum temperature of more than 47°C occurs between October and March in the southern and northeastern lowlands (EPA, 2003).

Ethiopia is among the countries hardest hit by climate change. According to NMSA (2001) there has been a general trend of atmospheric warming and increased incidence of drought and flooding incidences in Ethiopia. A temperature rise of 0.3 per decade is recorded for the mean minimum and maximum temperature in the highlands (Muna, 2006). Similarly, other reports have predicted rising temperature and reduced precipitation patterns in the future (UNEP, 2006). Thus, climate change, coupled with the ongoing problem of land degradation and poor socio-economic infrastructure is feared to exacerbate the problem of food production and environmental management in the country (Aklilu and Alebachew, 2009).

3.1.2 Poverty profile of Ethiopia

Ethiopia's economy is based on agriculture. This sector is responsible for more than 90% of exports, more than 85% of employment, and 55% of GDP (Degu, 2000). The export sector mainly comprises coffee, chat, oil seeds, pulses, livestock products and increasingly horticultural products. The agricultural sector is mainly based on some 10 million small-scale household farms, which produce over 95% of agricultural output. They are constrained by, among others severe land shortages. The average household landholding is about 1 hectare (Deininger et. al, 2003). However, a large and growing proportion of farm households in the highlands (20-25%) cultivate

less than 0.5ha of land. This is often insufficient to an average rural family for a full year, even with adequate rainfall.

The outcome is poverty and food insecurity. According to the latest Human Development Report, Ethiopia ranks 169 (out of 177 countries) in the Human Development Index, an assessment combining per-capita income, life expectancy, adult literacy and primary school enrollment and literacy rate (UNDP, 2007). Ethiopia has one of the highest infant mortality rates (97/1000). Average food intake is reported to be 1840 calories per day or about 17 percent below the average for sub-Saharan Africa. Child malnutrition is widespread, with 47 percent of children under five significantly underweight and moderate to severe stunting affecting 52 percent of children. Some four to million people are chronically food insecure and require food aid from year to year on an ongoing basis. An additional six to seven million more people are transitionally food insecure, and require food aid when the rains fail or under-produce.

Overall poverty, mostly caused by failed government polices and successive droughts, poor environmental management records, poorly performing agricultural sector, and dependency on foreign aid coalesce to paint a bleak outlook for Ethiopia (UNDP 2003, 2007; MEDaC, 1999). Despite sustained attempts by the EPRDF (Ethiopian People's Revolutionary Democratic Front) government towards poverty alleviation, Ethiopia still remains one of the world's poorest and food insecure countries. The level of poverty, although widespread and deep, remains extremely unequal among the poor (MEDaC, 1999). The majority of the poor who live in the countryside often lack adequate resources in terms of farmland, grazing land and necessary inputs and support for economic and social productivity. Lowland herders and small-scale farmers are often the most vulnerable to drought and famine and the most likely to descend into destitution due to climate change and weather fluctuations (Aklilu and Alebachew, 2009).

In addition to the problem of expanding demographic pressures and the severe shortage of land, the country must contend with the problem posed by global warming which include frequent climate shocks from erratic rainfall regimes, rising temperature trends and constrained adaptive capacity.

3.2 Ethiopian biofuels development and utilization strategy

Energy plays a pivotal role in economic and social development. In many of the least developed countries most of the energy comes from biomass with most of it being used for household consumption. In Ethiopia biomass accounts for 91.5% of the

country's total energy demand while imported petroleum and electricity supply 7.4% and 1.1% of the requirement, respectively. Despite the small share of modern energy in the country's energy consumption, Ethiopia imports its entire petroleum fuel requirement and with expanding demographic and economic pressures the demand for petroleum fuel is rising rapidly. Imported petroleum products accounts about 40% of total imports and absorb 60% of export earnings. The volume of imported fuels grew by 115% between 2004 and 2005 and the fuel bill increased tremendously and consumed about 82%/ of the country's foreign exchange earnings. On the other hand, the overdependence on traditional biomass has caused tremendous pressure on the limited environmental resources of the country.

Given the rising cost of petroleum oil prices and the increasing volatility of the market, the mounting pressure on natural resources for traditional energy and the impact of this on agricultural production, finding alternative energy sources that could fully or partially replace imported oil and/or decrease the pressure on fuel wood is very essential. In addition to environmental benefits, supply security for petroleum fuels is essential for sustained economic development as reduction of the petroleum import bill will enable the government to allocate more of its scarce foreign exchange earnings to other development investments and expenditures. In this regard, renewable energies can have substantial contribution to the country's efforts to reduced poverty and bring about sustainable social and economic development. To realize such objectives, Ethiopia has developed a biofuel development and utilization strategy. The biofuel strategy of the FDRE was prepared by the Ministry of Mines and Energy and issued in August/September 2007.

3.3 Issues and rationale for biofuels development in Ethiopia

The Ethiopian biofuels development and utilization strategy is developed with the twin objectives of achieving energy security via diversifying the energy sources in the country and lowering exposure to the price volatility in international oil market including kerosene and LPG gas. It is also hoped that such developments will expand rural and social development through job creation in feedstock production, transport and distribution and building local industrial bases. By blending ethanol with gasoline and biodiesel with diesel, the strategy further intends to reduce contribute to soil and water conservation and more generally to the global effort in fighting climate change and its harmful impacts on economies, social systems and ecosystems.

The biofuel strategy document justifies the economic viability of biofuels development in Ethiopia in terms of saving scarce foreign exchange through import substitution, generation of jobs, rural development and foreign exchange earnings from exporting

biofuels and accessing funds through carbon trading. It also argues that Ethiopia has comparative advantage for the production of energy crops in terms of large human power, land and suitable climate for biofuel development.

According to the strategy document, in Ethiopia the gross available potential land for production of feedstock for biodiesel is estimated to be 23,305,890 hectares and the total irrigable land for sugarcane production for ethanol production is about 700,000 hectares. Thus, according to the strategy Ethiopia has a potential to produce 1billion liters of ethanol within available suitable land.

The strategy is developed based on the assumption and selection of Jatropha curcas as a principal feedstock for biodiesel production followed by Castro bean and Sugarcane as a principal feedstock for ethanol production. The strategies focus mainly on stimulating feedstock enhancement, stimulating demand, and enhancing environmental sustainability, capacity building, defining roles and responsibilities of different institutions, supporting research and development, awareness creation and promotion of biofuel and establishing biofuel development program. In this regard, the strategy document contains some important principles to guide the implementation of the biofuel development strategy:

- Making sure that the production of biofuels supports national food security;
- Making sure that development of biofuels does not harm economic development, environmental and cultural values or conflict with traditional land, water and grazing land use rights of farmers and pastoralists;
- Ensuring broad participation of farmers and pastoralists for benefit sharing;
- Maintaining environmental sustainability through conservation and improving of soil fertility, water quality and biodiversity;
- Ensuring the economic utilization of by-products of biofuels and the detoxification of toxic substances for environmental safety;
- Ensuring sustainability of the country's economic resource development and securing maximum benefits from the use of biofuels;
- Ensuring coherence between biofuel production and international principles of greenhouse gas emissions;
- Focus on the sustainable use of local resources based on mosaic-style farming patterns (including forest restoration areas, etc) rather than monoculture that erode biological diversity;
- Avoiding displacement of local communities or indigenous peoples, or encroachment into any of their traditional territories, including those where these communities' land ownership has not yet been recognized in its entirety by the government in their country;

- Support communities, especially those that are socially or economically marginalized. Local farmers and communities should have ownership and control over biomass production and processing facilities, generating income for local communities;
- Eliminate the use of agrochemicals and artificial fertilizers. Switching to non-intensive production will also be vital to reducing emissions of nitrous oxide;
- Ensure that the development of any further bioenergy technologies does not involve the development or release of GM crops or trees into the environment because of the environmental, cultural and socio-economic impacts they may have on the conservation and sustainable use of biodiversity;
- Be based on sustainable local biomass standards, certification or labeling systems, that have been developed, administered and supported by a democratic process that includes local and affected communities;
- Avoid any conflict with food production and food sovereignty, either by directly or indirectly removing land from food production or by leading to an increase in food prices.

3.4 Brief review of the biofuel strategy

The oil crises of the 1970s stimulated the same passion for renewable energy (solar, wind, water in particular). It should be noted that more than three decades later, countries like Ethiopia which are better positioned in such renewable energy sources as water, wind and solar sources, have not managed to leverage these sources for energy security, poverty reduction or sustainable development. There is a sense of urgent and immediate need in Ethiopia to carry out in-depth reflections in the biofuel sector, which is still not fully understood.

The bottom line is that agrofuels development-if targeted at degraded lands, and designed with appropriate social, economic and environmental safeguards-could provide benefits in the form of land rehabilitation and local income and employment opportunities. However, improved planning and law enforcement is necessary to ensure biofuel development does not take place at the expense of farming and pastoral communities and the range and forestlands and the communities that depend on them. This requires careful investigation into the impacts of biofuel production and use on society, economy and the environment for each biofuel system on its own merits and against social, environmental and economic sustainability criteria.

The Federal Democratic Government of Ethiopia (FDRE) has prepared several well-intentioned, well-formulated and clearly stated national sector policies and strategies

with the aim of developing the respective sectors and promoting social and economic development in the country as a whole. The biofuel strategy is one of these sectoral strategies developed with the aim of achieving energy security and initiating rural and social development through generation of employment opportunities, improved incomes and better living conditions, agricultural innovations and export earnings. The strategy document is comprehensive in terms of coverage. It gives major strategies including the intensification of biofuels development, acceleration of technology transfer, research and development, increase domestic use and export trade, increase flow of finance and strengthening international cooperation in biofuels.

Biofuels development strategy documents elsewhere have set a fixed amount of mandatory targets with a given penetration level and time frame for agrofuels production and use in transport fuels. As in the EU Biofuels Directive, the targets may be set on some conditionality such as production being 'cost effective', 'sustainable' and 'second generation being available'. In this case, the Ethiopian biofuels development and utilization strategy lacks some important details and short and long term targets for biofuels development with specific time limits and measurements or a certain penetration level and time frame ((Bekele, 2008; Yohannis and Hilawi, 2008).

At the world scale, the rapid increase in biofuel demand has recently led to prominent warnings by respected bodies such as the United Nations. Many interest groups, activists and social scientists who are concerned with current practices in agrofuels development are increasingly warning against the social, cultural, economic and environmental costs of current and projected developments in large-scale biofuel (agrofuel) plantations and are calling for reconsiderations in the pursuit of precautionary and sustainable measures for the interests of all stakeholders in the energy sector. In Ethiopia too, with the rising demand and request for huge plots of land, biofuel (agrofuel) cultivations has also come debate regarding the potential positive and negative impacts of these investments on society (particularly indigenous and local communities), food security and sovereignty, biodiversity and the environment as a whole. While proponents of agrofuels (the government, investors and some other stakeholders) point to the potential for energy security, export earnings and greater economic opportunities for farmers, pastoralists and other rural communities, many others argue that agrofuels risk damaging the already mismanaged biodiversity, marginalizing indigenous and local communities and creating more greenhouse gas emissions than they prevent. This debate is further complicated by the lack of coordination, transparent approaches, free flow of information and trust among the various stakeholders in the sector.

Agrofuels must be considered within an overall energy ‘‘mix’’ which should also integrate other forms of clean alternative energies. Beyond the diversification of energy sources, energy efficiency should also be a strategic priority both for production and of consumption systems. Careful attention must be paid to agrofuels whose large-scale development involves numerous actors. A national multi-stakeholders dialogue and a harmonization of energy, agricultural, environmental and social policies should be assured in order to maintain a balance between food security, energy, and the right to local community and sustainable social development. Priority should also be given to the strengthening of small-scale local production on selected ‘marginal’ or ‘unused’ (by humans, animals, plants) lands in order to satisfy national needs and to provide benefits at the local level. International trade could be considered but only as a secondary option.

The other important but debatable issue is the total estimated land said to be available for agrofuels development. According to the strategy about 23.3 million hectares of land is available for biodiesel development while the total irrigable land for sugarcane production for the expansion of ethanol production is about 700,000 hectares. There are serious doubts as to whether this much of ‘marginal’ land could be available for agrofuels production. Most people are not sure if such estimates include arable land, forested areas, wetlands and other protected areas. Given the absence of careful land inventory and reliable and up-to-date statistical data, it is very difficult to have a reliable and accurate estimate of the total land that can be made available for the cultivation of energy crops. Some suspect that some regions might have reported inflated figures. Given expanding animal and human population, increasing settlements and land use changes (conversion of forests and rangelands in to farms and settlements) the reliability of the estimate need to be questioned. There is need for conduct of careful and detailed land-use inventory and land use plan at regional and federal levels.

The strategy is prepared on the premises of contributing to the national and local needs for food security and rural development, protecting the interests of local communities and contributing to the global fight against climate change. However, the reality on the ground might be totally different. It is understood that Ethiopia is new to the modern production of liquid agrofuels and some problems and challenges may be faced at the initial stage of implementation. But if the reality so far and the experiences from regions is not given due attention at this stage, the social, economic and environmental benefits outlined in the strategy document may not be realized (for details see Gebremedhin, 2008, Negusu, 2008a). Reports from five major regional states (Oromiya, Amhara, SNNPR, Benishangul Gumuz, and Gambella) showed that the rush to agrofuels development in Ethiopia is being conducted without due concern

to the environment and the interests and expectations of local communities where large plots of land are being allocated for large biofuels projects (Derese, 2008; Mach, 2008; Mesfin, 2008).

The reports from all the five Regional States clearly demonstrated how biofuels development is being conducted without any reference to the guiding principles put in the strategy document. No environmental or social impact assessment has been done. It has also been reported that local officials allocate land with little or no knowledge about the federal biofuels development strategy of the country. On the other hand, reports show that sometimes land is allocated to investors for the cultivation of energy crops without the knowledge or prior information of concerned regional offices. Such practices really pose a threat to the country's economy, local livelihood systems and ecosystems and call for a reconsideration of the experiences so far for the interest of sustainable social and economic development through maximizing the expected benefits spelled out in the biofuel strategy document.

3.5 Challenges observed in the implementation of the biofuel strategy

3.5.1 Questions regarding the availability and suitability of land for energy crops

It is clear that the biofuel strategy of Ethiopia aims to contribute to Ethiopia's development goals through energy security, job creation, rural development and transformation as well as reducing the negative impacts of energy consumption on the environment. With such objectives, the Federal government has declared that 20% of the country's land is allocated as appropriate for biofuel production. Many foreign companies and local developers have already been allocated land from farmland, forests, rangelands and other protected areas.

Table 2. Land available for biofuel production

Region	Total Area (ha)	Area claimed suitable (ha)	% from total
Tigray	5,007,864	6,500	
Oromia	35,300,681	17,234,523	50%
Benishangul Gumuz	4,928,946	3,128,251	60%
SNNPR	11,234,319	49,025	
Gambella	2,580,261	2,829,999	???
Somali	NA	1,485,000	
Amhara	15,917,366	966,535	
Total	115,000,000 (?)	23,305,890*	20%

Source: Adopted from MoME (2007) and Derese Bekele (2008)

However, more and more commentators and researchers are increasingly questioning the allocation of a fifth of the country's land area in to energy crops (Negussu, 2008; Gebremedhin, 2008). Given the lack of any reliable and up-to-date statistics on the distribution of land resources and any land use zonnation in the Regional States, the allocation of such huge land area for the production of energy crops is questionable. "Declaring a fifth of the country as a land available and suitable for agrofuels would be misleading because the assessment is not based on detailed suitability assessments that takes into account a range of other factors" (Negusu 2008b: 126). Large tracts of crop, range and forestlands are included in the areas designated as unproductive or 'marginal' for crop and livestock production and hence suitable to the production of energy crops. The lack of any acceptable definition or shared understanding on what constitutes a 'marginal land' in Ethiopia is also another serious challenge which needs to be addressed if the strategy is to achieve its major goals.

3.5.2 Exaggerated claims about marginal lands and the productivity of Jatropha

Ethiopia has a total landmass of 1,127,127 km², and geographically most of that area is located in the arid and semi-arid lowlands where temperature is high and the rainfall extremely low and variable. The population density in the lowlands is sparse and the economy is predominantly based on pastoral and agro-pastoral activities. Because of the assumptions that Jatropha can grow well and produce better yield in such arid and semi-arid lowlands (with rainfall as low as 200mm and mean temperature of 20-25°C), much of the dry lowlands are assumed marginal, vacant and suitable for Jatropha plantations. However, the assumption that the dry lowlands

of Ethiopia are more or less vacant, unproductive or less productive and thus more suitable to Jatropha crops is misleading. The lowlands of Ethiopia support millions of pastoral and agro-pastoral communities who eke out a living out of the most fragile environment with complex economic and social systems based on long-standing and well-respected resource management systems based on opportunism and flexibility. In addition to the fallacious assumptions about Jatropha, the introduction of large plantations and annexation of land from the indigenous tribes will not only compromise their livelihoods, but affect the already fragile and changing local ecosystem in the arid areas. Most of the positive characterizations and claims that have led to the popularity of Jatropha curcas as a high-yielding crop that can thrive under dry climatic and poor soil conditions are not proven beyond doubt (GRAIN, 2007; Jongshaap et. sal. 2007; Quwens et. al., 2007).

Other critics of Jatropha crops voiced serious concerns about the environmental and social impacts of the crop. For instance, Western Australia has banned Jatropha due to its toxicity to both human and animal lives, and its ability to become a hard-to-control weed. Commentators further state that claims of Jatropha thriving under low precipitation, high temperature and poor soil conditions, and needing no irrigation are misleading and false due to the unsustainably low yields. They argue that instead of so called marginal land being used to grow Jatropha, Jatropha will end up competing with food crops for the best lands and intensifying the food crisis in food insecure rural (agricultural and pastoral) areas (GRAIN, 2007; Hamza, 2008).

3.5.3 Social dislocations and livelihood insecurity

The biofuel/agrofuel industry is very active in Ethiopia, and the Federal government is doing all it can to attract foreign investment. According to latest data from the Regional States, more than 60 developers in various regions are registered for development of energy crops for the production of biodiesel and bioethanol (6 projects out of which 4 are government projects) production (Yohannes and Hilawi, 2008; see also Derese, 2008; Mach, 2008; Mesfin, 2008). The most popular crop is Jatropha, followed by castor beans and some palm oil in the coffee-growing regions, all of which are to be used to produce biodiesel. There are also moves afoot to establish an ethanol industry and to introduce new, specially bred varieties of crops. However, as the pressure on land intensifies, the growing pastoral and agricultural population and livestock resources will increasingly be facing pressures and displacement from their private and family farms and ancestral communal grazing lands. The majority of the pastoral and agro-pastoral population and those indigenous and local communities around forest and rangeland areas still depend on the farms,

grazing lands and the forest resources for their livelihoods and socio-cultural practices and rituals.

Table 3: Impacts of selected ongoing biofuel/agroful projects in Ethiopia

Company	Land granted and under negotiation (in ha)	Land use type	Social/economic impacts
Horizon PLC	53,000, Gambella	Natural forest	Threat to livelihood and land use conflict
East Africa Holdings	40,000, Gambella	Dense forest	Loss of livelihood and land use conflict
Jatropha Biofuel Agro Industry	80,000, Benlshangul Gumuz	Forest area	Displaced forests Loss of local livelihood
IDC	15,000, Benlshangul Gumuz	Multipurpose	-
Sun Biofuels/NBC	80,000, Benlshangul Gumuz	Forest, woodland, range land	Source of firewood, food and feed to their cattle, and medicine
Ambasel Jatropha project	20,000 (applied for 80,000), Benishangul Gumuz	Natural forest (project needed to clear the forest)	Source of firewood and free grazing area
Flora Eco Power Ethiopia	Obtained 15,000 Requires200, 000, Oromiya	Forest, bush land, cultivated land, grazing land	Lose of wild life, forest cover, etc
Global Energy Ethiopia	-2,500, SNNPR -7,500ha contract with 25,000 out-growers	Agricultural land	Land use conflict (displacement of food crops)
Vatic International	50,000, Amhara	Farm land	Threatened farm land

Source: Compiled from ABN (2007), Yohannes and Hilawi (2008), Derese (2008) and Mesfin (2008).

The Ethiopian biofuel development and utilization strategy also outlines the need for effective and maximum community participation and the need for communication and consultation with key stakeholders. The strategy clearly recognizes that local communities in the pastoral and agro-pastoral lowlands of Ethiopia are totally dependent on mobile livelihoods which are strongly attached to animal herding, mixed

farming and the collection of forest products, and urges that the local communities should not be denied access to their traditional land use rights. It stresses the importance of food security, recognizing that more than five million people suffer from food insecurity, and says that their welfare must not be compromised by the biofuel industry. But in reality, this is already happening: although there is growing population pressure on the land and pastoralists and family based farmers are struggling to make ends meet, vast tracts of land are now being granted to foreign companies to produce energy for export. In most cases, land for cultivation of energy crops is allocated and granted to developers without conducting social and environmental impact assessments (SEIAs). With out consultations and prior informed consent of affected local communities, it is very difficult to claim that communities will be benefit from such large-scale investments. Unless full participation of potentially impacted rural communities is guaranteed, there are fears that the stipulated objectives of the biofuel strategy may not be fully materialized.

There are now a number of foreign biofuel/agrofuel companies operating in Ethiopia. About 400,000 ha of lands have been granted so far to 14 biofuel (agrofuel) companies. But, if one counts land under negotiation, the total increases by more than three-fold of what has been allocated until now.

4. Conclusions and recommendations

4.1 Conclusions

Interest around agrofuels at the international level has exploded over the past few years. The increased interest in agrofuels has been fuelled not only by the rising price of oil and the volatility of the market, but also with regional instabilities and the strained political relationships between oil exporting countries and the West. In addition, several African and other developing countries have engaged in agrofuels development for domestic consumptions as well as export. Ethiopia, meanwhile, is attempting to position itself in the dynamics around agrofuels with a particular concern about maintaining a balance between food and energy security and supporting sustainable development in the country. This position is motivated by the country's strong demographic growth, the urgent need for the improvement of access to energy and, more broadly, by the need for reducing poverty and achieving economic growth.

However, much of the shift toward the development of agrofuels in Ethiopia is occurring without careful consideration of the social, economic, and environmental implications of such systems. The good intentions of the government as stipulated in

the biofuel strategy document gives due recognition and special attention to food security, community participation and the protection of agricultural and forest lands, biodiversity and local populations. The main issue is that agrofuels development, if targeted at degraded or marginal lands, and designed with appropriate social, economic and environmental safeguards, and in consultation with affected communities, could provide benefits in the form of land rehabilitation, generation of local employment and improved income and rural development. However, improved planning and law enforcement is absolutely essential to ensure biofuel development does not take place at the expense of farming and pastoral communities and the grazing areas and forestlands these communities depend on for their livelihoods and socio-cultural manifestations.

Thus, it is important to revisit the limited experiences Ethiopia went through in the development of agrofuels so as to avoid the social, economic and environmental impacts of ongoing biofuel (agrofuel) projects and make appropriate corrections and preparations for the proper implementation of the strategy. However, current progress in the production of energy crops call for Ethiopia to learn from the experiences of other African and Latin American countries and from previous experiences within the country. This will help in the development of a holistic view of agrofuels based on policy and production techniques that takes into account the multifaceted effects of biofuel production.

The current production of biofuels inputs in Ethiopia is not well understood and coordinated. There is urgent need for new levels of cooperation across a wide range of disciplines to help decision makers in the realm of agrofuels to best evaluate the local, regional, and global impacts of their actions. On the other hand, the country's limited experience so far is evidence of the gap between the biofuel strategy and on-the-ground implementation. Good coordination and understanding between federal and regional organs, careful monitoring of implementation practices and harmonization of the interests of various stakeholders is crucial. In order to achieve the stated objectives, Social and Environmental Impact Assessment (SEAs) of projects need to be considered as a prerequisite for land allocation and project implementation with focus in the future on small-scale productions on carefully selected areas to avoid land use conflicts, displacements and forest destructions.

There is also need for understanding the potential gender-differentiated risks of agrofuels production and including them in the biofuel strategy document. This would also ensure the consistency of the biofuel strategy with other important policy objectives, such as sustainable rural development, gender equality, and adaptation to climate change, strengthening the potential synergies – and reducing the risk of

trade-offs – between them. In this case, more research is needed on the identification and substantiation of the potential gender differentiated, socio-economic risks and opportunities of biofuel production at both the intra-household level (i.e. on both men and women) and the inter-household level (i.e. on male- and female-headed households).

4.2 Key messages

- The implementation of the strategy needs to address energy security within a context of integrated energy planning and rural development, with the genuine participation of rural communities, particularly women.
- Providing the economic enabling environment for decentralized, community-owned small scale biofuel production based on organic agricultural production that ensure rural energy and food security.
- Introducing ccommunity, local and national control criteria: small scale, mixed or inter-cropping of feed stocks and local level processing for local community consumption should be given priority with economic instruments (subsidies, levy reductions and tax incentives) targeted specifically to create small and cooperative biofuels enterprises premised on best social and ecological practice.
- The strategy must clearly state social and environmental impact assessment (SEIAs) as a prerequisite for the implementation of biofuel projects. For existing projects, periodic monitoring of environmental and social impacts should be done.
- There is no detail land use plan and land-use inventory in Ethiopia. The strategy should be supported by careful and detailed land use plans and inventories which should help avoid uncertainties with regard to land available for the development of agrofuels in the different Regional States in the country.
- Ensuring that biofuel projects are designed and operated under appropriate, comprehensive, transparent, consultative, and participatory processes that involve all relevant stakeholders. Full involvement of communities and other stakeholders in making decisions about agrofuels demands support in the form of training and skills development (capacity building) and transparency from community representatives and government offices and commitment for maximum benefits to communities and rural areas.
- Ensuring that the development of agrofuels is supported be strong links and coordination between and among different sectors, diverse disciplines and the full participation of all relevant stakeholders from local communities, governmental agencies and civil societies.
- Ensuring that biofuel production respects the human rights or labor rights of workers. There is need for ensuring that decent work and good working and living

conditions are provided for workers, women and men. Particularly the participation of women should be encouraged and supported through the protection of women against discrimination of any kind, whether in employment or opportunity, with respect to wages, working conditions, and social benefits.

- Ensuring that local populations are fairly and equitably compensated for any agreed land acquisitions and relinquishments of rights. Free prior and informed consent and negotiated agreements shall always be applied in such cases. This should be supported by appropriate social and environmental impact assessments (SEIs) to resolve disputes over tenure claims and use rights.

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EDUCATION AS A MEANS OF RURAL TRANSFORMATION THROUGH SMOOTH RURAL-URBAN MIGRATION: SOME EVIDENCES FROM ETHIOPIA[1]

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Abstract

This paper attempts to model the determinants of rural-urban migration in selected villages of Ethiopia. Income differential, one of the determinants of rural-urban migration, was calculated for each respondent from the predicted level of income that non-migrants would earn at destination if they were to migrate and the level of 'reservation' income of the migrants at origin. Income differential in the migration decision model is positive and significant lending support to the standard Harris-Todaro model. More interestingly, level of education is found to be significant in triggering rural-urban migration even after accounting for its indirect effect on migration through earnings. This may support the argument that education changes the preferences of individuals in rural villages in favour of public goods that are found in urban centers over cultural 'status goods' in rural areas.

Key words: Rural-urban migration, status goods, education, self selection

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1. Introduction

A major phenomenon that challenges a typical developing country is unhealthy rural-urban balance where the rural areas are characterized by high population pressure in the face of meagre resource base such as land, and the urban centers grappling with high rate of unemployment and poverty (Ray, 1998; Lucas, 1997). A way out of this abnormal status quo requires a rural transformation-structural change in the livelihood of the rural population which involves a change in the economics, social, demographic, and environmental organizations of the rural area (Koppel and Zurick, 1988).

Rural –urban migration as a means of rural transformation through its effect on the rural-urban balance is constrained by the fact that urban areas are also challenged by high rate of unemployment and rampant poverty. This paper argues that smooth rural-urban migration, that is migration which at least does not contribute to the urban socio-economic problems, can be achieved by making quality education an urban phenomenon.

One of the distinctive features of development process that has been witnessed by the now affluent nations is the fact that their economies have changed from rural based agriculture to urban-based industry (Lucas, 2004; Bhattacharya, 1993). At the heart of such transformation towards what Lucas (2004) called “a society of sustained growth in opportunities,” lies rural-urban migration. In particular, according to Bhattacharya (1993), the more palliative steady rural-urban migration in terms of reducing population pressure in pre-industrial Europe got its momentum following the industrial revolution. The labor intensive industrial establishments induced long term industrial growth and created enough jobs that could absorb the rural surplus labor. This led to a decline in the share of rural population in Western Europe.

Rural-urban migration is believed to help reallocate resources, most importantly labor, from less productive sectors, usually agriculture, to vibrant sectors such as manufacturing industry. It also improves efficiency in both traditional and modern sectors in particular in the presence of redundant labor in the agricultural sector and relatively high real wages in the modern sector (Ghatak et al, 1996).

Regardless of such historical merits that rural-urban migration has had, policy makers in developing countries are fearful of this phenomenon. Thus, their policy interest towards rural-urban migration is dictated by the concern regarding the rate of urban population growth (Lucas, 1997). This is partly due to the undesirable consequences

of migration resulting from the mismatch between urban jobs created and new migrants seeking jobs.

As Bhattacharya (1993) argued, in early 1950s, industrialization in developing countries was favoured not only to ensure growth but also to change the rural-urban population balance. In this regard, the role of rural-urban migration has been emphasised as a positive phenomenon in relieving population pressure in the countryside of developing countries. After the realization of the prevalence of inequality and poverty despite gains in growth in the 1960s, the rural-urban migration came to be considered as both a cause and symptom of underdevelopment in developing countries (Bhattacharya, 1993).

These concerns were complemented by research works in the field. One of the most cited theories in the migration literature that has predictions of unintended results of rural-urban migration is that of Harris and Todaro (1970). The Harris-Todaro model argues that individuals' migration decisions are determined by rural-urban income differentials net of cost of migration and probability of finding jobs at destinations. The most important prediction of the model is that the equilibrating condition of the process of rural-urban migration is unemployment in the urban centers and as such migration is a disequilibrium phenomenon. This follows their basic assumption that urban wages are rigid and are set too high. Thus, development schemes that target on reducing urban unemployment might end up with an even higher level of unemployment rate in urban centers which compromises welfare.

Even though the merit of rural-urban migration is contentious in developing countries, the fact that a large segment of the society of these countries still resides in rural areas necessitates for a policy that targets a smooth rural-urban migration to enhance rural transformation. The pressure of the seemingly alarming rural-urban migration is felt probably because migrants flow mainly to a few destinations, usually the capital cities. The reality is that the long term resultant of the rural-urban migration in developing countries is a low share of urban population. While the share of the rural population in England was 50 per cent as early as 1850 and a mere 11 per cent in 1998 (Lucas, 2004), Ethiopia, in her long history, managed to urbanize only 15 per cent of her population as she enters the 21st century (CSA, 2000 and 1999). In sub-Saharan Africa countries, the average share of the urban population in 2005 was 35 per cent (UN, 2007).

Following the Harris-Todaro (1970) predictions of the persistence of rural-urban migration even in the face of high unemployment in urban areas, there have been a number of extensions to the debate. Stark (1991) argued that individuals may not

migrate even under significant wage differential or they may do so in the absence of meaningful wage differential, and yet this does not imply irrationality. He argued that this has rather something to do with risk-pooling strategy of a household and relative deprivation. Lucas (2004) has associated the phenomenon with human capital where high urban wages are available only for high skilled labors and as such individuals migrate to urban centers because “cities are good places to accumulate human capital.” Thus, at a point in time, it is possible to find individuals who are in the process of learning but not employed. Rural-urban migration in this sense can be perpetuated by the widening difference in skill between the urban and traditional rural workers.

However, it is quite difficult for a rural individual who has never been introduced to some level of education to migrate to urban centers in search for education that would enable him to accumulate the high skill that is required to be able to compete in the urban labor market. This is because the gap between the initial stock of knowledge of an individual and the level of skill required for urban jobs could be too high to the extent that rural values are more appreciated. This paper approaches the problem from a different perspective. When individuals are introduced to some level of education, their preferences change from rural-based traditional status goods to urban-based public goods. Once rural life is considered as backward, higher rural income over the expected urban earnings in urban areas may not be able to keep individuals in rural origins. As such, rural areas are ‘safe’ and effective places to accumulate the initial human capital which serves as a basis for both smooth rural-urban migration and further human capital formation with better quality.

The paper emphasizes the role of education in fostering rural transformation by inducing smooth rural-urban migration. Education, besides its effect on migration through its impact on earnings differential (Fan and Stark, 2008; Lucas, 2004), also has the power to break the cultural inertia that keeps individuals in their original rural place of residence by changing their preference. Since urban employers have a preferential treatment for educated migrants, the level of unemployment may not necessarily be as high as predicted by Haris and Todaro- a point stressed by Fields (1975). More importantly, urban labor markets in developing countries are characterized by a skill gap where the unemployed are unskilled while there is a sheer absence of critically needed skilled manpower.

The empirical section of the paper attempts to model the determinants of rural-urban migration using Ethiopian data collected on both migrants and non-migrants from some villages in North and South Wollo of the Amhara regional state. The analysis gives a particular emphasis to the role of education in inducing smooth rural-urban migration as a means of desirable rural-urban balance.

The remaining part of the paper is organized as follows. Section two briefly assesses the patterns of migration in Ethiopia. In section three, an attempt is made to derive the theoretical underpinnings of the decision to migration in special reference to Ethiopia. Section four discusses empirical results. Section five concludes.

2. Patterns of migration in Ethiopia

2.1 The national pattern

In general, rural-urban migration in Ethiopia has been relatively low for so long. The fact that only 16.2 per cent of the 73.9 million people of the country live in urban centers indicates the sluggishness of the rural-urban migration. The most populous regional states Oromia, Amhara, and Southern Nations, Nationalities, and Peoples which account for 80.4 per cent of the total population have urbanization rate of only 12.4, 12.3, and 10.3 per cent, respectively. The capital, Addis Ababa, accounts for about 22.9 per cent of the total urban population of the nation (CSA, 2008).

The large population in the agricultural sector of the country could not even manage to feed the nation. About 83.8 per cent of the population of this country ekes its living from subsistence agriculture. The agricultural sector in which such large mass of the population is engaged accounts for 43 per cent of the GDP. With declining per capita land holdings, land fragmentation, and loss of soil fertility, rural households hardly accumulate a buffer stock that would enable them to cope with even a onetime crop failure. Thus a development policy that does aim to significantly change such rural-urban balance seems to have a slim probability of success.

According to the 1999 Labor Force Survey of the Ethiopian Statistical Agency (CSA, 2000), 19.9 per cent of the Ethiopian people were internal migrants. For the five years period prior to 1999, only about 4.3 per cent of the population have migrated. These figures include rural-rural, rural-urban, urban-urban, and urban-rural migrations which account for 37.6, 23.5, 23.2, and 15.7 per cent of all migrations, respectively.

In terms of relieving the population pressure in rural areas, the rural-urban migration rate can be shown to be insignificant. Given, according to the 1999 National Labor Force Survey, the total number of migrants and the 23.5 per cent share of the rural-urban migration in all forms of migrations, rural-urban migrants in proportion to the rural population over the five year period prior to 1999 is calculated to be 1.2 per cent. This can be roughly translated as only some 0.23 per cent of the rural population migrating to urban centers annually. This figure contrasts with the 2.7 per cent annual growth rate of the rural population of the country. About 17 per cent of the rural

migrants and 16.8 per cent of urban migrants headed to the capital, Addis Ababa (CSA, 2000).

Table 1: Percentage Distribution of Recent Migrant Population by Broad Age group, Sex and Main Reason for Migration: National – 1999

		Main Reason for Migration						
		Education	Marriage	Search for work	Job Transfer	Along with family	Returned home	To live with relatives
All ages								
	Total	9.0	13.2	17.4	5.1	24.5	10.4	8.2
	Male	10.8	1.4	22.2	8.8	23.4	14.1	8.3
	Female	7.5	23.0	13.4	2.1	25.4	7.4	8.2
0 – 14	Total	8.9	0.8	7.3	0.3	58.0	5.8	10.8
	Male	7.7	0.1	9.1	0.5	60.1	5.2	9.3
	- Female	10.1	1.5	5.5	0.1	56.0	6.4	12.2
15 – 64	Total	9.2	18.7	22.0	7.3	10.6	12.2	6.6
	Male	12.4	2.1	28.7	12.8	6.8	18.0	7.2
	Female	6.6	31.8	16.7	2.9	13.6	7.6	6.1
65+	Total	0.6	0.7	3.8	0.6	8.2	20.4	33.2
	Male	1.1	0.5	4.7	1.2	5.7	24.5	31.8
	Female	0.0	0.9	3.0	0.0	10.5	16.5	34.5

Source: CSA, Ethiopian National Labor Force Survey, 1999.

Generally educated people are more mobile. In the 1994 population census, about 51 per cent of all recent migrants of all forms were literate. The literacy rate of the non-migrants during the same period was however 21 per cent. The migration rate (all forms of migration) for the illiterates was 0.8 percent and this rate progressively increases with education. Among individuals with primary, junior secondary, senior secondary and tertiary levels of education, the overall migration rates were 2.1 per cent, 3.5 per cent, 6.0 per cent, and 16.2 per cent, respectively. Moreover, about 69.6 per cent of migrants with urban origins (to all destinations) were literate. About 30.4 per cent of the migrants with rural origin were literate. Given the literacy rate of 68.9 per cent in the urban areas during the same period, it might not be appropriate to directly associate the form of migrations with urban origin to level of education. However, given the 15.3 per cent of the literacy rate in the rural areas, the 30.4 per

cent literacy rate among migrants of rural origin can clearly show self selection of migrants by level of education[3].

Among those individuals in the age group 15-64, the major reason for migration is job search. By the account of this reason of migration, male are dominant. The earning differential between the urban and rural sectors is believed to be a major catalyst of rural-urban migration at least for those who migrate looking for jobs. In the country, about 55 per cent of GDP is accounted by the non-agricultural sectors. It can be roughly approximated that the per capita income of citizens engaged in non-agricultural sectors is about 7 times higher than the per capita income of citizens who make their livelihood from agriculture. Such differences naturally trigger a net movement of people from rural to urban centers.

2.2 Patterns of migration in the villages under study

The study covers about 250 households and 1000 respondents in six villages in Amhara regional state in Ethiopia. These villages are Alasha, Buhoro, Menentela, Kulie, Girana, and Habru-Ligo. They were systematically selected based on their distances from major towns.

The migration pattern in the villages under study in relation to the various migration characteristics is more or less similar to the national pattern. It is observed that the rate of rural-urban migration has an inverted u-shape trend with age. In general, men and those individuals with better education dominate the rural-urban migration.

The rate of rural-urban migration among villages significantly varies with distance from major urban centers. Alasha, which is the nearest village to a major town, has a total migration rate of 10.4 per cent, while Habru-Ligo, which is the farthest village from urban centers, has a migration rate of 2.5 per cent.

The major migration characteristic that influences the pattern of migration is education. In all villages combined those individuals who are illiterate account for only 4.6 per cent of the total migrants. Individuals with primary, junior secondary, senior secondary, and tertiary levels of education account for 24.1, 21.8, 29.9, and 19.5 per cent of the total number of migrants, respectively.

[3] It was not possible to determine the pattern of rural-urban migration specifically by level of education from the 1994 report on population and housing census.

The strong association between education and migration becomes even clearer when the migration rate among the groups by education level is considered. The migration rate for illiterate is only 0.6 per cent. On the other hand, this rate for educated individuals progressively increases from 4.1 per cent for those with primary level of education to 94.4 per cent for those who have tertiary level of education. This figure excludes individuals who moved to urban areas exclusively for education purpose and are currently enrolled.

3. The model

A given household might compare utilities in different locations (Stark, 1991; Aroca and Hewings, 2002). Let us consider an individual who contemplates between moving to urban centers and staying in rural areas. The individual compares not only expected incomes in the places of destination and reservation income at places of origin but also the type of goods he prefers to consume in maximizing his utility. Suppose that the utility in rural area is a function of a composite of goods x_r and cultural values that can be considered as 'status good', g_r. The variable g_r represents the mode of life such as weddings, traditional beliefs, child-rearing, traditional savings and insurance schemes (such as *iqqub* and *iddir* in the Ethiopian case) and association to a place where one is born and has grown up. Thus, the utility is given by:

$$u_r = u_r(x_r, g_r) \qquad (1)$$

The individual faces a budget constraint. Assume that each basket of commodities is bought for a price p_{xr}. However, the 'cultural' good g_r does not have an explicit price. To enjoy the rural 'status' good, or cultural values, one has to claim a certain rank in the society. An individual has to put an effort to accumulate wealth that would be enough to cover lavish festivals such as wedding, charity, lending to neighbours during unfavourable circumstances to get a status of benevolent[4]. Let us assume that all of these activities claim the household to possess wealth beyond what is required for decent life. An individual who can afford to pay for such cultural values can enjoy them and pays extra prices p_{gr}. The budget constraint is therefore given by:

$$p_{gr} g_r + p_{xr} x_r \leq W_r \qquad (2)$$

[4] The rank of an individual or a household in a community has been emphasized as an important determinant of migration decisions through relative deprivation by Stark (1991), Stark et al (2004) .

where W_r is wealth. To simplify matters, assume that wealth equals rural income, y_r.

Maximization of utility represented by Equation (1) subject to the budget constraint (2) gives demands for x_r and g_r. Substituting these ordinary demands back into the utility function, we have:

$$V_r = V_r\left(x_r^*(p_{xr}, y_r, p_{gr}), g_r^*(p_{xr}, y_r, p_{gr})\right) \quad (3)$$

If the individual were to migrate, he would maximize his utility by consuming composite goods x_u and public goods, g_u, that are very rare in rural areas. The public goods might include electricity, tap water, hospitals, asphalt roads, public TV channels, and cinemas.

More importantly, the preferences for public goods require some level of sense of 'modernity' which in turn can be thought of being a function of education. The knowledge endowment of a migrant is critical not only as an input to the potential return in terms of income but also as a means to assimilate to the relatively complex urban life. In rural areas, it is believed that the minimum requirement for even visiting a town is ability to read. Further, education changes the individual taste in favour of urban life; an individual with some level of education begins to consider some rural cultural values as backward.

Suppose that a parameter B captures the level of such 'modernity' and also the degree of information that an individual has about the urban labour market. The utility with the parameter, B, which is related to demand for public goods is given by:

$$u_u = u_u(x_u, Bg_u) \quad (4)$$

The individual buys the commodities x_u and g_u from the market at their corresponding prices. However, the migrant is expected to contribute to the government in taxes so that public goods would be available. Given the price of each commodity and the tax contribution, the migrant would face a budget constraint:

$$p_{xu}x_u + (t_u + p_{gu})g_u \leq W_u \quad (5)$$

where p_{xu}= price of ordinary goods, p_{gu}= price of public goods, t_u = tax contribution for the provision of public goods, and W_u= wealth of a migrant at destination.

Let us further assume that urban wealth equals current earnings weighted by the probability of getting job, π. Assuming that earning is a function of the level of education, E, and cost of migration, C_m, is mainly a function of distance, r, we have:

$$W_u = y(E)\pi - C_m(r) \tag{6}$$

The individual would maximize the utility represented by Equation (4) subject to the budget constraint represented by Equation (5). Accordingly, the demands for ordinary and public goods would be:

$$x_u^* = x_u^*(p_{xu}, p_{gu}, t_u, y_u(E), \pi, C_m(r); B)$$

and (7)

$$g_u^* = g_u^*(p_{xu}, p_{gu}, t_u, y_u(E), \pi, C_m(r); B)$$

Substituting Equations (7) into (4), we obtain the indirect utility:

$$V_u = V_u(x_u^*, g_u^*) = V_u(p_{xu}, p_{gu}, t_u, y_u(E), \pi, C_m(r); B) \tag{8}$$

Let the difference in utility in the two locations be given by:

$$\Delta V = V_u(x_u^*(.), g_u^*(.)) - V_r(x_r^*(.), g_r^*(.)) \tag{9}$$
$$- V_u(p_{xu}, p_{gu}, t_u, y_u(E), \pi, C_m(r); B) - V_r(p_{xr}, p_{gy}, y_r)$$

Let us further define a function $M^* = f$:

$$M^* = f(.) = f\{[y(E) - y_r], (p_u^* - p_r^*), \pi, C_m(r); B\} \tag{10}$$

where $M^* = f: \Re \to \Re$ is a monotonic transformation of ΔV and could be thought as a propensity to migrate of an individual, p_u^* and p_r^* are weighted prices of goods in urban and rural areas, respectively.

The individual is assumed to migrate if $\Delta V > 0$. By implication, an individual decides to migrate if $M^* = f(.) > 0$. In Equation (10), $(y(E) - y_r)$ represents the income differential which is commonly believed to be the most important determinant of migration decision. The term $(p_u^* - p_r^*)$ represents difference in costs of living in the two places. As mode of life changes when an individual migrates from rural area to urban center, the composition of goods would be different implying that the migrant would face different prices. In particular, households in rural areas enjoy 'lower' prices for staple crops since they produce it themselves. Cost of transportation could also increase prices at destination. Probability of securing job at destination, π, cost of migration, $C(r)$, and the parameter B which can be proxied by level of education, E, directly enter the function of migration decisions.

The underlying utility function in both areas and their differences are assumed to be continuous. The individual's migration decision model under Equation (10) can be rewritten in econometric setup as:

$$M_i^* = w'\gamma + u \qquad (11)$$

where w = vector of independent variables, γ = a set of parameters, and u = random error term. The vector w includes individual, household and location (geographic) attributes. Besides level of education, income differential, and distance from the nearest town are of particular interest.

Denoting the discrete response variable representing whether an individual has migrated or not by M, the propensity of migration can be related to it according to:

$$M = \begin{cases} 1 \ if \ M_i^* > 0 \\ 0 \ if \ M_i^* \leq 0 \end{cases} \qquad (12)$$

The discrete choice variable M assumes a value of 1 if the individual has moved to urban areas and a value of '0' otherwise. Thus, the model can be estimated using probit or logit.

4. Estimation and results

Since data on level of education for both migrants and non-migrants is observed, it would be possible to estimate migration decision using standard index models (logit and probit). But the need to include income differential which is the major determinant of rural-urban migration into the model to account for the indirect effect of education and for specification purpose complicates the estimation. That is because calculating earnings differential is not straight forward. The earnings outcome for migrants depends on the outcome of migration. For non-migrants, the income which they would have earned had they migrated is not observed. Similarly, the income the migrants would have earned had they stayed in their original location is missing. Thus, earnings is incidentally truncated both from the migrants and non-migrants point of view (Heckman, 1979; Nakosteen and Zimmer, 1980).

Thus, the estimation of the earnings of the migrants and non-migrants in their respective places requires going beyond ordinary least squares due to the possible existence of self selection which may result in biased estimates. The fact that some individuals migrate while others do not could be an indication for the existence of important differences between the two groups of individuals in terms of viewing benefits (Greenwood, 1975). There might thus be self selection in the sense that the sample could no more be considered as random. This threatens the validity of inferences that are made about the underlying population based on OLS regression results. In particular, Heckman (1979) argued that the earnings of the migrants do not give a reliable estimate of the income that the non-migrants would have earned had they migrated resulting in "a biased estimate of the effect of a random treatment of migration". When this problem exists, the OLS model will be mis-specified as if a relevant variable was omitted (Nakosteen and Zimmer, 1980; Ghatak et al, 1996, Greene, 2003).

Fortunately, there is an alternative model which accounts for possible existence of selection problem; that is the Heckman procedure of selection model. Following the argument by Nakosteen and Zimmer (1980) and the framework developed in section 3, suppose that an individual generates an income of y_r from rural based economic activities and an income of y_u from urban based economic activities.

The incomes function of an individual in rural areas and the earnings function of a migrant in urban areas can respectively be given by:

$$y_r = x'\theta + \epsilon_1$$
$$y_u = z'\beta + \epsilon_2 \qquad (13)$$

But migration decisions are determined by income differential $(y_u - y_r)$ and costs of migration. At the same time, the earnings outcome is dependent on the outcome of migration decisions. Hence, the earnings and migration decision equations can simultaneously be given by:

$$y_r = x'\theta + \epsilon_1$$
$$y_u = z'\beta + \epsilon_2$$
$$M = w'\gamma + u \qquad (14)$$

Given the fact that one observes y_u only if $M_i^* \geq 0$, it is possible to derive for migrants as:

$$E(y_u|M^* \geq 0) = E(y_u|u \geq -w'\gamma)$$
$$= z'\beta + \rho\sigma_{\epsilon_2}\left[\phi\left(w'\gamma/\sigma_u\right)/\Phi\left(w'\gamma/\sigma_u\right)\right]$$
$$= z'\beta + \beta_\lambda \lambda_i(\alpha_u) + v_1$$

where $\beta_\lambda = \rho\sigma_{\epsilon_2}, \alpha_u = -\left(\frac{w'\gamma}{\sigma_u}\right)$, $\lambda_i(\alpha_u) - \phi\left(w'\gamma/\sigma_u\right)/\Phi\left(w'\gamma/\sigma_u\right)$, $\phi(.)$ and $\Phi(.)$ are the standard normal population density function, and the standard normal cumulative density function, respectively. The function $\lambda_i = \phi(.)/\Phi(.)$ is the inverse Mill's ratio. It is assumed that $\epsilon_1 \sim N(0,\sigma_1^2)$, $\epsilon_2 \sim N(0,\sigma_2^2)$, $u \sim N(0,1)$ and $corr(\epsilon_2, u) = \rho$. The application of the Heckman procedure is necessitated if ρ is statistically different from zero (Greene, 2003; Nakosteen and Zimmer, 1980).

In the rural income function, the dependent variable is annual per capita income in Birr (the Ethiopian currency; 1 USD ≈ 12 Birr as of 2009). The explanatory variables consist of land size, labour, oxen, cattle, dummy for access to irrigation, dummy for rural enterprise, and the level of education of the head. It is required that at least one explanatory variable which does not enter the regression equation should appear in the selection equation. Accordingly, the selection equation includes distance from major towns, sex, age, and age squared besides the variables which also appear in the regression equation. [See Table 2].

For the estimation of earnings of migrants, a logarithm of annual income of migrants in Birr was used as a dependent variable. The covariates include level of education, age (proxy for experience), square of age, and sex (takes on a value of 1 if the individual is female and 0 otherwise).

Table 2: List of Variables Used in the Estimation

Variable	Mean	Standard Deviation	Min	Max
Rural per capita income (in logs)	6.67	0.84	3.37	8.77
Labor (in logs)	0.88	0.44	-1.39	1.91
Land size (in logs)	-0.47	0.62	-2.08	1.01
Oxen	1.66	1.16	0	9
Level of education of the head	1.44	2.85	0	11
Cattle	2.49	2.43	0	12
Dummy for rural enterprise	0.20	0.40	0	1
Dummy for access to irrigation	0.41	0.49	0	1
Age	37.37	15.75	18	90
Age square	1644.46	1390.02	324	8100
Sex (female = 1, male = 0)	0.49	0.50	0	1
Distance from major towns	62.04	33.97	12	98
Urban income of migrants (in logs)	8.46	0.81	6.40	11.34
Level of education	9.68	4.30	0	21
Age	0.65	7.13	18	45
Sex (female =1, male = 0)	0.35	0.48	0	1
Income differential (difference of logs)	-0.47	0.75	-2.68	2.41
Level of education	3.58	4.41	0	21
Sex (female = 1, male = 0)	0.48	0.50	0	1
Age	36.51	15.44	18	90
Age square	1571.15	1354.49	324	8100
Pre-migration land per labor	0.12	0.08	0	0.5
Land per labor ratio squared	0.02	0.03	0	0.25
Level of education of the head	1.56	2.95	0	11
Age of the head	53.61	12.95	25	90

The data used for the estimation of the model is the own survey data from the villages that are discussed under section 2.2. Households were asked about their income by source and factors of production and whether any member of the household has currently migrated out. Sending families were also asked about some demographic and socio-economic information of the migrants including the income and type of job of the migrant. For individuals who migrated to a nearby town, it was not difficult to trace them and get information as required. However, it was not possible to get data on the income of some of the female migrants who usually change their original place of residence due to marriage arrangements.

Table 3: Earnings of Non-migrants (FIMLE Results)

Dependent Variable: Per capita income (in logs)		
	Regression Equation	**Selection Equation**
Labor (in logs)	-0.363	0.359
	(-2.89)**	(1.70)
Per capita land size (in logs)	0.245	-0.116
	(2.50)*	(-0.76)
Oxen	0.173	0.171
	(4.80)**	(1.81)
Level of Education-Head	0.035	-0.178
	(2.33)*	(-7.31)**
Cattle (per capita)	0.063	0.012
	(3.37)**	(0.22)
Dummy rural enterprise	0.445	0.006
	(4.40)**	(0.03)
Dummy access to irrigation	0.470	0.372
	(5.24)**	(1.64)
Intercept	6.308	4.849
	(40.75)**	(3.84)**
Distance from major towns		0.0012
		(0.38)
Age		-0.219
		(-2.75)**
Age-square		0.004
		(2.71)**
Sex (Female = 1)		0.349
		(2.23)
The inverse Mill's ratio (λ)		0.200*
Number of observations	886	
Censored	77	
Uncensored	809	
Wald $\chi^2(7)$	163.48	
LR test of indep. eqns.($\rho = 0$)	$\chi^2(1) = 3.89$*	

Figures in parentheses are z statistics.
* significant at 5%; ** significant at 1%

Full information maximum likelihood (FIML) and Heckman two-step estimation procedures are used to estimate the income function of non-migrants and the earnings function of the migrants. There were no major differences in the results from the two methods of estimation both in terms of coefficients and z-ratios. [For FIML results, see Tables 3 and 4]. The null for the absence of selectivity bias was not rejected at 5 per cent and 1 per cent levels in the case of non-migrants and migrants, respectively, thus supporting the appropriateness of the use of the Heckman procedure.

Table 4: Earnings migrants (FIMLE Results)

Dependent Variable: Per capita income (in logs)		
	Regression Equation	**Selection Equation**
Level of Education	0.180	0.172
	(5.14)**	(6.69)**
Age	0.027	0.247
	(2.53)*	(3.13)**
Sex (female = 1)	-0.530	0.291
	(-2.79)**	(1.56)
Intercept	4.838	-5.738
	(6.55)**	(-4.70)**
Distance from major towns		0.0008
		(0.27)
Age-square		-0.004
		(-3.00)**
Sex (Female = 1)		-0.291
		(-1.56)
The inverse Mill's ratio (λ)		0.533**
Number of observations	896	
Censored	838	
Uncensored	58	
Wald $\chi^2(3)$	31.73	
LR test of indep. eqns.($\rho = 0$)	$\chi^2(1) = 11.46$**	

Figures in parentheses are z statistics.
* significant at 5%; ** significant at 1%

The next step in estimating the migration decision equation is calculating the difference in earnings of individuals in places of origin and destination. Using the

estimated incomes function of non-migrants, the reservation level of income of migrants has been predicted. Similarly, using the estimated earnings function of migrants, the expected income of non-migrants which they would earn if they were to migrate is predicted.

Denoting the estimated urban income and rural income by $\hat{y}_u$ and $\hat{y}_r$, respectively, the income differential can be calculated as:

$$\Delta\hat{y} = \hat{y}_u - \hat{y}_r \qquad (15)$$

Using the simple income differential $(\hat{y}_u - \hat{y}_r)$ in the migration decision equation may not be appropriate. Individuals who contemplate to migrate to urban centers do not necessarily consider only nominal wage rates at destination. As migration theory dictates, one of the factors that enter in the calculus of expected income is probability of finding job. Harris and Todaro (1970) considered the proportion of filled jobs to the total urban labor force (or simply urban employment rate) as perceived probability of getting a job in urban areas. Following their approach, the employment rates by educational status is used as perceived probability of getting a job for this analysis. Thus, assuming that there is no unemployment in rural areas, the difference in expected income is calculated as:

$$\Delta y = \pi\hat{y}_u - \hat{y}_r = (1-u)\hat{y}_u - \hat{y}_r \qquad (16)$$

where π = probability of securing job in urban areas, and u= rate of unemployment.

The Ethiopian national labor force survey shows that urban unemployment rate for active labor force with no formal education, primary level of education (1-8 grades), secondary level of education, and tertiary level education were, respectively, 16.7, 23.1, 33.9, and 12 per cent (CSA, 2000).

For a significant number of the observation, the income differential without accounting for urban unemployment is positive for both migrants and non-migrants. Only few migrants have negative income differentials. This might pose a question that if individuals who did not migrate so far have positive income differential in favor of urban expected income, why did they not migrate? In fact, one of the arguments of Haris and Todaro (1970) is that the probability of finding job and cost of migration play a key role in migration decisions. In Stark's (1991) line of argument, individuals may not migrate even under significant wage differential or they may do so in the absence of meaningful wage differential. This reflects the risk-pooling strategy of a household.

In this particular case, accounting for rate of unemployment in urban areas has increased the number of individuals with negative income differential even for educated migrants, except for those who have a tertiary level of education. This latter result may lead to another interesting point that individuals in rural areas once introduced to a certain level of education may still prefer to work in urban areas even if rural economic activities get them better earnings. This might be due to the fact that education changes their perception so that they prefer urban public goods to rural cultural values.

The migration decision equation is estimated by including the incomes differential using a binary probit model [see results on Table 5]. The explanatory variables include income differential, distance from major towns, level of education, per capita land size before migration and its square, age, and sex (female = 1). It has been found that differences in income adjusted for probabilities of finding job are significant and positive. It seems that the result supports the hypothesis that individuals migrate to urban areas in response to earnings differential.

Table 5: Probit Estimates of Determinants of Migration

Dependent Variable: Migration Decision, M (M=1 if migrated, 0 otherwise)		
	Coefficients	**Slopes**
Income differential	0.323	0.007
	(2.60)**	
Level of Education	0.124	0.003
	(6.30)**	
Pre-migration land- labour ratio	-5.436	-0.123
	(-2.07)*	
Land –labour ratio squared	15.338	0.347
	(2.71)**	
Distance	-0.001	-0.00003
	(-0.57)	
Age	0.211	0.005
	(3.30)**	
Age square	-0.004	-0.00008
	(-3.26)**	
Sex (female = 1)	-0.180	-0.004
	(-1.12)	
Level of education-Head	0.044	0.001
	(1.69)	
Education-Head-squared	-0.0003	-7.45e-06
	(-1.44)	
Intercept	-6.156	
	(-4.44)**	
Number of Observations	1008	
Wald $\chi^2(11)$	105.43	
Pseudo R^2	0.33	

Figures in parentheses are robust z statistics.
* significant at 5%; ** significant at 1%

The significance of education in the migration model may suggest that besides its impact on migration decisions through income, it also causes changes in preferences. That is, individuals with little or no education tend to stay in their original places for cultural reasons even if they face differences in income. On the other hand, individuals with some level of education may not necessarily prefer to stay in rural areas even if their earnings from agriculture are higher than the expected income in urban areas. Education can also serve as a means to narrow the information gap about the labor market at destination.

Distance which is intended to capture costs of migration was not statistically significant. A study by Agesa (2001) using data from Kenya showed also similar result. The insignificance of distance in this particular study might be a result of multicollinearity problem because level of education of individuals also depends on distance from urban centers. In fact, when level of education is dropped from the regression, distance has a negative and significant coefficient.

Land per labor ratio has a negative and significant coefficient while its square has a significant positive coefficient. This result may in general imply that members of families with small land-labor ratio tend to migrate since such households have excess labor. On the other hand, a relatively higher level of per capita land size may encourage migration by easing the cost of migration through its effect on income.

5. Conclusions

The merit of rural-urban migration is contentious in developing countries. Yet, the fact that a large segment of the society of these countries still resides in rural areas requires a policy that targets a 'managed' rural-urban migration to enhance rural transformation. Education might be considered as a means of achieving rural transformation through smooth rural-urban migration.

It has been demonstrated that relatively educated individuals in rural areas migrate to urban centers not only because education gives them a means to secure higher earnings at destinations but also because it induces them to develop a preference for urban public goods instead of rural based traditional ways of life.

Rural-urban migration is desirable and inevitable. The challenge is how to avoid outcomes that make rural-urban migration a signal of a malfunctioning transformation process. The desirable features of rural-urban migration can be achieved through education and hence the latter can be used as a means to ensuring smooth rural-urban migration in particular in a country such as Ethiopia which is characterized by a high skill gap. This requires making sustainable education a rural phenomenon.

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BUSINESS ENVIRONMENT IN HIGHER EDUCATION: THE PERCEPTION OF THIRTY PRIVATE HIGHER EDUCATION BUSINESS FIRMS IN ADDIS ABABA

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Abstract

This paper aimed at assessing the existing Business Environment in private higher education sub sector based on a survey on randomly selected Education Firms (30), Staffs (60), Students (60), Alumina (60), and Employers (30) and Parents (30). Indicators mainly related to Infrastructure, Competition, and Relationship with Government, Crime, Disorder and Justice System were considered. Constraints and opportunities are identified based on respondent's rank. Comparisons with other private firms and equivalent government institutions are also made.

The findings indicate that there is competition among domestic education firms, mainly by using rumors or lowering costs. The majority of firms capacity utilization is 75%, having middle and low income groups as their main market. Respondent firms confirmed for their awareness and participation of policy related matters, also consider the basic service and inspection of the government as efficient and helpful except the issue of predictability of rules and regulations, the lengthy licensing and inspection process of MOE. Access to land, electricity, access to finance are the leading constraints identified. In other hand the undrtaken reform have brought benfite related to access to land, electricity, macroeconomic and poltical stablity, licensing and permit and access to finance. This result implies the need for additional improvement programs related to access to land and finance, hoping that electricity related constraints will be addressed in the near future by the undergoing investment. The education service evaluation revealed that private higher education service is similar between the competitors and at least comparable to equivalent government institutions which implies the shortcomings of higher education service may not be strictly associated with being provided by private firms.

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1. Introduction

1.1 Background

Following political and economic reform the private sector participation in many sectors of the economy has started to flourish. EIA (2008) statistics shows that total annual registered investment have reached more than Eth. Birr 19 billion (2007/08), though the conversation rate of registered investment to operation is low. Despite these encouraging signals however, the participation of the private sector is not as satisfactory as needed, and still is limited as compared to most developing countries. According to UNCTAD (2008) statistics the annual inflow of FDI to East African countries in 2007/8 is 3,867 million dollars out of which the share of Ethiopia is 254 million dollars where as the inflow in the nearby countries like Kenya, Sudan and Uganda is 728, 2,436 and 368 million dollars respectively. The quality of the private investment in terms of fulfilling the development needs of the country is also under question.

In the years 2002 and 2006 investment climate and business environment assessment for Ethiopia had been done by focusing on manufacturing industry. Service sector in general has been considered as secondary in most Business environment assessments except in some countries in which wholesale and retail business and the informal sector have considered separately (World Bank, 2008a). However, Business environment assessment related to private education services has not been done so far. But like all other sectors private education investment is affected by existing Business environment and the performance in our case is also poor. The EIA (2008) statistics shows that those operational private education investment projects are 14.4% as compared to the approved education projects. This indicates the necessity of careful and timely assessment of the Business environment in education sector.

This paper aims at assessing Business environment and identifying constraints and opportunities that affects private investment in higher education. It is done based on micro level information that are collected from private higher education firms, staffs, students, alumni, employers, parents and regulatory bodies in Addis Ababa.

This paper is organized in four major chapters: the introduction part covers the statement of the problem, objective, methodology, significance and scope of the study. Second chapter presents the details of result and discussion about business environment by categorizing into seven sub chapters. In the third chapter the evaluation result of private

higher education service is delivered. Finally the summery of findings is presented in chapter four.

1.2 Statement of the problem

Education in general and higher education in particular are the necessary instruments to effectively and efficiently function the economy. It becomes one of the centers of attention in developing economies as it is the way out to enhance the efficiency of labour through its economic, social and political impact. In the present world economy the importance of higher education for development becomes more and more essential and considered as one determinant factor as a result of rapidly evolving technological advancement. Education, as Harbison and Myers (1965) stress, "is both the seed and the flower of economic development." The correlation between higher education and national income is also very strong; the African higher education study (2008) noted that:

> ***"…****in the present world economy, without substantial numbers of university-trained professionals a country cannot advance. No educational factor correlates as strongly with national income as does university enrollment".*

The government service delivery capacity in terms of both efficiency and effectiveness is also determined by the presence of adequate educated labor force in the government machinery. For the long period of time investment in education sector, especially higher education has been left to government. Such past policies made private investment in the sector to be low. The EIA (2008) statistics tell us that from the total of 360 registered higher education investment projects since 1991 those who became operational up to 2005/6 are 51[3] (14%) the rest majority are either under implementation stage (2.5%) or in pre-implementation stage (84%). This indicates the existence of huge gap between interest and actual investment. It requires careful assessment of the Business environment and reveals constraints to take action accordingly, which is noticeably lack.

Previous studies related to Business environment mainly focused on manufacturing or/and specific to some manufacturing industries (See Dollar and et. al. 2003, World Bank, 2004 for India, Carline and et. al., 2003 and others). The 2006 survey made by World Bank (2008a) revealed that the top five Business environment constraints in

[3] The MOE statistics (2008) listed out only 34 private higher education firms that provide undergraduate degree programs.

Ethiopia are access to finance, access to land, practice of informal sector, tax rate and electricity. Specific to either main service sector in general or education sector in particular have not done so far. Sector and sub-sector based business environment analysis and/or making comparison with other competitors' economies for favorableness of the investment climate is important as existing constraints in general may not hold true in all the cases or their impact to each sector may vary as it happens in most cases. Such difference may affect investment related decision making and divert (crowed) investment to more favored sectors. Therefore, this research is believed to have rational importance as it answers the following researchable questions:

1. Based on micro level information what are the major Business environment related constraints for private higher education investment?
2. Is the service provision of private higher education disfavored by existing Business environment constraints as compared to equivalent government institutions?

1.3 Objectives of the study

As it is explained above in the problem statement the main objectives of the paper are:

- To reveal clearly the existing Business environment in higher education sub-sector more evidently using micro level information of different stakeholders [private higher education firms, staffs, students, alumni, employers, parents and regulatory bodies] and to make comparison with other sectors.
- To pick out major Business environment constraints in private higher education that needs more attention and/or improvement actions.
- To evaluate the private higher education service as compared to equivalent government institutions which helps to test out whether existing Business environment has affected the private education service or not.
- To stimulate issues related to Business environment in private higher education service for dialogue and further investigation.

1.4 Methodology

The study is a descriptive type as it dowel on describing the accurate facts about existing situation of Business environment and private higher education based on survey data obtained from firms and their beneficiaries. The major factors considered are growth & development, competition & service efficiency, business & government relations, crime &

disorder and infrastructure. As proxies of these factors various other indicators are considered, the details of the indicators and sample questioner are annexed. Both secondary and primary data are used for the study, secondary data are carefully taken from EIA, MOE, HERQA and Enterprise survey of World Bank and used after cross-checking their consistency. The primary data is collected for the purpose of ICBE project in which Unity University and Trust Africa have conducted.

The MOE statistics (2007) information reveals that in Addis Ababa there are 34 non-government higher education institutions that provide service for under graduate program, out of which about 62% private colleges provide general[4] education programs (Business, Computer, etc), 30% provide health Science programs while the rest 8% provide services like teaching, Hotel & Tourism and Art (these are categorized as 'other' programs). The stratification is done accordingly, from business and computer related service provider firms eighteen (60%), from health nine (30%) and from other 'three' (10%) samples are randomly taken.

From each of these firms two staffs, two students and one parent are randomly selected. This helps to make the perception more realistic and unbiased. In addition, employers of graduates from private higher education firms and alumni are also included in the sample in order to see from the beneficiaries' perspective. Since it is impractical to construct a list of all firms that employed graduates from private higher education institutions, thirty sample employers and two alumni from each are selected at a random from a list of 100 firms that are commonly known to have employed graduates of private higher education institutions. A total of 272 stratified random samples are included.

1.5 Significance of the study

The study has significance for private sector, beneficiaries, government and others as it helps to understand the existing facts on Business environment specific to higher education sub sector which has not done so far. It also serves as one alternative reference for their decision considerations to potential investors. The study also reveals main constraints and gaps that the sector has faced which help to come up with issues for further research, dialogue and actions for improvement. It also serves as alternative reference and benchmark for future similar studies. As higher education institutions relatively understand better what Business environment is all about both theoretically and

[4] This is our own categorization

based on their tangible experience their information may have better significance as compared to other business sectors which also increases the significance of this research.

1.6 Scope and limitation of the study

Business environment is a wide and multi-sectoral concept, however the scope of this study is delimited to certain aspects in terms of key issues to be considered. The main issues or indicators to be considered in assessing Business environment are already mentioned in the methodology part. Factors that are overlooked in this study but are believed to influence investment climate are like skill (professional) levels, geographic issues, gender and other conditions such as international market. In addition as the paper focus only on higher education sub sector elementary, secondary and TVET, and other sectors of the economy which in one way or another influence and/or be influenced by Business environment are not considered. The major reasons of such delimitation are the wide nature of Business environment and limitation of resource both in terms of money and time.

The other main limitation of the study aroused as a result of the incompleteness of the survey. Respondent firms failed to fully provide information related to trend of growth and firms capital which made impossible to empirically estimate the effects of potential constraints. Some questions were also subjected to interpretation which resulted variation in response and have affected the data quality and strength of analysis. Perception based information has also its own inherent limitation.

2. Theoretical review

2.1 investment climate and business environment /ICBE/

Investment has been explained in different ways at different periods: Keynesian, neoclassical, neo-liberal and the recent theory of uncertainty. Keynesian theory is known by introducing an independent investment function in the economy. The central assumption of this theory as noted by Asante (2000) is that saving and investment must not be identical within the economy as the decision makers are different. This is an evidence for the existence of factors that determine investment other than saving. Following this theory accelerator theory has come that considers investment as a linear proportion of change in out puts (Sachs & Larraine, 1993). This theory disregards the role

of expectations, profitability and capital costs which was favored by Keynesian Asante (2000). This theory leads to the development of flexible accelerator model which considers investment (net) as a function of the difference between the desired investment and existing capital stock. This model does not disregard output, internal funds, cost of external financing and capacity utilization as determinant of desired capital stock.

The neoclassical Jorgenson (1971) approached desired (optimal) capital stock as a function of output and user cost of capital (the flexible accelerator model). According to this model the user cost of capital depends on price of capital goods, real interest rate, depreciation rate and tax structure. The other neoclassical theory related to investment climate is the Tobin 'Q' theory of investment. Tobin's Q considers that the driving force of investment is the ratio of the market value of existing capital stock to its replacement cost (Sachs & Larraine, 1993). According to his argument delivery lags and increasing marginal cost of investment are the reasons why 'Q' would differ from unity Asante (2000). So the neoclassical determinants of private investment can be summarized as Tobin's' Q, real interest rate, user cost of capital and public investment.

Neo-liberals Galbis (1979), Mckinnon (1973) and Shaw (1973) concentrate on the importance of financial deepening and interest rate to stimulate growth through investment. The center of the argument relays on the fact that 'developing countries financial repression is caused by control of interest rate in a down ward direction' (Asante 2000). According to them this does negatively affect saving and investment. They believe that liberalization plays important role in allocating resources efficiently in addition to increasing saving and loanable funds. In contrast to neoclassical, neo-liberals believe that investment is positively related to real interest rate, having an assumption that capable market is in disequilibrium with demand for funds exceeding supply. A raise in interest rate increases the volume of financial savings through intermediaries and thereby raises funds for investment - a phenomenon that MacKinnon (1973) calls the "conduit effect". But Ashanti (2000) argues that countries case studies support the view that macroeconomic and structural reforms are necessary but not sufficient for the expansion of private investment. His argument is based on the findings of the recent study made in Ghana and Bolivia. The study clearly pointed out that establishing market oriented rules alone may be insufficient to convince the private sector that it is worth committing resources to investment.

The recent literature Roderick (1991) in Asante (2000) has introduced uncertainty theory as a determinant of private investment. As Ashanti (2000) noted the positive effect of

policy, its sustainability and irreversibility does not fully guarantee investment related decision, unexpected consequences as a result of the reform can be one reason for withholding investment. He summarized the three uncertainty variables: firstly variability (variance, moving standard deviation or moving coefficient of variations) of user cost of capital, real exchange rate, inflation rate, distortion in the foreign exchange market (proxied by the black market premium) and real GDP. The debt to GDP ratio and debt services as a ration of export of goods and services are the second and third variables respectively.

Since the above mainstream theories basically assume developed (perfect) capital market structure and minimum government intervention in the economy they couldn't fully explain ICBE in developing economies. Therefore, World Bank (2003), Asian Development Bank (2005) and other papers related to ICBE consider three general factors when they talk about ICBE: macroeconomic, infrastructure and governance. Macroeconomic considerations include the economic strength, fiscal & monetary, exchange rate, and stability. Infrastructure considerations include quantity and quality of physical infrastructure (Power, Transport, Telecommunication), and financial infrastructure such as banking and credit service. Asian Development Bank (2005) divided infrastructure into 'hard' such as the quality of roads, irrigation, ports and airports and 'soft' infrastructure such as the quality of service provision related to electricity, water and telephony. A well functioning financial sector is taken as the major component of investment climate determinant because it encourages investment by mobilizing savings as well as permitting investors to manage risk. Governance in this context covers those factors related to laws & regulations, predictability and consistency in interpreting and enforcing laws and regulations, and corruption issues. The burden of firms face in complying regulations, quality of basic service from government institutions are good proxies of good governance according to World Bank (2003). Lansbury and Mayes (1996) expressed governance in general in terms of the ease with which firms can enter and exit a market, which is one main yardstick of a competitive market. As investment climate is closely linked to governance, high quality institutions and social infrastructure, it is highly dependant on the behaviors of the government.

In the Ethiopian Foreign Investment promotion strategy document, EIA (2004) investment climate is expressed as a function of general investment environment (The 'Product'), the 'price or cost of doing business', the opportunity that the economy has and the effectiveness of promotion strategy. The general investment environment encompasses political stability, economic strength, attitude of welcome, government policies,

infrastructure, labor and human resource, Banking and finance, efficiency of bureaucracy, local business strength, quality of life etc. The price or cost of doing business is explained by tax incentives, grants, tariff protection and similar price mechanisms. This EIA approach is inclined to Dato's Jegathesan () of the S.A.I formula - **$P = E + C_4 + O$**,

Where: **P**- refers to profit or Prosperity,

E- refers to environment for investment as expressed in ten check points (Political stability, Economic strength, Attitude of welcome, Government policies in equity, employment including expatriates, exchange control and legal frame work for rule of law, Infrastructure, Labor/ human resource, Banking and finance, Government bureaucracy, local business environment and quality of life.

C4- refers to **C**ost of doing business, **C**onvenience of doing business, **C**apability of the environment to sustain dynamic economic growth, and the last **C** refers to the concession or carrots available to attract investors into the economy and the productive target sectors.

O- Refers to Opportunities the country does offer and how will investors become aware of it.

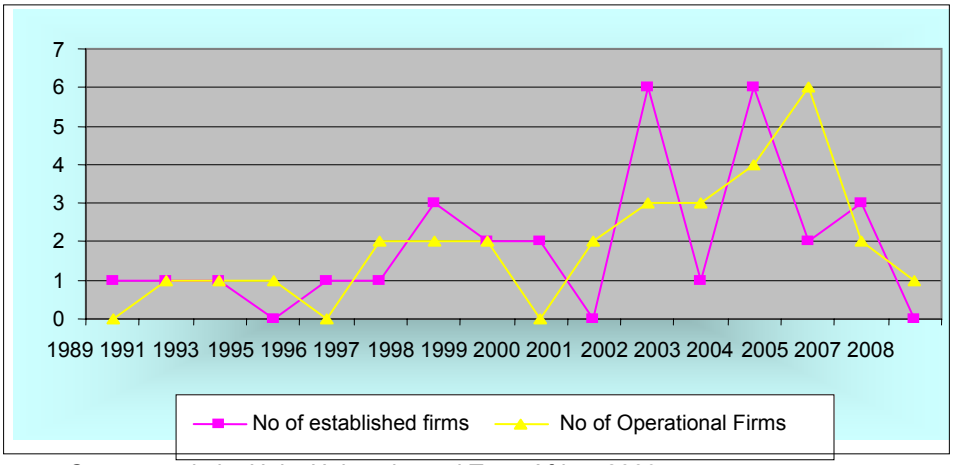
3. Result and discusstion

3.1 Service size, distribution and depth

In this section service type, distribution, size and depth of higher education service by private firms are discussed in detail based on the response of firms, staff, students, alumni and parents.

The sample firms response regarding to its establishment history indicates that higher education as private business started around 1989, then in successive years up to the year 2000 on average one additional new firms had entered each year in the market. Large number of firms had entered in the market in the years 2002 and 2006 in each year six firms had entered. About sixty percent of respondent firms have entered in the market after the year 2002, (see Figure 1 below). This may be as a result of the government policy that allowed private institutions to give training up to the level of bachelor degree. The response also shows that there is strong correlation in timing of establishment and going into operational of these few (30) lucky firms, which may indicate that these few firms that are operational now went into operation within very short period of time just after their establishment. As we will see later on, the reason might be because most firms do their business in rented facilities without fulfiling all the needed basic requirements.

Figure 1: Sample firms establishment & operational Period



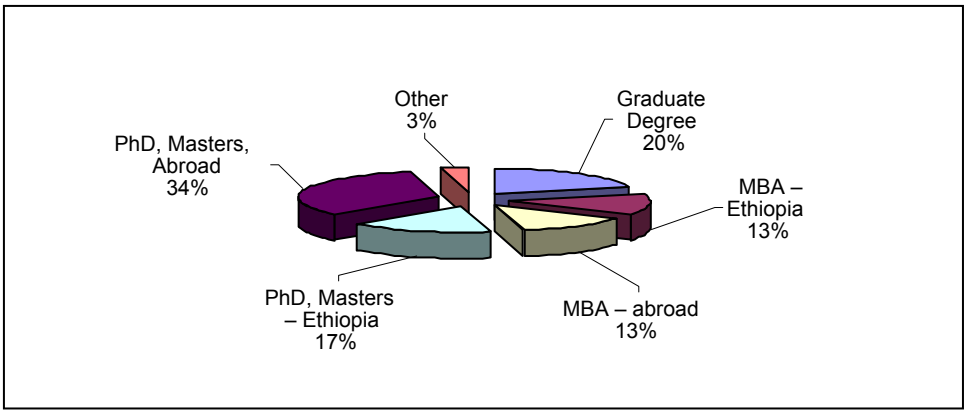
Source: Survey made by Unity University and Trust Africa; 2009

From the survey made there are six firms that are solely owned, the rest and the majorities are established in the form of partnership. Forty percent of the establishments' response shows that the firms are part of large firms. The share holding of the firms varies from ten percent up to eighty five percent, the average falls around fifty percent. The business firms start their business by employing a wide range of permanent staff; the twenty six valid respondents result indicate firms that started their business with less than ten employees are only three, the maximum goes to fifty; however the average number of permanent staff for start up of business is 19.42. In terms of classification of ownership by nationality except one firm all are registered as domestic firms, implying that the views and perceptions about investment climate and business environment presented in this paper represents mainly the domestic firms. Firms top management experience and level of education similarly shows variation from totally inexperienced manager to thirty years of plenty experience in the field of education, however, the average experience in the profession is pulled to 8.571. The mangers level of educational qualification, as shown in the Figure 2 below, varies from degree (20%) to Masters and PhD abroad (34%).

The current staff composition of higher education business firms similarly varies from a total of seventeen in relatively small establishments up to eight hundred in larger firms; the mean current value of total current staff number is 114.75. There are few large education firms that affect (inflate) the mean number of staff composition. When staff composition is seen by teaching and non-teaching staff the mean values are 42.85, 49.15

and 15.33[5] for academic, administration/ management and support staff respectively. The pattern of the data shows that as the number of total staff increase, implies firms get larger; the proportion of change of administration staff is more than the proportion change of teaching staff.

Figure 2: Top managers' level of Education



Source: Survey made by Unity University and Trust Africa; 2009

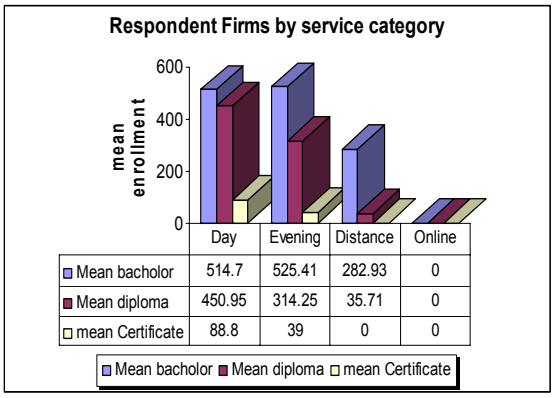
From the sample taken there are only four firms that have employed expatriate staff, the number of staff they hire range from only one to four expatriates. When we consider firms on how deep engaged in enrolling students, the mean total enrollment of students in the academic year of 2006/07 was found to be 1590.43, which of course have exhibited a large scale of variation, the standard deviation is 2107.22 for degree and 1328.3 for diploma, having a range from the minimum 24 up to maximum of 7606 students. Similar to the academic staff, the mean enrollment is affected by few firms which have higher capacity of enrollment. These four education firms are Unity University (4355), St. Merry University College (5217), Admass College (6283) and Microlink ICT (7606).

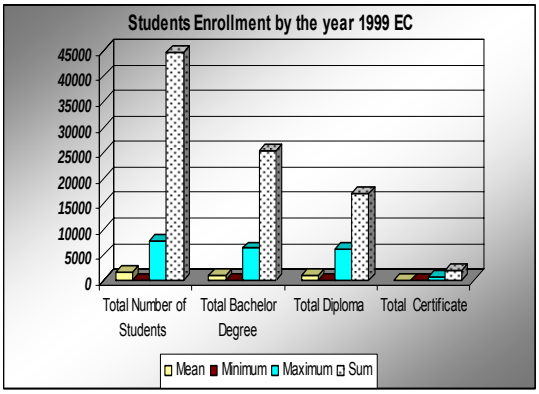
The same year enrollment is disaggregated by levels of education from bachelor level to certificate and presented in the figure below. The mean enrollment values per firm for each level are: bachelor (971.15), diploma (858.15), and certificate (172.27), this indicates that bachelor program is the largest mean enrollment per firm. When this is disaggregated further in to regular, evening, distance and online education programs; as it is seen in the Figure 3 below, there are no firms that provide online education programs

[5] In the response there is inconsistency in separating administration/management staff and support staff.

but there are distance education programs both in diploma and degree programs which the mean enrollment are 35.71 and 282.93 respectively.

Figure 3: Enrollment in the year 2006/07





Source: Survey made by Unity University and Trust Africa; 2009

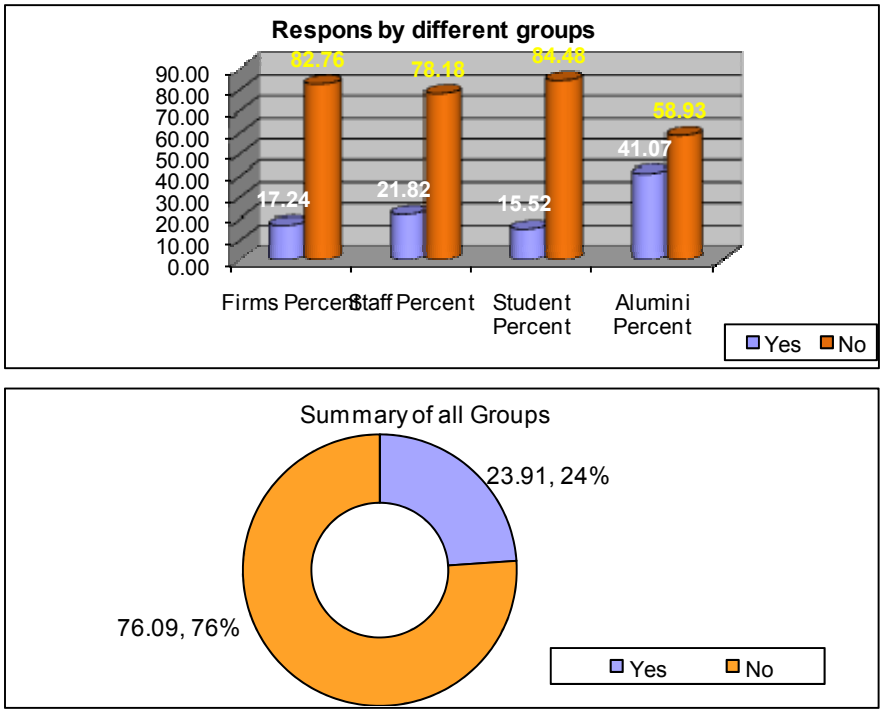
The major education programs of these firms are day and evening regular programs in both degree and diploma cases. The mean enrollment for bachelor day and evening is 514.70 and 525.41 respectively; similarly for diploma day and evening is 450.95 and 314.23 respectively. [6]

In order to study the types of services and the degree of importance in which education firms commonly provide, they are asked to choose and put percentage value of among the common four types of education services: teaching, research, consultancy and publishing. The firms' response shows that the main service is teaching (mean percentage value is 90.96%), Out of the 60% respondent firms respond that they are engaged in research, it takes 7.31% share out of their total services, and from 13 firms those respond to engaging in consultancy services it takes 4.85% out of their whole services. There are also around 50% respondent firms that have engaged in publishing services which amount on average to 3.64% of their total services.

[6] Reliable information is not found about the graduation details of the sample firms for the year 2006/7 as only two to five valid responses are on average found.

The other consideration about firms' service characteristics is their service quality as it is indicated by international recognized quality certification. Regarding to these firms, staff, students and alumni have asked about it. Firms' response shows that it is only 17.24% of firms that have services which are international recognized quality certification. But there is some degree of inconsistency on the response of different groups of respondents, especially the alumni, as 41.07% of their response shows the firms service have recognized quality certification, see Figure 4 below. Two firms have specified the type of service they provide that are internationally certified, these services are Cisco & E-learning, and health related certification.

Figure 4: Summary on response of internationally recognized quality certification

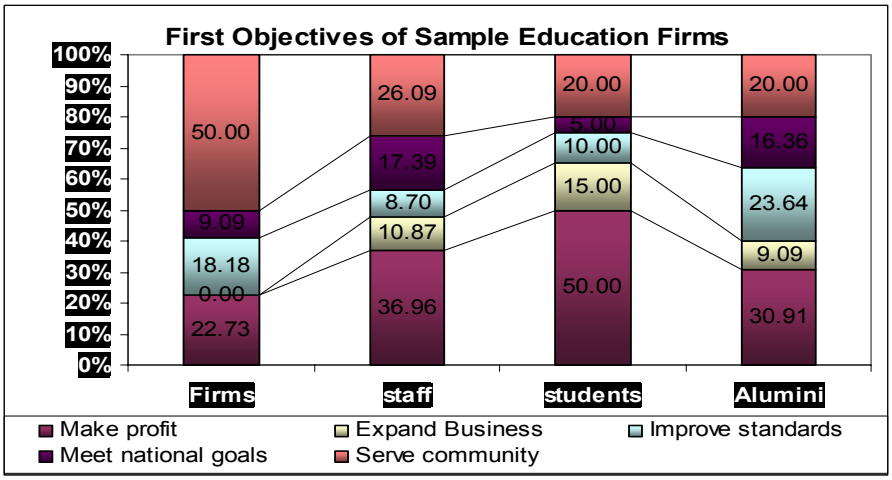


Source: Survey made by Unity University and Trust Africa; 2009

Regarding to the objectives of the firms, firms themselves, staff, students and alumina have given ranks on five main possible types of objectives; making profit, expanding business, improving standards, meeting national goals and serving communities. The comparative analysis shows that the difference is observed mainly on two objectives;

profit making and serving community. According to 50% of firms their first objective is to serve the community, where as 50% of their counter parts (students) have responded that firms first objective is to make profit. The rank of other three objectives lies in-between these ranks, 37% of staff and 31% of alumni believe that firms' first objective is to make profit. In general firms and the other groups of categories perceive that those private higher education firms have range of listed objectives, but the dominant objectives are either to make profit or serve the community. The details of respondents that they assume firms first objective are depicted below in the following figure.

Figure 5: Prioritizing objectives of education establishments



Source: Survey made by Unity University and Trust Africa; 2009

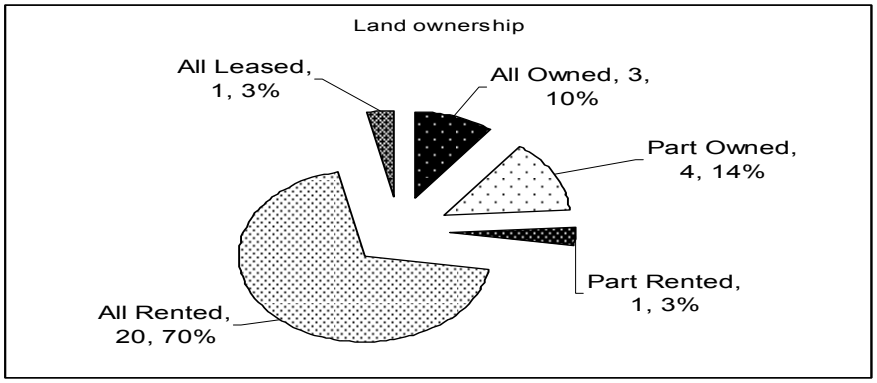
3.2 Infrastructure

A strong infrastructure enhances the competitiveness of an economy and generates a business environment conducive to firm growth and development. Good infrastructure efficiently connects firms to their customers and suppliers, and enables the use of modern technologies. On the contrary, deficiencies in infrastructure create barriers to productive opportunities and increase costs for firms. The indicators used in this study are land access and ownership, power source and power outage, source of water supply, disruption and rate of disruption per month; communication service particularly e-mail and web. Finally the four main categories of infrastructure: electricity, transport, communication and water supply are considered as obstacles to firms. These factors are believed to be the major ones that affect

any business in general and teaching business in particular. In most of investment climate assessments which are usually done by UNCTAD these indicators are commonly used.

With regard to land access the response shows that only 10% of firms from the total respondents are fully owned the establishment, while the other 13.3% are partly and the majority percentage of firms provide their services by renting buildings (see figure below). By its nature education in general and higher education in particular as a business has a long lasting effect for those who assume their objective is to serve the community. Firms working on rental bases, leads to question whether the business is just at its infant stage or their target are the short term benefit that arises from the accumulated backlog demand or is there obstacle in accessing to investment capital or land? It is tried to examine whether relationship exist between land ownership types with number of students enrolled and the required teaching facilities. Fortunately, no relationship is found which might be because the majority of firms are working on rented facilities, and there are also regulations that obligate firms to meet the minimum facilities requirement even if they work on rented facilities.

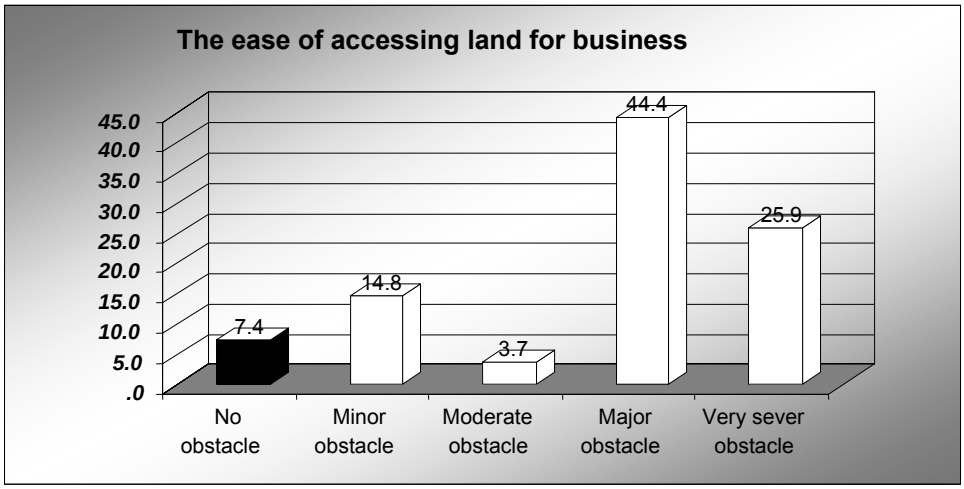
Figure 6: Land ownership of respondent firms

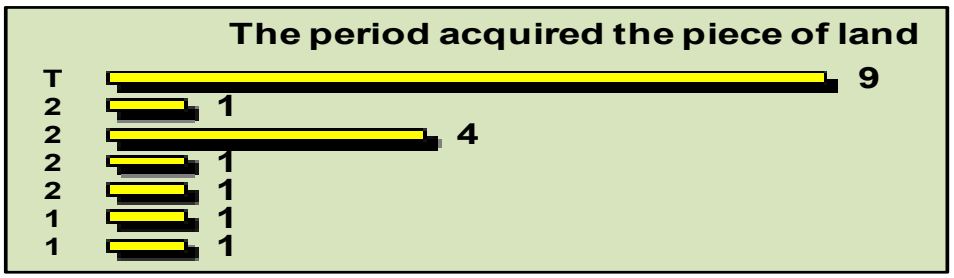


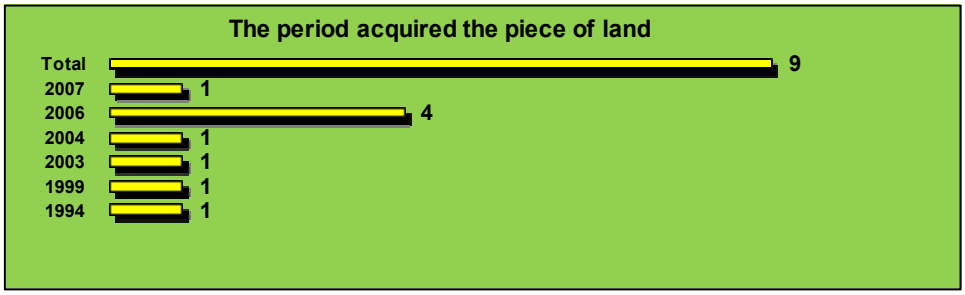
Source: Survey made by Unity University and Trust Africa; 2009

The response also shows that there are nine firms that acquire their own land on lease bases, out of which (44.4%) are acquired in 2006, on the other cases average supply of plot of land per year for higher education business is one. Firms gave their rank regarding to ease of accessing land for their business, as shown in the Figure 7 below, the majority of respondents ranked as major obstacle (44.4%) and very severe obstacle (25.9%).

Figure 7: Land as obstacle, land supply and percentage of ownership





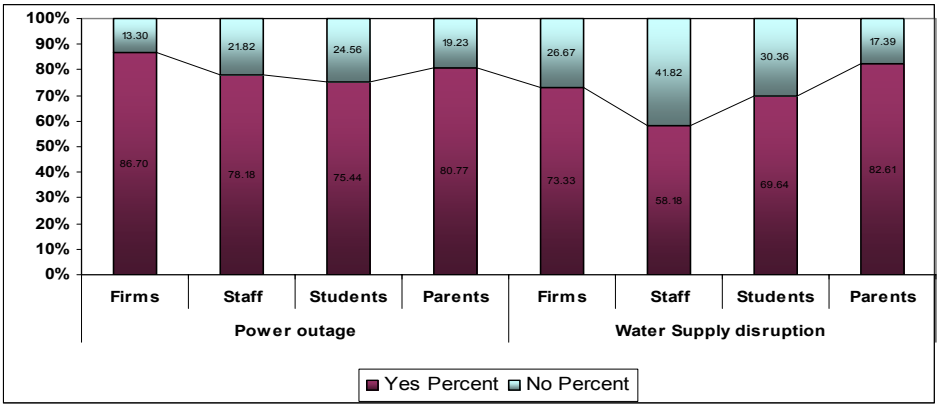


Source: Survey made by Unity University and Trust Africa; 2009

Regarding to power outage among the four groups (firms, staff, students and parents) the majority (86.7%) of respondents confirmed for the existence of power outage. As it is seen in the Figure 8 below it seems that almost all these groups uniformly perceive on

the existence of the power outage, though the largest percent is firms. Despite of the existence of significant power outage those firms that own or share generator are only forty percent of the twenty six valid respondents. This may trigger a question how the rest sixty percent of firms manage their services during power interruption especially in those training areas that depend on electric power like IT fields.

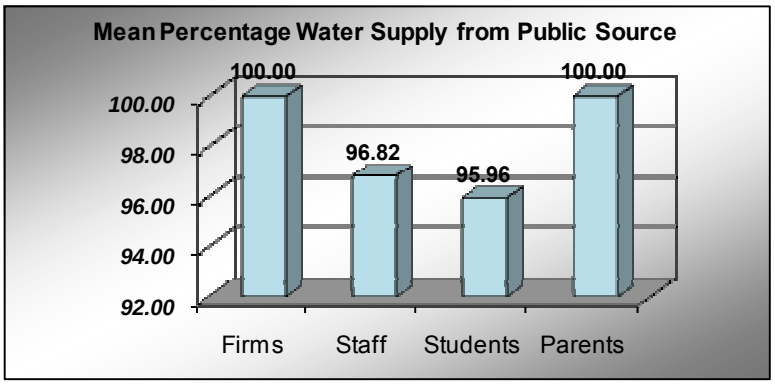
Figure 8: Power Outage and Water Supply Disruption

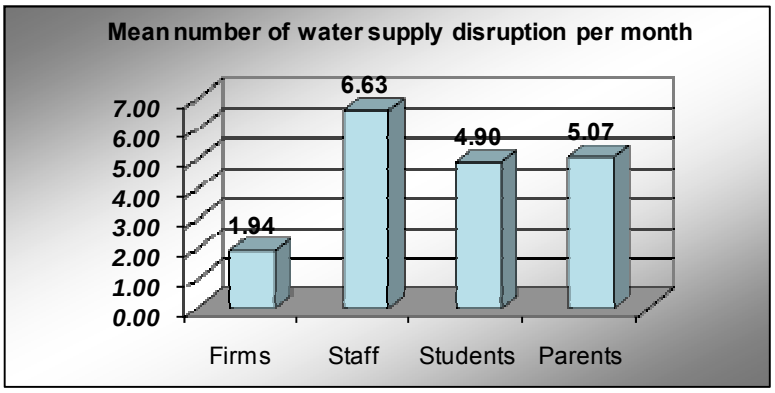


Source: Survey made by Unity University and Trust Africa; 2009

Similarly the existence of water disruption is confirmed by significant number of respondents (group's average 70 %). The mean disruption rate per month varies among the different group of respondents. The lowest is firms response (1.94 per month) while the highest is staff (6.63 per month), as seen in the Figure 9 below.

Figure 9: Water Supply and Disruption Rate per month

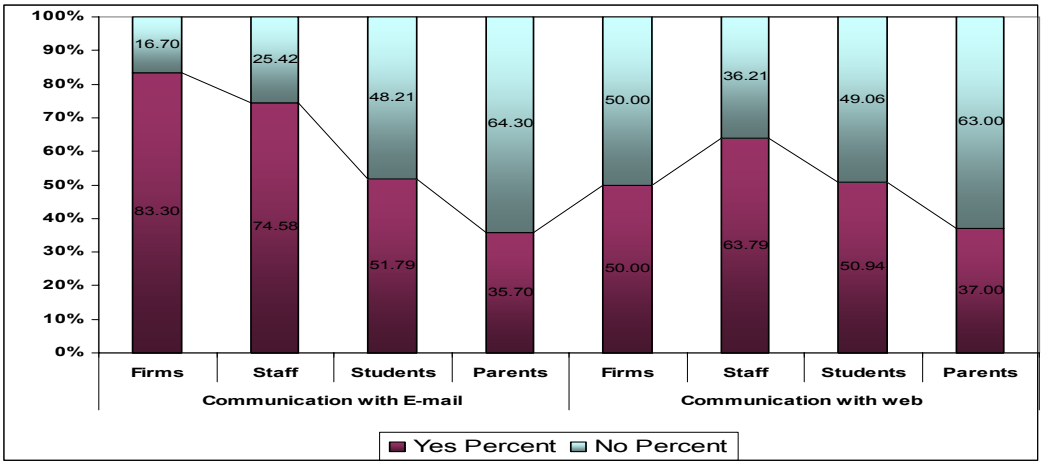




Source: Survey made by Unity University and Trust Africa; 2009

Regarding to the business firms communication with clients the major indicators used are communication through e-mail with clients and using web as a means for their business to provide the services. The result shows that there are dissimilarities among the categories. The highest positive response for using e-mail is given by firms (83.3%), and the lowest is given by parents (35.70%), the rest staff (74.58%) and students (51.79%) found in-between the two extremes. However, the mean response value for the existence of communication through e-mail is 61.34%. Relatively the response given to the existence of communication through web is somewhat consistent, see Figure 10 below, with mean percentage value of 50.43% which is nearly equal to the percentage response of firms and students. Higher percentage response is given by staff (63.79%) and the lowest is given by parents (37%). Relatively speaking, those firms' that use e-mail for their services are greater than web users. In order to increase efficiency and enhance research activity the type of IT connectivity to web is important to those firms lack such connectivity.

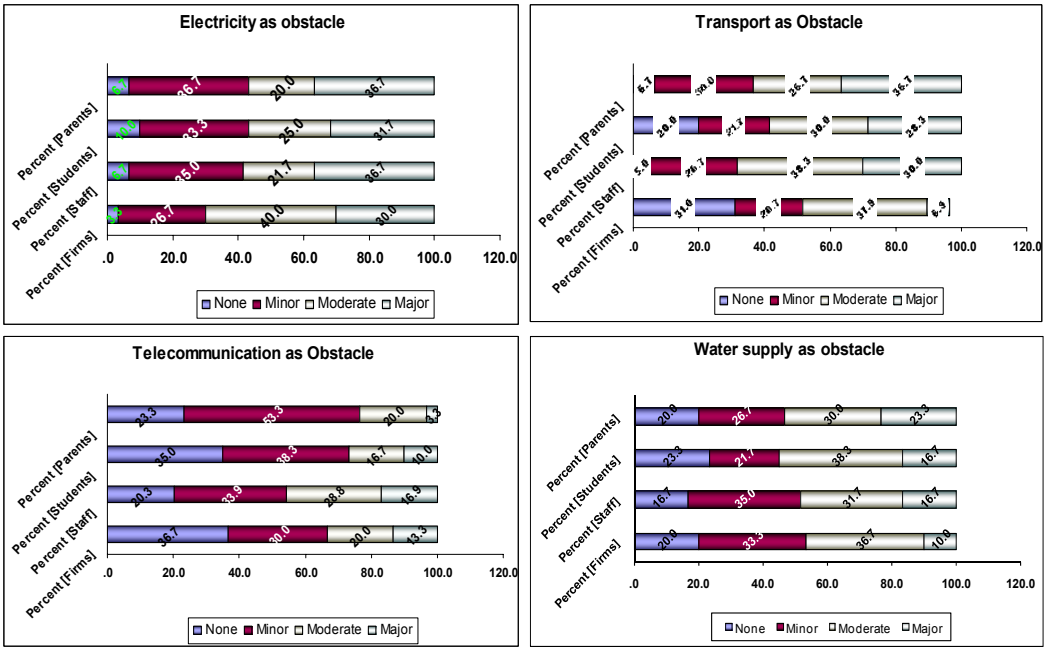
Figure 10: Communication through E-mail and Web



Source: Survey made by Unity University and Trust Africa; 2009

The next thing seen in this section is about ranking infrastructure as obstacle in general. In the study four infrastructure factors are included which are electricity, transport, communication and water supply. This helps to make some comparative analysis among these major factors as the previous discussion only tell us the situation in each case. For each factors the four groups of respondents (firms, staff, students and parents) gave their rank for a four scale ordinal alternatives: none, minor, moderate and major obstacles. The result found out as shown in the Figure 11 below electricity is relatively moderate obstacle for 40% of firms, and major obstacle for 30% of them. For the other three groups the percentage tells that electricity is both minor to certain group (35-36%) and major obstacle to others almost to similar percentage of responses. This might be because of the difference in electric power outage in different localities. Transport is comparatively a moderate obstacle for the majority of all groups except parents, the majority percentage of parents rank it as major obstacle. Telecommunication infrastructure is minor obstacle for the majority of all groups, but few, less than 17% consider it as major obstacle. Water supply is considered as moderate obstacle for the three groups, but the majority of staff considers it as minor problem.

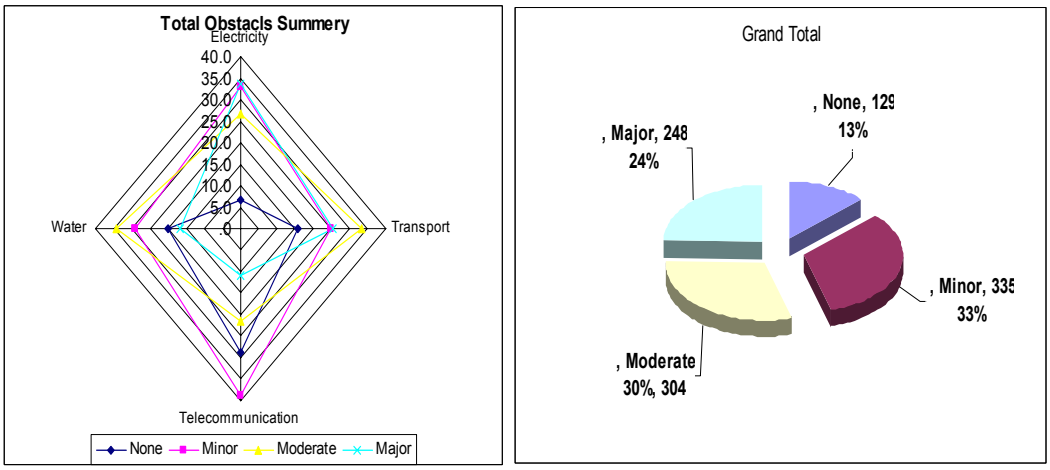
Figure 11: Infrastructure considerations as obstacle



Source: Survey made by Unity University and Trust Africa; 2009

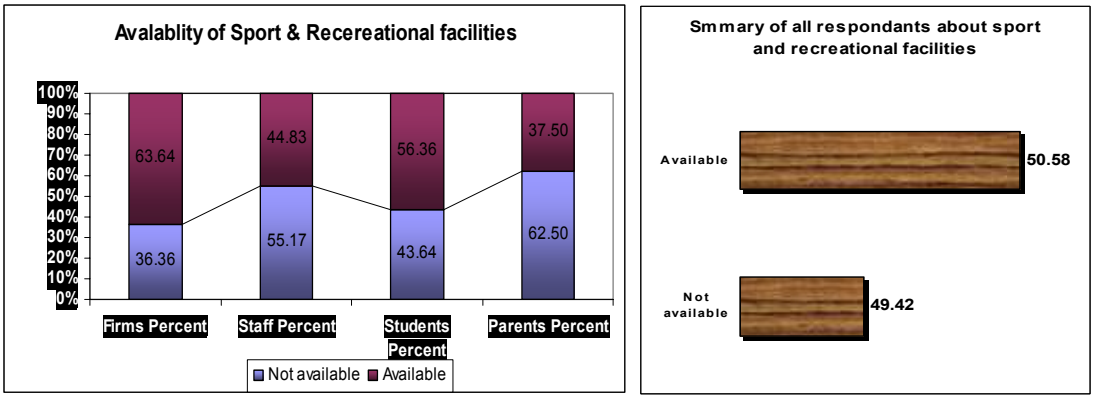
When the four infrastructure indicators are seen in each group, electricity is major obstacle for majority of firms, both transport and water supply is relatively moderate obstacle, and telecommunication is minor obstacle to the majority (see Figure 12 below). But when we consider infrastructure as obstacle in general, by summing up all, is a minor problem, an average of 33% of firms rank as minor, some 30% rank as moderate and 15% as major obstacle. There are also considerable number of firms (23%) that identified infrastructure not an obstacle at all.

Figure12: Combined Result of Infrastructure Obstacles



The infrastructural considerations revealed that access to plot of land is major obstacle to education firms. Firms and other groups also identified for the existence of power interruption, the majority of which not backed up by generator. There is also significant water disruption at least two times per month. Though e-mail is used for the business, web is not sufficiently utilized. In general considering electricity, transportation, water supply and communication as obstacle, electricity is relatively the major obstacle where as communication is the least.

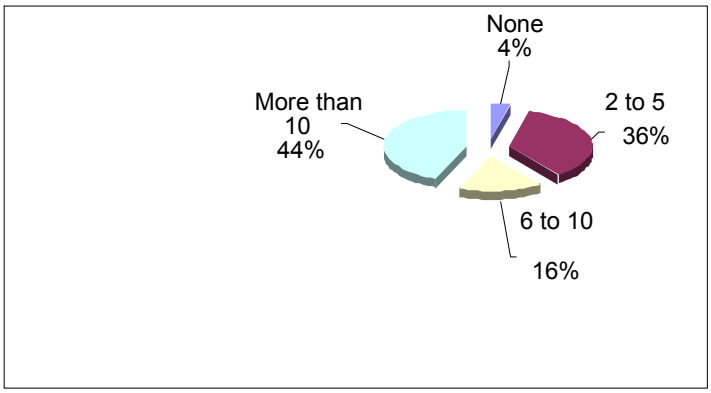
Figure 13: Availability of sport/ recreational facilities



3.3 Competition and service efficiency

In order to survive and prosper in a competitive market firms must improve or innovate their business process and increase productivity. A sound business environment encourages firms to experiment and learn; it rewards success and punishes failure. But it is difficult to exactly measure the degree of competition firms' face. As a proxy of competition and efficiency a number of indicators considered including number of competitors to firms both domestic and foreign, income group of parents and guardians, sharing the market of students, mechanisms of competition to increase the market share, introduction of new practices by firms, capacity utilization of firms and the way of economizing their resources.

Figure 14: Number of firms' competitors

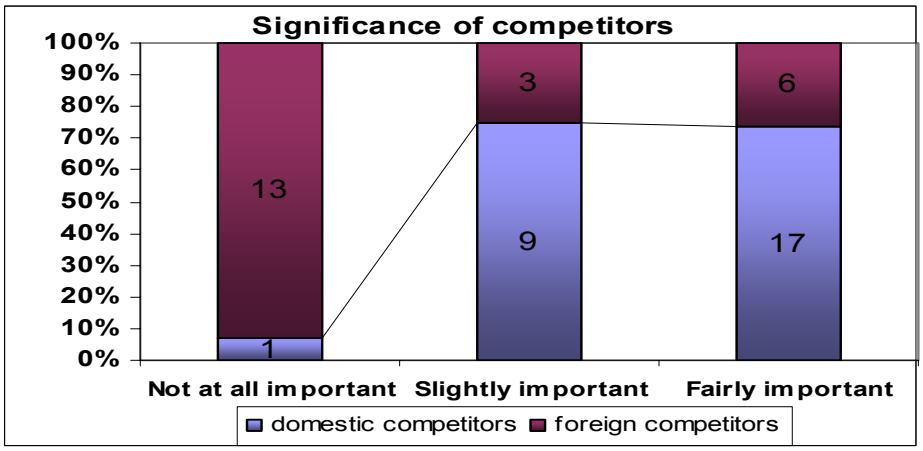


Source: Survey made by Unity University and Trust Africa; 2009

The result shows that the competition does appear as intense. Large percentage of firms (44%) consider that they have more than ten competitors at this infant stage of the business, but all except one, have more than two competitors. This competition is from the market share that is left after the government institutions utilization capacity has exhausted. This implies that the competition may further get fierce in the future as the government enrollment capacity is dramatically increasing. According to the respondents the mean percentage share of students that is going to private sector is 61%, though the response given in this particular point varies from respondent firms to firms.

Sample firms are also requested about the significance of the competition to their business. Having the aforementioned amount of competitors the significance of domestic competitors is fairly important for 60.7% of firms and slightly important for 32.1% of respondents firms. Though the competition is fierce it is not as such discouraging to potential entrants or further to expand the existing business. The significance of foreign competitors is not at all important for majority of firms (59.1%), and only slightly important for 13.6% firms and fairly important for 27.3% firms. As stated earlier there is only one firm from the sample taken that has foreign investment title otherwise others are home grown.

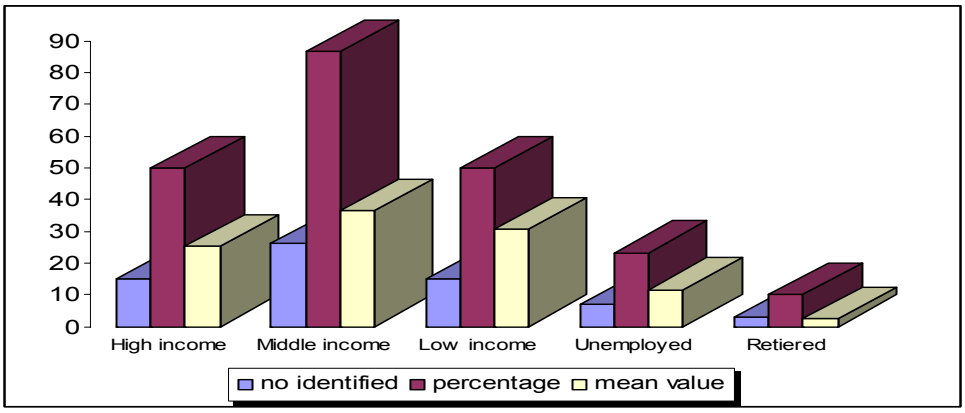
Figure 15: Significance of competitors



Source: Survey made by Unity University and Trust Africa; 2009

The parents or guardians of those students who enrolled in private institutions are from all income group types; high, middle and lower income group, however 50 % of respondents respond for the existence of high income group but the mean percentage of high income group is 25.2, see Figure 16 below. For the existence of middle income group 86% of respondents respond, the mean percentage value is 36.65. There are also respondents (50%) for the existence of low income group in private firms with a mean percentage of 30.67%. This result indicates that the market segmentation of private firms is to target more at the middle and low income groups than high income ones.

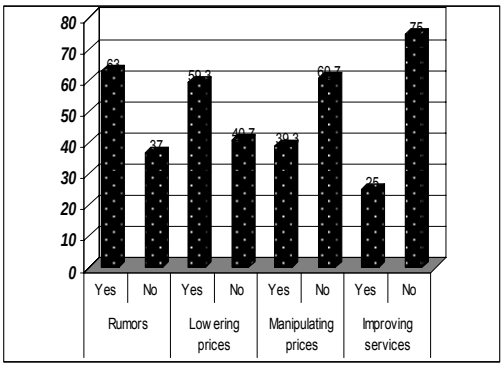
Figure 16: Income group of parents / guardians

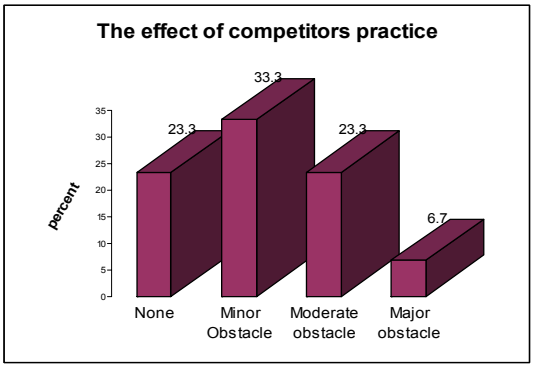


Source: Survey made by Unity University and Trust Africa; 2009

To study the options of competition, how firms take away students and teachers from competitors, a variety of possible alternatives are considered: rumors, lowering and/or manipulating prices and improving services. Though two or more of the methods are exercised by most of the firms the dominant mechanisms in order are rumors (63%) and lowering prices (59.3%). But the effect of these competitors' practices to the proper running of the business is either none for 23%, or minor obstacle for 33% of the firms. Of course there are also firms that consider it as moderate obstacle (23%).

Figure 17: Mechanism of competitors and its effect as obstacle



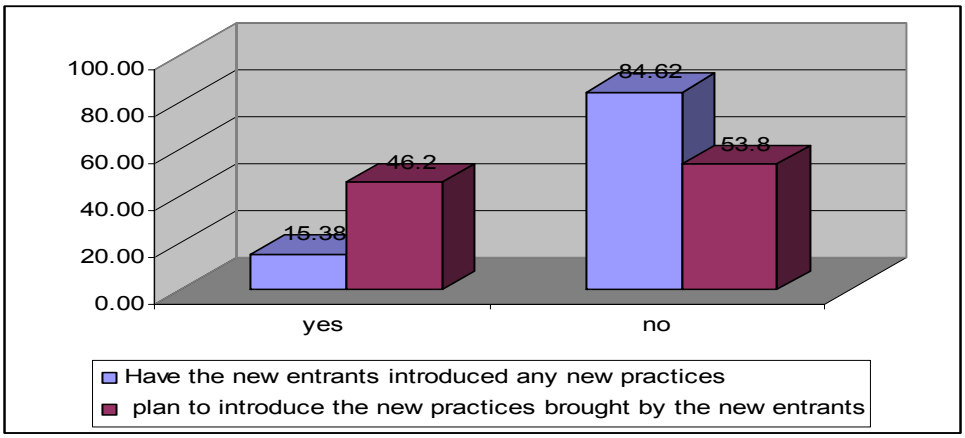


Source: Survey made by Unity University and Trust Africa; 2009

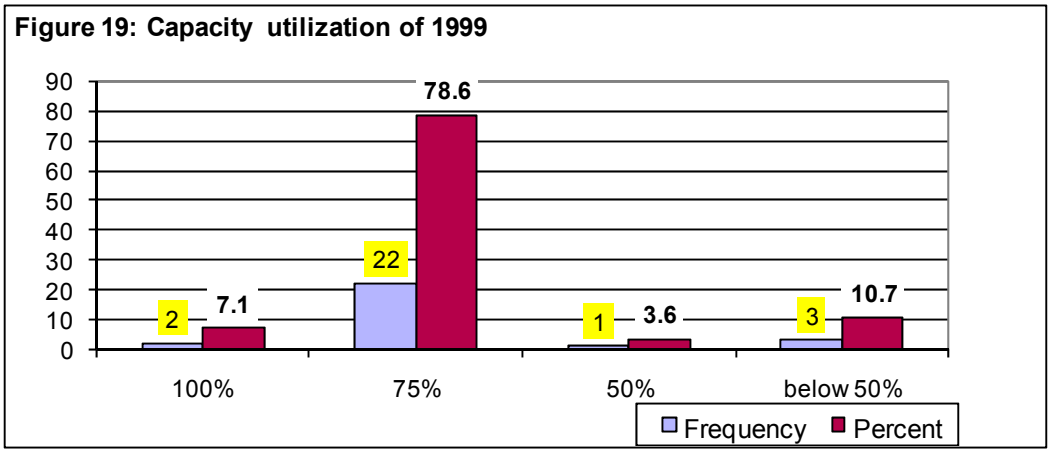
In the last three year the mean number of firms that exit is nearly four, whereas the mean number of firms that entered in the year 2006/07 is 1.6. The common reasons that firms identified for exit are lack of demand, high cost of rental facilities and high tax, lack of access to finance, fail to meet government regulation, stiff competition and conflict among proprietors.

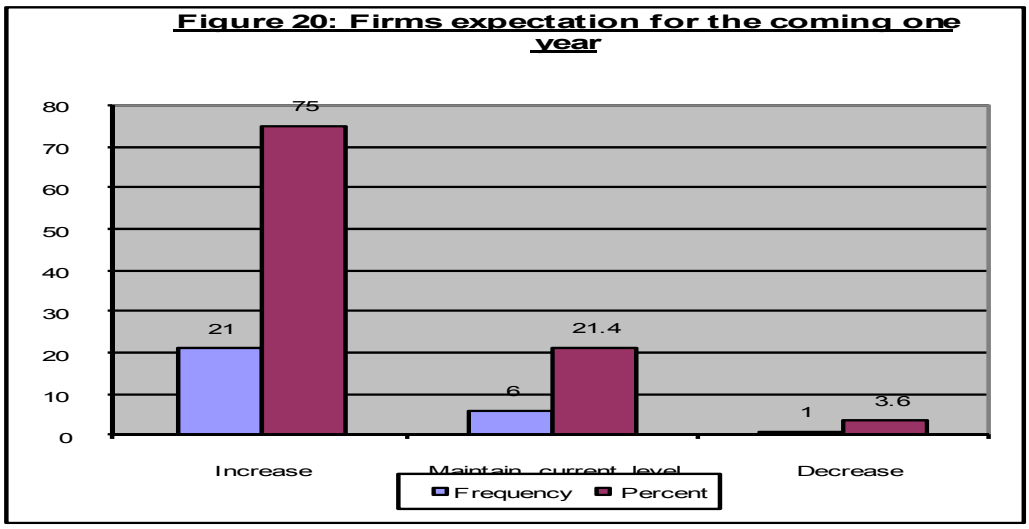
In order to see innovation as instrument of competition, firms are asked whether new entrants have introduced new practices or not. This new practice could be related to teaching materials and methods, course design, technology support, student or staff recruitment or any other. The majority of the respondents (84.6%) said that those new entrants did not introduce new practices. For the question whether they have plan to introduce new practices for the coming period, only few (43.3%) respond and their result shows that only 46.2% of firms from the valid respondents have got plan to introduce new practices.

Figure 18: Introduction of new practices



The other indicator of the efficiency of firms to increase service quality and productivity is capacity utilization. The majority of the firms (85.7%) capacity utilization is 75% and above, but there are firms (10.7%) whose capacity utilization is less than 50%. The main reasons mentioned for the underutilization of capacity is mainly lack of demand and working capital. The good news is almost all firms' expectation for the coming one year is either increase the service capacity (75%) or maintain the current level (21.4%). This implies firms expect that there is still potential demand that can be attracted.





Source: Survey made by Unity University and Trust Africa; 2009

Education firms enrollment fee also considered to show the degree of competition and it gives a signal for the existence of price war. Especially in the main areas of competition, bachelor and diploma programs both day and evening there is large variation between per credit hour cost, see Table 1 below. This may be partly explained by the nature and type of the course and partly as a mechanism of dislocating other competitors from the market.

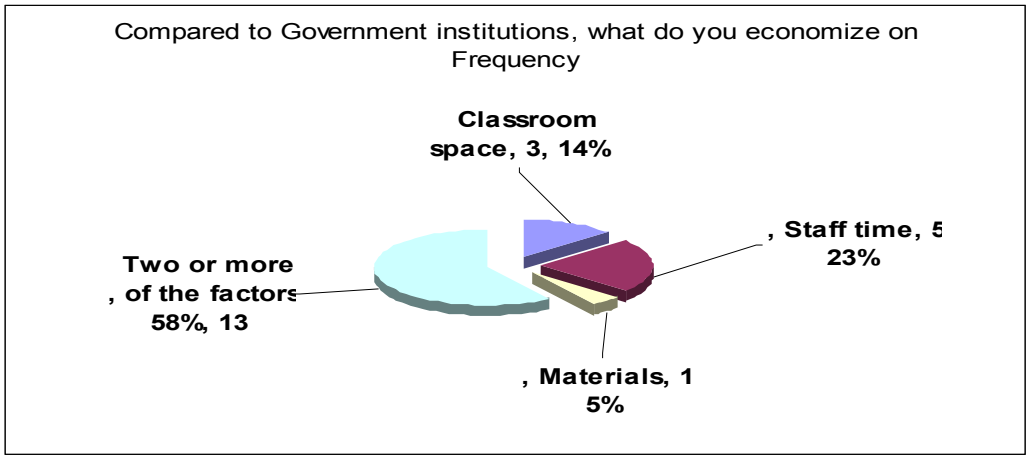
Table 1: Per credit hour cost

	No. of respondents	per credit hour cost		
		Mean	Minimum	Maximum
bachelor degree day	18	71.67	40.00	120.00
bachelor degree evening	15	92.27	35.00	400.00
bachelor degree dist	3	40.00	40.00	40.00
diploma day	12	92.25	35.00	300.00
diploma evening	10	84.60	35.00	260.00
diploma distance	1	30.00	30.00	30.00
certificate day	4	31.25	20.00	60.00
certificate evening	4	32.50	20.00	65.00

Source: Survey made by Unity University and Trust Africa; 2009

The other way of increasing efficiency in order to be more competitive is economizing resources. Education firms have opportunity to economize time mainly staff time, class rooms and teaching materials. Majority of the firms' response for the request in this regard as compared to government institutions shows that firms economize one or more of the items: academic staff time, class room and materials as compared to governments, see Figure 21 below.

Figure 21: Items firms economize



Source: Survey made by Unity University and Trust Africa; 2009

3.4 Government business relationship

One of the core areas for the assessment in the investment climate is the relationship of government and business firms. Good economic governance in areas such as regulations, business licensing and taxation is a fundamental pillar for the creation of a favorable business environment. Effective regulations address market failures that inhibit productive investment and reconcile private and public interests through enhancing investment by providing various incentive schemes and by protecting firms from informal practices and unfair competition. The number of permits and approvals that businesses need to obtain, and the time taken to obtain them affects investment by increasing transaction cost. In addition, unpredictability of policy directions and inconsistence of regulations, lack of proper enforcement, a negative perception about the tax environment, may limit the operation and growth of the private sector.

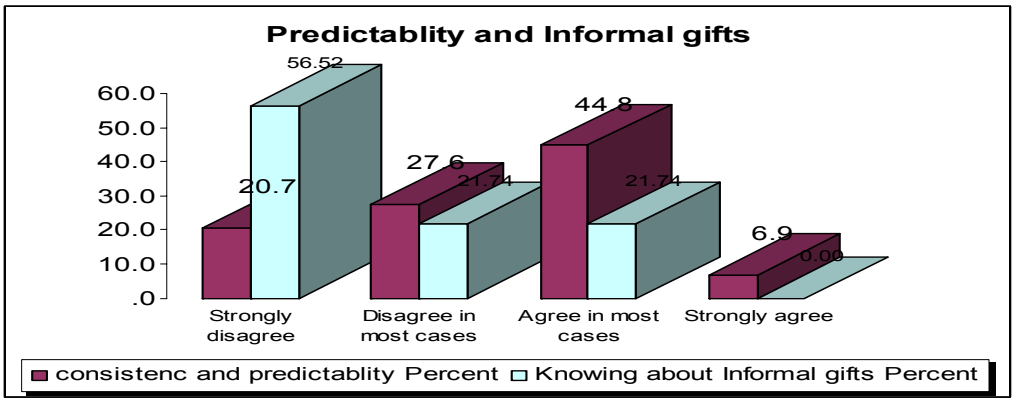
Among the many factors that explain the relationship, the indicators used here are familiarization of firms to the policies that affect them, their participation in policy issues, and predictability of governments' regulation and its enforcement as these build confidence for business communities for long-term investment, expansion and improvement of business. They all have direct or indirect impact on encouraging for doing business, conducting research and development and publishing results.

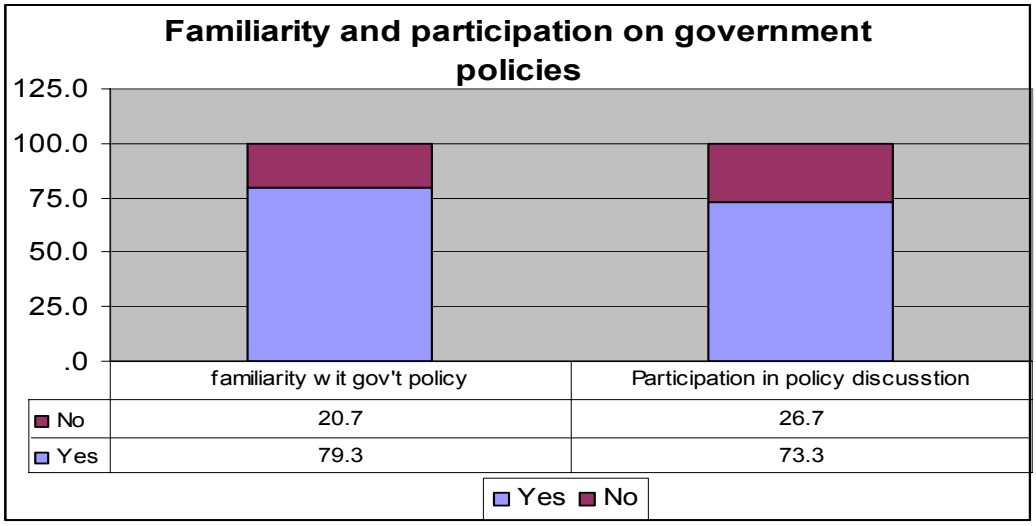
In addition, the firms' perception about the existence of informal gifts, inspection by different offices: quality agencies, MOE, tax authorities, labor and social affairs are also taken as proxies to measure the relationship of government and business firms. In order to see government service responsiveness to clients the waiting periods of different service that related to education are considered. The institutions' operational efficiency and honesty are also evaluated by the different groups. The different associations in which firms are member of and involve, the required support from these associations are also taken into consideration. Finally the main types of investment climate indicators such as tax rate and administration, licensing and permit, corruption etc as obstacle are identified and ranked by firms. The result obtained is discussed hereunder.

The result shows that the majority of firms (75%) agree in most cases that they are familiar with government policies, and they also participate in policy discussions directly or through their representatives at different levels (federal, regional and/or local). But the result about government regulations and enforcement predictability is inconclusive as half of firms identified as they agree in most cases and the other half disagree in most cases

for predictability (see figure below. This may be partly in conflict with those majority firms that respond positively for the familiarity and participation on government policy; or there is irregularity or inconsistence either in enforcement of laws and regulations or the repetitively done amendments of such regulations as part of the reform activity has affected the predictability.

Figure 22: Predictability, familiarity and participation on government policies, and existence of informal gifts

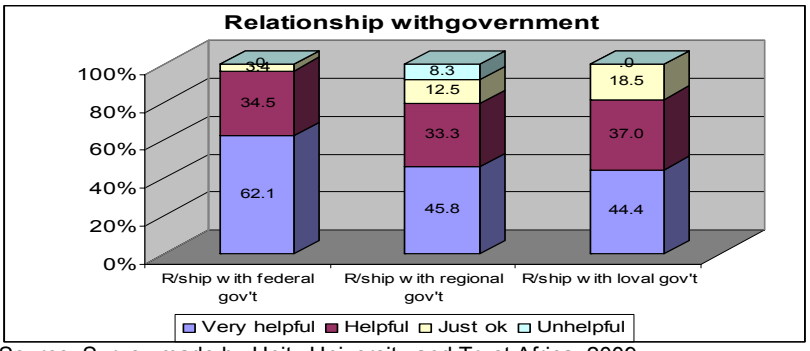




Source: Survey made by Unity University and Trust Africa; 2009

Firms have asked how helpful the relationship with government for doing the business well. In general the majority of firms identified that their relationship with government is helpful for their business, but when it comes to the different levels of government from federal to regional then local the number of firms identified as helpful reduces though the difference is not as such significant. This leads to a suggestion that either problem solving decisions are still centralized or the capacity of regional and local governments are not sufficiently enough or they are not providing friendly services. Their response is shown in the Figure 23 below.

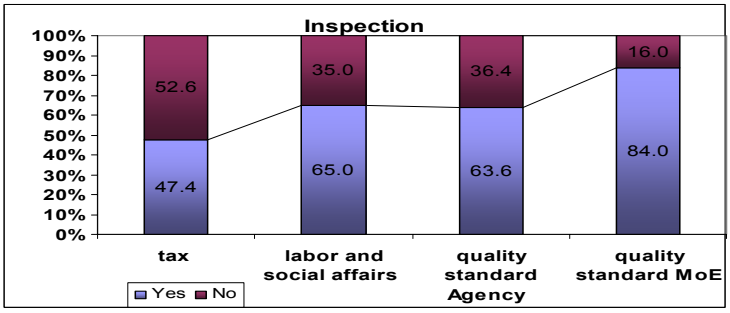
Figure 23: Relationship with Government



Source: Survey made by Unity University and Trust Africa; 2009

About the inspection of government offices to higher education, those governments that are expected to visit private higher education are tax administration offices, labor and social affairs office, ministry of education and quality standard agencies. Majority of firms have identified the existence of all types of inspection in the typical year except tax office. Relatively the visits for inspection made seems more (84%) by quality and standard of MOE, then comes labor and social affairs (65%), quality standard agency (63.6%) and finally comes tax office (47.4%).

Figure 24: Inspection by government Institutions

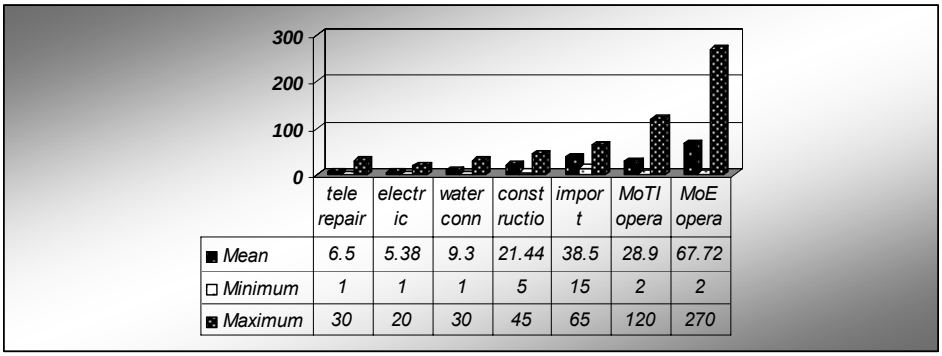


Source: Survey made by Unity University and Trust Africa; 2009

The senior managers' time which is spent in dealing with government regulations varies from none to 75%, but the mean percentage time spent of their total management time is 21.7 per firm though there is a significant variation with in firms response. According to enterprise survey data of 2006, generally in Ethiopia business firms' management time spent in dealing with requirements of government regulations is 3.77%. This result shows that the higher education management takes more time (21.7%) in dealing with government officials as compared to the Ethiopian average percentage (3.77%). Considering senior management's time spent for such activity in terms of time tax paid for government is very costly.

Firms get different services from government that are essential for running their business properly. These services affect directly their efficiency and competitiveness. The services include supply and repair of telephone, electricity, water, and different licensing and permit services. Firms are asked to give information about the waiting periods they take in order to get such services and evaluate the services in general based on their experience. The result found out is delivered in the Figure 25 underneath. According to the response the mean waiting period in days for the three utility services are below ten days: for telecommunication repair (6.5), electric connection (5.38), and water connection (9.3). But the waiting periods for construction permit, operating license from MOTI and operating license from MOE are 21.44, 28.9 and 67.72 respectively. The service that takes the highest mean waiting period is from MOE in order to obtain operating license.

Figure 25: Waiting periods based on firms' experience



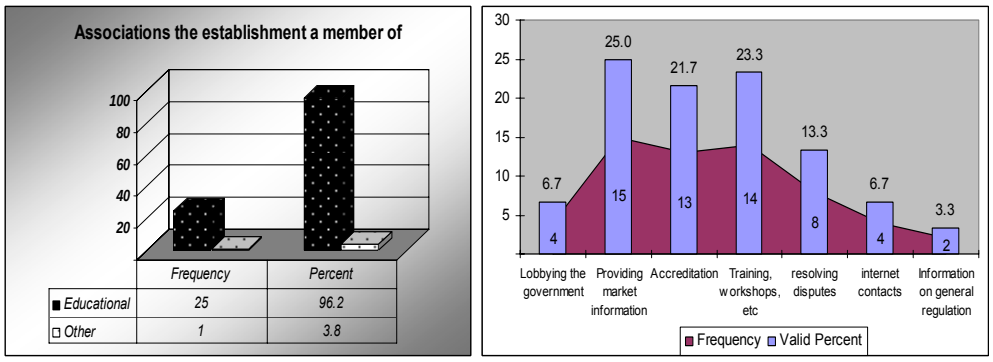
	tele repair	electric	water conn	construction	import	MoTI opera	MoE opera
Mean	6.5	5.38	9.3	21.44	38.5	28.9	67.72
Minimum	1	1	1	5	15	2	2
Maximum	30	20	30	45	65	120	270

Source: Survey made by Unity University and Trust Africa; 2009

One common alternative of developing the business sector and strengthening the relationship with government, so as to create a more conducive business environment is through being members in different associations. These associations engage in advocating and help for the improvement and simplification of government

bureaucracy. There are professional associations, in this case higher education associations, and other non professional associations which firms have the opportunity to involve. Firms have asked in which of these associations they involve in. The result shows that almost all higher education firms that are considered in the study (96.2%) are identified themselves as members of professional associations but not in other. These firms require different services and support from the associations, see figure 26 below. The three most identified services that firms expect from the associations are providing market information (25%), support for accreditation process (21.7%), support on training and workshop (23.3%).

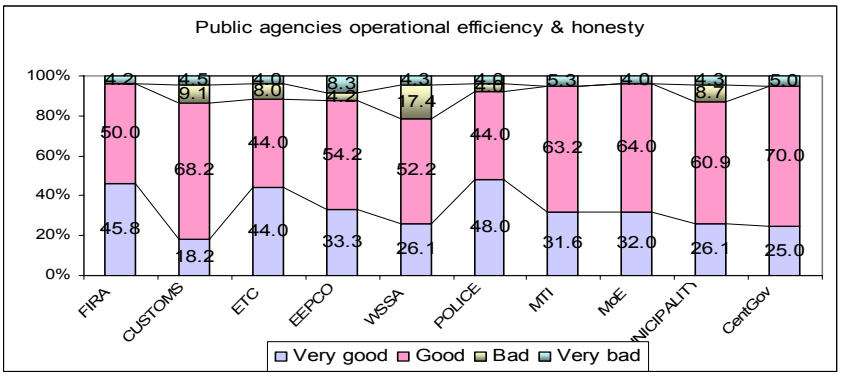
Figure 26: Firms Membership in associations, and services and support they need from the associations



Source: Survey made by Unity University and Trust Africa; 2009

In order to see the operational efficiency and honesty of public service including the central government, ten public institutions are evaluated by higher education firms based on four scale ordinal variables: very good, good, bad and very bad. The result shows that, as depicted in the Figure 27 below, all the institutions efficiency and honesty is ranked on average 33% as very good and 57% as good, implies that 90% of the education firms are satisfied by the operational efficiency and honesty of these listed public services including the central government.

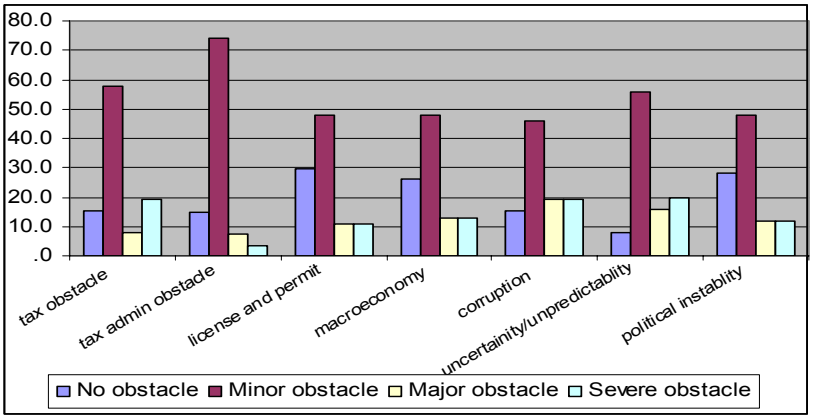
Figure 27: Public agencies operational efficiency & honesty



Source: Survey made by Unity University and Trust Africa; 2009

Firms are also asked to choose from the potential obstacles that deemed to be obstacles for the normal operation of the firms and for the expansion of their business. Seven potential obstacles are considered: tax rates, tax administration, licensing and permit, macroeconomic stability, corruption, uncertainty, political stability. Firms gave their rank based on a four scale measurement (not obstacle, minor, major and severe obstacle). The rank of the majority of firms shows that all the cases identified as minor obstacles, see the Figure 28 below. Among the obstacles the three most sever obstacles are unpredictability of policies (20%), tax rate and corruption 19.2% each; the three least identified as obstacle which can be considered as opportunity are licensing and permit (29.6%), political instability (28%) and macroeconomic stability (26.1%).

Figure 28: Major Investment climate indicators as obstacle



Source: Survey made by Unity University and Trust Africa; 2009

3.5 Crime and conflict resolution

Crime imposes costs on firms as they are forced to divert resources from productive uses to cover security costs. It drives up the cost of doing business, creates burden on law enforcement, erodes human-capital, keeps workers out of labor market, and disrupts schooling and affect public investment. Commercial disputes between firms and their clients occur regularly in the course of doing business, resolving these disputes can be challenging and costly where legal institutions are weak and sluggish. Both foreign and domestic investors perceive crime and conflict as an indication of social instability.

In this study as a proxies of crime and conflict resolution the indicators seen are students' default of payment, security of formal guards and existence of professional securities, firms annual cost that goes to security, estimated cost of losses as a result of theft, robbery, vandalism & arson. The existence of disputes, the method of resolution either in court or '*shimglina*'; the time taken for litigation and its enforcement are considered in order to see the conflict resolution environment. In general obstacle of street crime and disorder to the firm, and the functions of judiciary system are evaluated.

The response of firms indicate that from the few valid respondents on the case of the default payment of students the findings shows that the maximum is seven per year, however the mean is one. This should be interpreted strictly as the chance of default risk in higher education is minimum because attending in classes; sitting in examination and obtaining results or certificates are usually used as collateral in case of default.

Table 2: Result related to conflict and conflict resolution

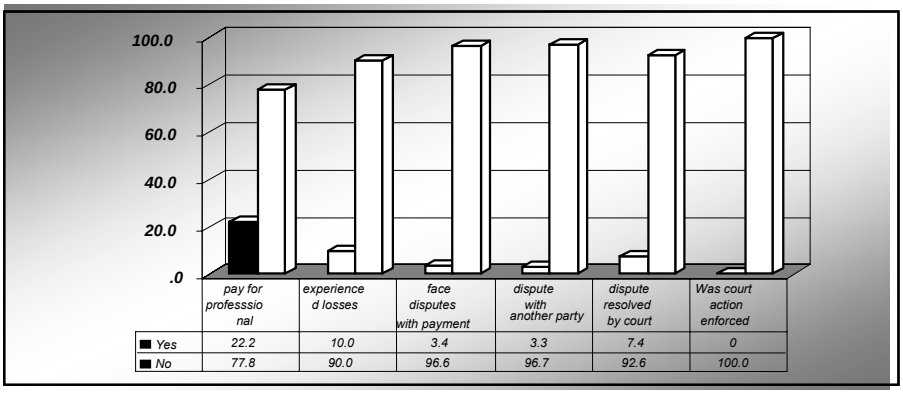
Indicators	Valid N.	Mean	Minimum	Maximum
No. of students dismissed because of default of fee payment in the year 2006/07	13	.85		7
% of the firm's annual cost goes to security including in-house guards	2	1.75	1	3
Estimated cost of losses as a result of theft, robbery, vandalism or arson (Birr)	2	5150.00	300	10000
How long did it take the court action from the day of its initiation to the date of judgment (Days)	1	8.00	8	8
How long did the *'SHIMGLINA'* action take to settle dispute (Months)	2	6.00	2	10
How long did it take between the date of *'SHIMGLINA'* judgment and enforcement (Months)	3	8.33	2	15

Source: Survey made by Unity University and Trust Africa; 2009

Twenty two percent the firms (6) pay for professional security services in addition payment to in-house guards, but those who experienced loss are only 10%, the cost of the loss varies from Birr 300 up to 10,000. Regarding to firms annual cost, the information obtained from two firms indicates that the cost ranges one to three percent of firms annual cost though most firms failed to respond this specific question.

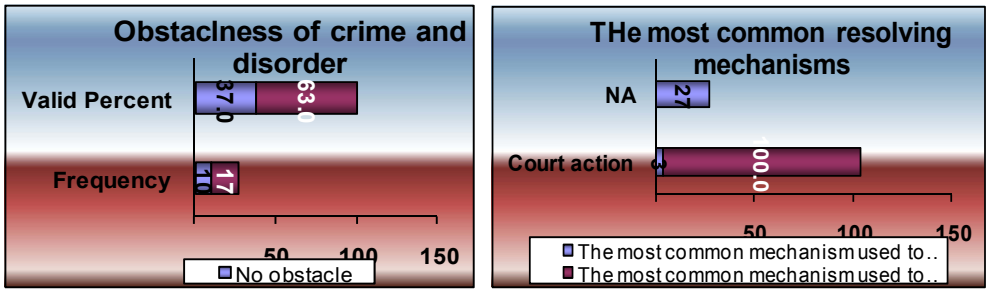
The number of responses obtained regarding to court action and *'shimglina'* about how much time elapses starting from initiation to judgment and then enforcement are very few. Only one respondent has encountered dispute with other person and another one had dispute related to payment. All except the two have no experience of court action related to their business. These two used to resolve their disputes by court action though they are not yet enforced; and none of them responded to *'shimglina'*. In general street crime, theft and disorder to the business is not obstacle to 37% (10) of respondents and it is minor obstacle to 63% (17) respondent firms.

Figure 29: Firms experience related to losses and court action



Source: Survey made by Unity University and Trust Africa; 2009

Figure 30: Obstacles of crime and disorder and Common dispute resolving mechanisms

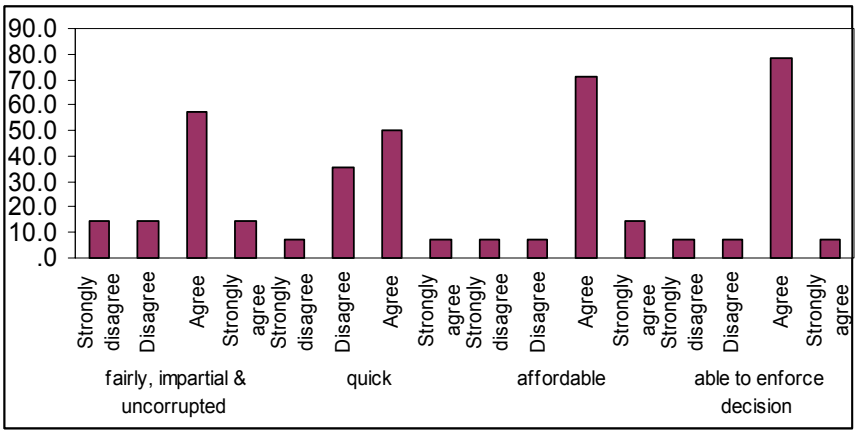


Source: Survey made by Unity University and Trust Africa; 2009

To evaluate the functioning of the judiciary system in general, four indicators are used. First fairness, impartiality and how the judiciary system is free from corruption is seen. Then speed of the court system in order to decide cases and the affordability to get these services is considered. Finally the enforceability of the court decision and its impact is seen as a separate service. In all the four cases those firms rank for favorableness greater than other choices, see Figure 31 below. The better indicator that is ranked as either agree or strongly agree by 85% of firms are the justice system affordability and ability to enforce decision. Since our sample firms have very limited experience related to court action the evaluation in general is corresponding to the previous information related to existence of losses and disputes.

The final four scale of measurement used to assess the functioning of judiciary system for evaluating the justice system as obstacle in general are no obstacle, minor obstacle, major obstacle and severe obstacle. This result is also consistent from the previous response as 29.4% respondents identified it as not an obstacle at all, and 70.6% of respondents identified as a minor obstacle. The existence of default of payment and loss as a result of theft, robbery, vandalism are low, and the impact of the malfunctioning of the justice system on doing business is also low. This seems more factual referring the nature of the higher education business. Crime is highly associated with informality and informality in higher education is minimal. Relatively speaking the existing modest competition is between education firms owned or managed by professionals. Therefore, the likelihood of crime, disorder and also disputes to occur are minimal as compared to other non-educational businesses.

Figure 31: Firms evaluation of the justice system



Source: Survey made by Unity University and Trust Africa; 2009

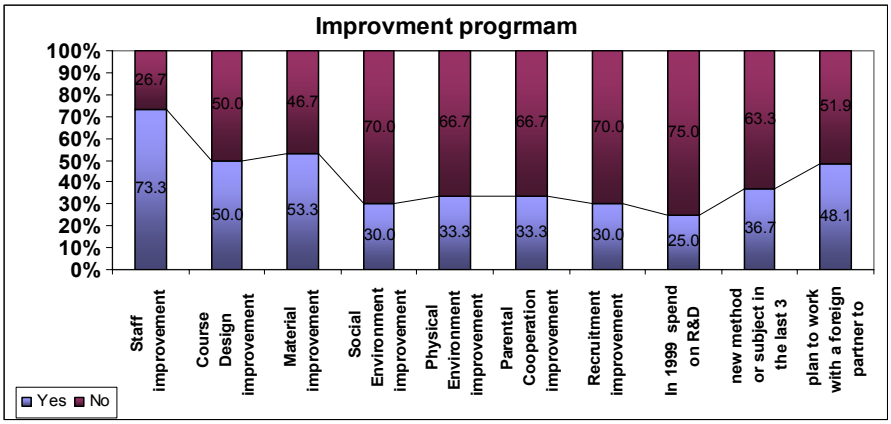
3.6 Growth and development

Favorable investment climate helps for the growth and development of higher education firms' in terms of their enrollment capacity, diversifying services and specially for conducting research and development. The dynamism of the current business environment requires producing competent skilled person who are able to perform well using new technologies, modern systems and other new capacities. In this regard higher education has responsibility to produce such type of skilled labor. This can be achieved through only developing firms capacities.

In order to see the growth and development of private higher education a series of indicators are used mainly related to improvement programs both made in the past and planned for future, and money spend on research and development. The past improvement programs are seen related to staff, material, course design, social and physical environment, parental cooperation and methods of recruitment. In the case of planned improvement programs firms are requested whether they have improvement program related to pay/return, better equipment, better space, and better social environment.

The result shows that it is predominantly self improvement programs that have been intensively practiced, as it is identified by 73.3% of firms response. Almost half percentage of the valid respondent firms have conducted curriculum design, teaching material improvement programs and have also plan to work with foreign partner in order to introduce new practices. On the rest of improvement programs, on average of 30% of respondents claimed to have improvement programs. The detail is presented in the Figure 32 below.

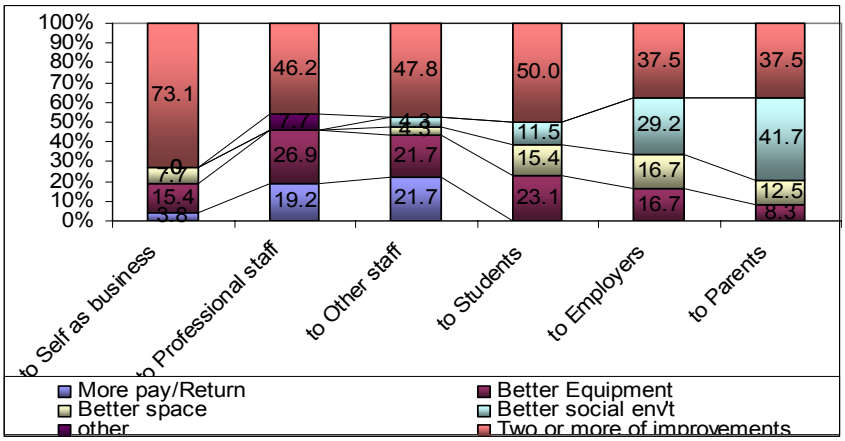
Figure 32: Improvement Programs



Source: Survey made by Unity University and Trust Africa; 2009

Regarding to the existence of any planned improvement programs for future, most of the firms (above 80%) identified as they have plan of one or more of the improvement programs related to pay, space, equipment and social environment. The result shows that it is improvement for better equipment and more pay/return that are cited more by the majority of staff, students and firms. For employers and parents improving social environment is the major future target area for improvement. There are also considerable number of firms' responded (48.1%) that they have plan to work with foreign partners in order to introduce new products. In the last three years 36.7% (11) firms have introduced either new method of teaching or programs.

Figure 33: Firms planned improvement programs



Source: Survey made by Unity University and Trust Africa; 2009

In the year 2006/07 there were only seven firms (25%) of respondents that spend for research and development. Only two of these firms responded to the amount of money they spend on research and development, the value ranges from 40,000 up to 200,000.

3.7 Constraints and opportunities

In order to see the existing opportunity and constraints for investing and doing higher education business in Addis Ababa different indicators that are related to infrastructure including land and finance, competition, crime and disorder and other macroeconomic and political stability are used. The three categories (firms[1], staff and employers) of respondents are requested to identify the top three and the least three

[1] Firms refer to private higher education establishments whereas employers are those business firms that hire graduates from those private higher education establishments.

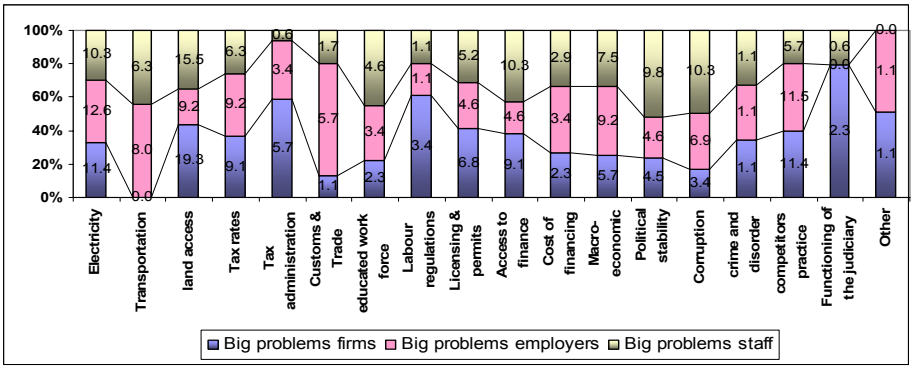
problems out of eighteen choices that are deemed to be either potential constraints or opportunities. Similarly firms are requested to identify the top three and the least three of those eighteen indicators that firms are benefited as a result of the undertaking reform. For our analysis on the one hand the least three identified problems and the top three identified benefits are considered as opportunity and the other hand, the top three major problems and the least three identified benefits are considered as constraint.

The response of firms regarding to constraints shows that, see Figure 34 below, the top three major problems are land access (19.3%), practice of competitors and electricity with (11.4%) each and then access to finance and tax rate with (9.1%) each. This result is inconsistent with the result of the least benefited opportunities in the two factors, land and electricity but not on others.

The response of staffs indicates that access to land (15.5%), electricity, access to finance and corruption (10.3%) each and political stability (9.8%) are the three top obstacles. According to staff response regarding to the question of the three least benefit obtained from the reform are corruption (12.4%), transportation (11.1%), access to land & practice of competitors (7.8%) each. This result is consistent with the firms' response that indicates electricity and access to land as among the top problems. Nevertheless, staff response has brought in to picture corruption as one big problem and the least benefit from the reform.

The employers result related to the top three problems shows that electricity (12.6%), practice of competitors (11.5%) and, access to land, tax rates and macro-economic stability with (9.2%) each are the major problems. They also said that they benefited least from reform areas related to transportation and corruption with equal weight of (10.5%), electricity (9.3%) and from functioning of the judiciary ().

Figure 34: The top three problems by firms, employers and staff

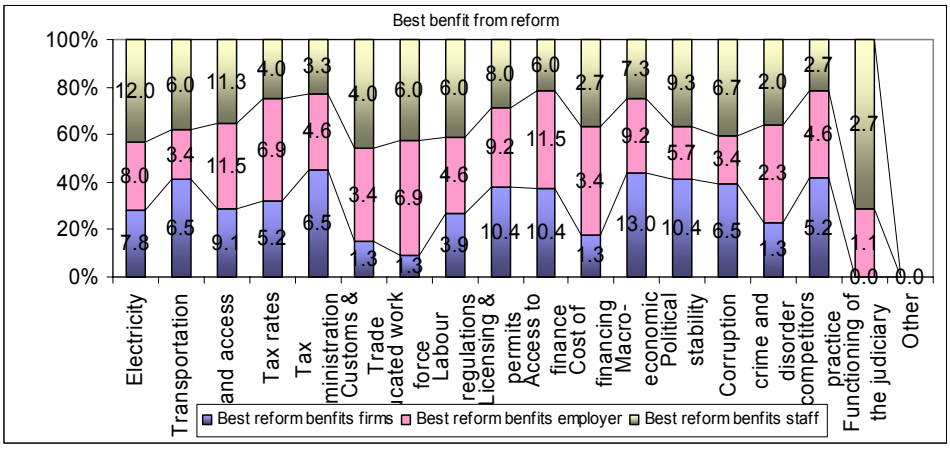


Source: Survey made by Unity University and Trust Africa; 2009

Regarding to the opportunities (benefits from reform) education business firms identified the following as top three opportunities: macro-economic stability (13%), political stability, licensing and permits, access to finance each (10.4%). Access to land (9.1%) is also identified as benefit from the reform following them. This may not be consistent with the previous identified response and from the fact that out of the total sample most of the firms (80%) are working on renting facilities and only nine have secured their own land so far. Those factors identified as the least constraints for doing business are also considered as opportunities. In firms' case the three least identified constraints are electricity, transportation, and street crime.

Staff response for the top three benefits from the reform are electricity (12%), access to land (11.3%) and political stability (9.3%). According to them the least three problems which are considered as opportunities are practice of competitors, electricity, street crime and disorder with equal weight of (8.3%), and educated labor force and labor regulation (7.7%) each.

Figure 35: The top three benefits obtained from reform by firms, employer and staff



Source: Survey made by Unity University and Trust Africa; 2009

Employers of graduates students from education firms recognize that they are benefited from access to land & access to finance with equal weight of (11.5%), licensing & permit and macroeconomic stability (9.2%) each and electricity (8%). Similarly taking the least three identified problems as opportunities according to employers are: transportation (11.5%), corruption & electricity equally (10.3%) and crime and disorder (6.9%).

The comparative analysis of the perception of the three groups (education firms, employers and staff) is summarized as follows. To firms, the first five top problems are:

a) land access,
b) electricity, tax rates and access to fiancé with equal weight,
c) license and permit,
d) tax administration and
e) Macro-economic stability.

The five top problems to employers are:

a) electricity,
b) competitors practice,
c) land access and tax rate with equal weight,
d) transportation and
e) corruption.

To the staff,

a) land access,
b) electricity,
c) access to finance and corruption equally,
d) political stability, macro-economic stability,
e) Transport and tax rates equally are the top five problems.

According to higher education firms' perception the top five areas that benefits obtained from the reform in order of importance are:

a) macroeconomic stability,
b) licensing & permit,
c) access to finance and political stability with equal weight;
d) land access, electricity and,
e) Transportation, tax administration and corruption with equal weight.

Whereas to employers' the top five benefit areas are:

a) land access & access to finance with equal weight,
b) licensing & permit and macro economy with equal weight,
c) electricity,
d) tax rate,
e) Educated work force and political stability in order are five areas that benefit the business.

To staff, electricity, land access, political stability, licensing and permit and macro-economic condition are the top five benefits from the reform.

In general, these results are almost similar to the findings of Enterprise survey and World Bank final output which are both done in 2006. The enterprise survey covered all business types while the World Bank result was focusing on manufacturing sector. For comparison the finding of the two surveys are presented hereunder.

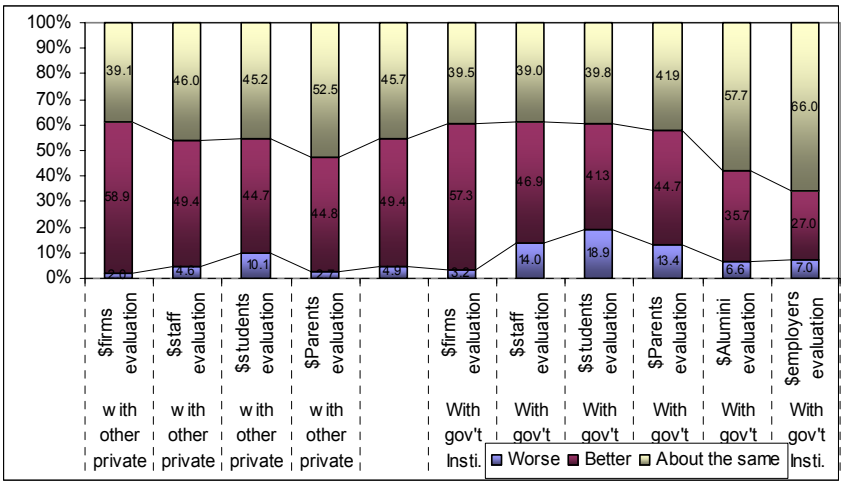
Top five constraints [Enterprise survey, 2006]	**Top five constraints for Manufacturing industry [World Bank, 2006]**
o Access to finance	o Competition from informal sector
o Access to land	o Access to finance
o Practice of informal sector	o Tax rates
o Tax rate	o Macro economic conditions
o Electricity	o Access to land

4. Evaluation of private higher education services

For the purpose of evaluating the private higher education service, six categories of respondents (firms, staff, students, alumni, parents and employers) are considered. The set of indicators used for evaluation are: academic, administrative and library conditions. Moreover, physical and social environment, fairness of fee, job prospects and location are also used to evaluate the service. Two types of evaluation is done, first firms are asked to evaluate their firm as compared to other equivalent private education business firms, and secondly they are asked to evaluate in comparison to equivalent government institutions. The results obtained from each category of respondents and the subsequent comparative analyses are discussed hereunder.

The firms evaluation by themselves shows that the majority percentage of these firms (57.3%) consider their service as better than others. Other considerable amounts of the firms (39.5%) consider their services the same with other equivalent private institutions. The staff evaluation also shows nearly similar result as 49.4% of staff respondents rank their firm better than others, and 46% staff rank the services they are delivering are the same as other equivalent private firms. Considering the response of students the result still shows some similarity in that the majorities (45.2%) consider their institutions are about the same as other private firms; but 44 % of respondent students consider they are enrolled in relatively better private institutions. On the opposite there are 10.1% students that rank their institutions as worse than other private institutions.

Figure 36: Evaluation of education services by different groups



Source: Survey made by Unity University and Trust Africa; 2009

In general the majority of the result obtained from both firms and staff indicates that the services rendered are at least as the same as across private institutions. The same is also confirmed by the student respondents except for those 10.1% who rated the services obtained from their establishments as worse.

When we compare private firms with government institutions the majority of respondent firms (57.3%) consider themselves as better, and others 39.5% consider their service is the same as government. Staff response also confirm the same result as 46.9% ranks as better and 39% said the services are similar. There are of course 14% staff respondents that rank as worse than government services. Staff response considered as good indicator in this regard as the academic staff have got chance to work in both government and private institutions, moreover, most of the academic staff are trained in government institutions.

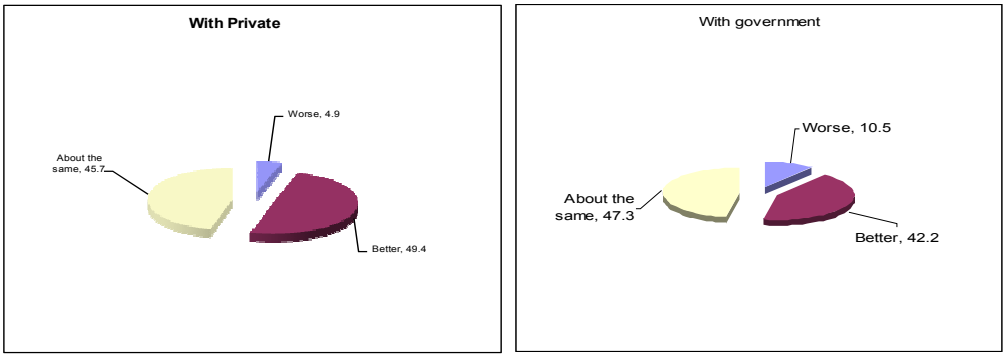
Similar to the above 41.3% of the respondent students said services in the private firms is better than the government institutions, and 39.8% said about the same, there are of course 18.9% that rank as worse. The majority of alumina regarding the service provided in the two institutions ranked similarly, and some considerable respondents (35.7%) identified the private as better.

The parents' response in evaluating the service is also consistent with what is stated above; the majority (52.5%) said service in different private institutions is about the same. There are respondents (44.7%) who identified the institutions in which their

students are learning as better than others. As compared to government more parents (44.7%) evaluated private education service as better and 41.9% as the same as government. There are 13.3% who ranked the service in the private sector as worse.

Taking the average value of all the categories to the evaluation of private firms' education service with respect to other equivalent private institutions shows that the majority (49.4%) rank themselves as better while 45.7% said it is the same as others, and 4.9% ranked their service is worse. When the cumulative private firms' evaluation as compared to government is considered the majority of the respondents (teachers, students and parents) (47.3%) identified the rank to be about the same, (42.2%) identified their service is better than government and the rest 10.5% as worse.

Figure 37: Cumulative service evaluation of private education firms with other private firms and with government institutions.

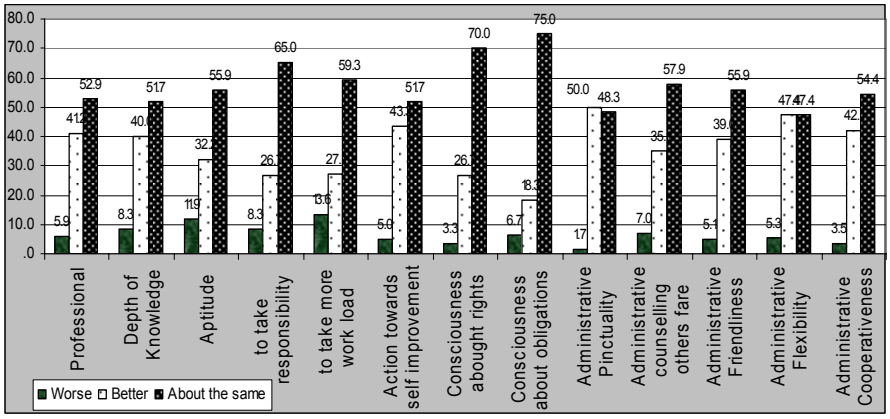


Source: Survey made by Unity University and Trust Africa; 2009

From this result one can argue that firms consider their service is at least as good as others competent firms including those of government institutions. This result is also confirmed by other counter group i.e. students, staff, parents and employers.

Alumni are also requested to compare the private education sector with government similar institutions with respect to professional fairness, depth of knowledge, aptitude, taking responsibility and work load, self improvement and consciousness about their right and obligation. As it is presented in the Figure 38 below, the majority response shows that it is about the same. But there are considerable responses that favor private firms as better especially in areas of punctuality (50%), administrative flexibility (47%), self improvement (43%) and Administration cooperatives (42%).

Figure 38: Alumni response for comparison with government institutions



Source: Survey made by Unity University and Trust Africa; 2009

5. Summary and Conclusion

- Private higher education business is a recent phenomenon in Ethiopia, which becomes more evident since 2002. The educational business firms provide predominatly bachelor degree and diploma programs. The enrollment capacity of firms varies from 24 up to nearly around 8000, and the mean staff number is 114.75. Though distance education is recently introduced by few firms, online programs are not yet introduced. Firms mainly focus on education service, i.e. they are giving no or little attention for research, consultancy and publishing services. Firms quikcly transfer to operation right after establishments which makes question for their fulfillment of those ingredients of necessities for education services. Though most firms are managed by those who have ample experience and high level of education background. There are also considerable number of firms that ate managed by those who have little experience or totally inexperienced managers.

- The infrastructural considerations revealed that access to plot of land is major obstactle to education firms. Firms and other groups also identified for the existence of power interruption, the majority of which not back up by generator. There is also significant water disruption at least two times per month. Though e-mail is used for the business, web is not sufficiently utilized. In general considering electricity, transportation, water supply and communication as obstacle, electricity is relatively the major obstacle and communication is the least.

- The marfketing straegy of provate higher education firms target middle and low income groups. There are indicators for the existence of competion among the domestic provate firms, but competion with foreign owned firms isalsmost non-existant as only one such firm is found. The major practices for competitions are spreading rumors and lowering costs, but the effects of such practices are insignificant in diverting customers from the other. Irrespective of the practices firms exit from the market and there are also new entrants. The majority of firms capacity utilization is 75%, and most firms expect that their capacity increases in the coming period. The reason for the exit and capacity under utilization mainly is failure to attract the existing demand. Firms identified that as compared to government insitutions private firms economize staff time, class room and teaching materials.

- The relationship with government is explained by the firms' awareness and participation on policy related matters which the majority has the practice. The service and inspection of the government is identified as helpful by the majority, though the tax paid to the government in the form of time as a result of inspection is high. Firms involve in professional associations but their participation in chamber and other association is almost non-existent. From the professional associations firms want support related to market information for simplifying accreditation process and providing training and workshops. The issue of predictability, the long licensing process of MoE and relatively high tax in the form of time are the major potential areas that may affect the relationship.

- Regarding to proxies of crime and conflict the response of firms is very few in general as their experience of losses and conflict are limited, i.e. it is minor or not obstacle in general. Very few used justice machinery for resolution and not "shimgilina". Even though their experiences are limited most agree that the justice system's fairness, impartiality, quickness and affordability and enforceability are not an obstacle for their business activity.

- Firms development and growth indicators shows that it is self sponsored improvement program that dominated, of course 50% of firms have engaged in curriculum development and material improvement programs. Half of respondent firms also have plan to work with foreign firms. The majority of firms future improvement plan is in the areas of pay/return and material/equipment improvement programs.

- The main constraints, electricity, access to land, tax rates are common big problems that all the three groups (firms, staff and students) picked out similarly.

However, licensing and permit is among the top five problems only to education firms. This may be because of MoE's deliance for permits. Access to finance and macro-economic stability as a problem perceived by education firms and staff but not by employers. What is unique big problem to employers which are not identified as among the top five by others is competitors' practice, Staff and employers consider transport and corruption among five big problems which is not identified by education firms.

- All the three groups (firms, staff and employers) similarly recognized that the reform regarding to licensing and permit, land access, electricity and macro-economic stability as well as political stability have brought benefit to business. The paradox here is that except macro-economc and political stability the aforementioned areas especially electricity, access to land and finance are still the major problem areas though to some extent benefit is obtained from the undergoing reform Firms and employers also perceive that there is benefit related to access to finance.

- All the six categories of respondents' perception show that the private higher education service is as similar as other competitor and to equivalent government institutions. The majority of firms and staff consider their firm service is better than the other, and all groups including students and parents consider the service found in private education firms is better than government institutions. The alumniresponse indicated that graduates from private firms are superior especially in punctuality, self improvement, administrative flexibility and cooperation as compared to graduates from public institutions.

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CLIMATE CHANGE IMPACTS AND RESPONSES IN THE SOUTHERN LOWLANDS OF ETHIOPIA

Alebachew Adem[1] & Aklilu Amsalu[2]

Abstract

Despite the vulnerability of Ethiopia to the impacts of global climate change and weather extremes, and the recognition of this by the Ethiopian government, research-generated knowledge on regional and local impacts of climate change, locally available adaptation and mitigation measures and other community responses are seriously inadequate. Although an enormous amount of resource, time, and energy have gone into reactive disaster response measures, poverty reducing and agricultural production boosting strategies, poverty, food insecurity, and catastrophic environmental hazards such as droughts, floods, diseases and pests remained the major threats to the overwhelming majority of the country's populations and regions. Very little attention has still been given to empirically analyze the root causes of the complex and multifaceted developmental challenges of the country posed by the threat of climate change. In the absence of such empirical research generated knowledge, however, attempts to improve the quality of poor households and bring about development through attaining food self-sufficiency would be unrealistic especially in the hazard-prone areas of the country. This paper is tries to identify major climate change induced-hazards, impacts and local level responses in the southern lowlands of Ethiopia and provide inputs for "climate proof" development interventions and policy formulation.

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1. Introduction

Climate change is rapidly emerging as one of the most serious threats that humanity may ever face. Hence, it has recently become a pressing issue in various development, environment and political forums at the national, regional and international levels. Many regional summits worldwide have dedicated discussion sessions on climate change based on the recognition that the global climate is changing and this has become more evident in recent years. In its fourth assessment report, the Intergovernmental Panel on Climate Change (IPCC, 2007) concluded that climate change is already happening with its multifaceted effects on human society and the environment.

Although no country is immune from the potential impacts of climate change, the impacts are highly variable over space and time. Particularly, climate change will present a significant challenge for developing countries (IPCC 2001, 2007). Developing countries who have contributed least to greenhouse gas emissions are among the most vulnerable. These countries have limited adaptive capacity as compared to the developed countries because of their limited financial resources, skills and technologies, high levels of poverty, and their excessive reliance on climate sensitive economic sectors such as agriculture (Reid and Huq, 2007). Further, poor communities are not only located in high-risk areas, but their lack of economic and social resources mean they are ill-equipped to adjust to the long-term changes in climate (Orinda and Murray, 2005).

It is widely recognized that poor communities who live in marginal areas and whose livelihoods are highly dependent on natural resources are especially vulnerable to the impacts of climate change (Macchi, 2008). They have limited capacity to cope with existing climate variability and future changes. Recent studies undertaken in several developing countries indicated that temperature increase and changes in the rainfall pattern reduced agricultural productivity and availability of natural resources (Morton, 2007; Kurukulasurvia and Rosenthal, 2003; Jones and Thornton, 2003; Dinar et al., 2008; Thomas and Twyman, 2005; Mendelsohn and Dinar, 1999). Moreover, changes in the mean climate have brought direct negative impacts on livelihood assets, health, food, and water security. Increased pressure on local coping strategies, social protection measures, and the ability to recover from shocks in many instances have led to resource degradation and scarcity, social tension, and conflicts.

In Ethiopia, climate change poses particular risks to poor farmers and pastoralists who have an immediate daily dependence on climate sensitive livelihoods and natural resources. The limited economic, institutional and logistical capacity to mitigate and

adapt to climate change exacerbates the vulnerability of millions of people in the country. The impacts range from recurrent drought and loss of biodiversity, rangelands and soil nutrients, to catastrophic floods and declining livestock and food production. Despite the vulnerability of Ethiopia to the impacts of climate change and weather extremes, little is known regarding the local level impacts and adaptation strategies. Therefore, the main objectives of this study were to 1) explore the local level impacts of climate change on people and natural resources and 2) assess local adaptation strategies and institutional responses in one of the most vulnerable parts of the country – the southern lowlands.

2. Study area

The study is carried out within three selected zones in the southern lowlands of Ethiopia. The lowlands of Ethiopia account for about two-third of the total area and 15 % of the population (Beruk, 2002; EPA, 2007; MoA, 1998). The population is pastoral and agro-pastoral largely mainly engaged in livestock production. The study focuses on three zones within the southern lowlands; Borena, Guji, and South Omo zones. Table 1 presents total area and population of the three zones.

Table 2: Population and total area of the study zones

	Population ('000)		Total area ('000km^2)	Density (persons/ km^2)
	Total	Female		
Borena	966	477	48.7	20
Guji	1,413	699	35.0	40
South Omo	577	289	24.3	24

Source: CSA, 2008

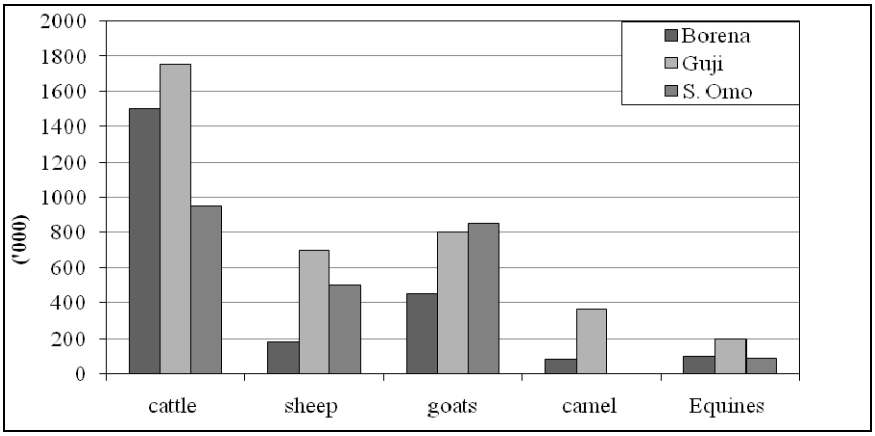
The physiographic setting of the study area is characterized by an extensive plain land with scattered hills and mountains. Elevation is generally below 1500m a.s.l. and some places are as low as 800 m a.s.l. The topography of Borena and South Omo zones are dominated by extensive flat land while that of Guji zone varies from gently undulating plains to hills and mountains. The climate of the study area is of semi-arid and arid type with average annual rainfall ranging between 350 and 800mm and average annual temperature between 19 and 29^{o}C. The area belongs to the dry sub-humid to the semi-arid moisture regimes. In some places, annual rainfall reaches up to 1000mm in the highland parts of the study area, like in the highland of Guji Zone. The rainfall distribution is bimodal with long rains occurring during March to May and short rains from September to November. The long rains account for about 60% of the total annual rainfall in many places of the study area. Both perennial and seasonal streams drain the area. While there are few perennial streams, the seasonal streams are countless. The major perennial rivers include Dawa, Woito, Segan, Omo,

and Genale. Omo is one of the largest rivers in the country and flows down south from the central highlands and joins Lake Turkana. The vegetation type is dominated by woodland savanna which is composed of bushes, shrubs and grasses.

Borena and Guji zones are dominantly inhabited by the Oromo people. These places are also considered as the cradle of Oromo people and reservoir of their culture and tradition (Asmarom, 1973). Although the Oromos are dominant in Borena and Guji zones, there are a number of other ethnic groups living interspersed with the Borena and Guji: Geri, (predominantly in Moyale), Gebra, Degodi (Somali clan around Moyale), Konso, Arbore and Hamer (in Teltelle and Dire Woredas of Borena zone). However, people of diverse ethnic groups inhabit South Omo; about 16 ethnic groups are known to live in the zone with diverse of cultures and traditions. Hamer, Arbore, Daasenech, Nyangatom, Ari, Banna, Karo, Kwegu, Mursi, Tsamai, Dime, and Bodi are some of the largest ethnic groups in the zone.

Majority of the people in the three zones are engaged in livestock based livelihoods. Although crop cultivation is practiced in some places, pastoralism is the main economic activity of the area. In Borena zone, for instance, livestock production is largely the dominant activity mixed with intermittent cultivation of crops. The low-lying parts of Guji zone focus on pastoralism while the uplands are agro-pastoralists. In South Omo, while pastoralism is the main engagement, there is also riverside cultivation along the lower courses of Woito and Omo rivers. Other activities such as bee keeping, collection of wild leaves and berries, and hunting are also common. Figure 2 portrays the type and distribution of livestock in the three zones. In general, the area is deprived of basic infrastructure and social services.

Figure 6: Type and distribution of livestock in the study zones



Source: Zone offices of Agriculture 2008

3. Methodology and data sources

Data for the study were collected from both primary and secondary sources. Primary data were obtained through a household questionnaire survey, focus group discussions (FGDs), key informant interviews, in-depth individual case study, direct observation, and expert interviews. The study selected six woredas from the three zones (two from each zone) and focused on eight rural Kebeles purposively selected from the woredas. A total of 359 households were drawn by employing a systematic random sampling procedure from the selected Kebeles for the household questionnaire survey. In addition, 16 FGDs were conducted with selected members of the community. Eight of the FGDs were gender separate (females only) and the rest mixed groups. Sixteen household heads (8 men and 8 women) were selected for the in-depth individual case study. These individuals were thoroughly interviewed using a checklist of guiding questions. The key-informants interviewed include experienced people and community elders. Experts at the various sector offices at the zone and woreda levels were interviewed in order to gain enhanced explanation of the problems, the causes and impacts. Discussions and group interviews with Woreda and Zonal administrators, officials and experts form sector offices as well as NGOs operating in the study area were conducted.

On the other hand, secondary data were procured from available meteorological records, published and unpublished documents, and various activity reports of governmental and non-governmental institutions. Although not complete, long-term rainfall and temperature records for some selected stations that cover 3 to 5 decades were obtained from the National Meteorological Agency (NMA). Further, relevant federal and regional government policies, strategy documents, and proclamations were reviewed and used. The information obtained was analyzed by employing appropriate quantitative and qualitative techniques and procedures.

4. Climate change impacts and responses in Ethiopia: An overview

Ethiopia is especially vulnerable to climate change because of its greater reliance on climate sensitive economic sectors like subsistence crop cultivation and livestock production. In addition, a large part of the country is arid and semiarid and is highly prone to desertification and drought (NMSA 2001). IPCC's regional review of the impacts of climate change identified three vulnerable areas in Ethiopia; food security, water resources and health (IPCC 2001). Droughts, famines, epidemics and floods are also very common occurrences in Ethiopia. In most instances, these disasters are associated with climatic variability and change. Several studies (e.g. Beruk 2002;

Coppock 1994; Dagnew 1995; Dessalegn 1991; Mesfin 1984; Mahmoud 2003;Webb and Braun 1994;Carter et. al. 2004; Nicholls 1993) pointed out increased frequency of incidence of these disasters in many places of the country. The disasters have claimed the lives of millions of people, destroyed crops, and contributed to the death of many livestock over the past decades.

Drought is widely recognized as a major climatic hazard and a key development challenge in Ethiopia. While opinions vary on the severity and frequency of drought in the historical past, recent reports show that droughts have increased in frequency and intensity in recent times. In particular, the southern lowlands are extremely vulnerable to drought and there have been notable droughts in this part of the country over the past years (Getachew 2001; Tesfaye 1988; Pankhurst 1966; Taffesse 2001; Webb & Braun 1994; Aklilu% Alebachew 2009a, 2009b). Flooding is also a problem in many places of the country. Major flood hazards have occurred in 1988, 1993, 1994, 1995, 1996 and 2006 leading to considerable loss of life and property (NMSA 2006). For example, the 2006 catastrophic flood led to the death of more than 650 people and the displacement of more than 35,000 people in Dire Dawa, South Omo and West Shewa and caused huge destruction of infrastructure (NMSA 2006). Similar situations were experienced in Afar, Western Tigrai, Gambella and the low-lying areas of Lake Tana. Associated with the floods, Acute Water Borne Diarrhea (AWD) and malaria outbreaks have caused many more deaths. On the other hand, changes in temperature and rainfall have had many negative impacts on human and animal health. For example, serious disease outbreaks including cholera, AWD, meningitis, and malaria have been reported due to altered temperature patterns and rainfall regimes (NMSA 2006; Tulu 1996; McMichael et. al. 2004). Changes in disease vector habitats will expose new populations to diseases such as malaria and livestock to schistosomiosis, trypanosomiasis, yellow fever and tick-borne hemorrhagic fevers. NMSA (2001) noted that the growth of the country's economy is highly influenced by climate change, particularly drought, and indicated the need to take these changes into account in development policies and programs.

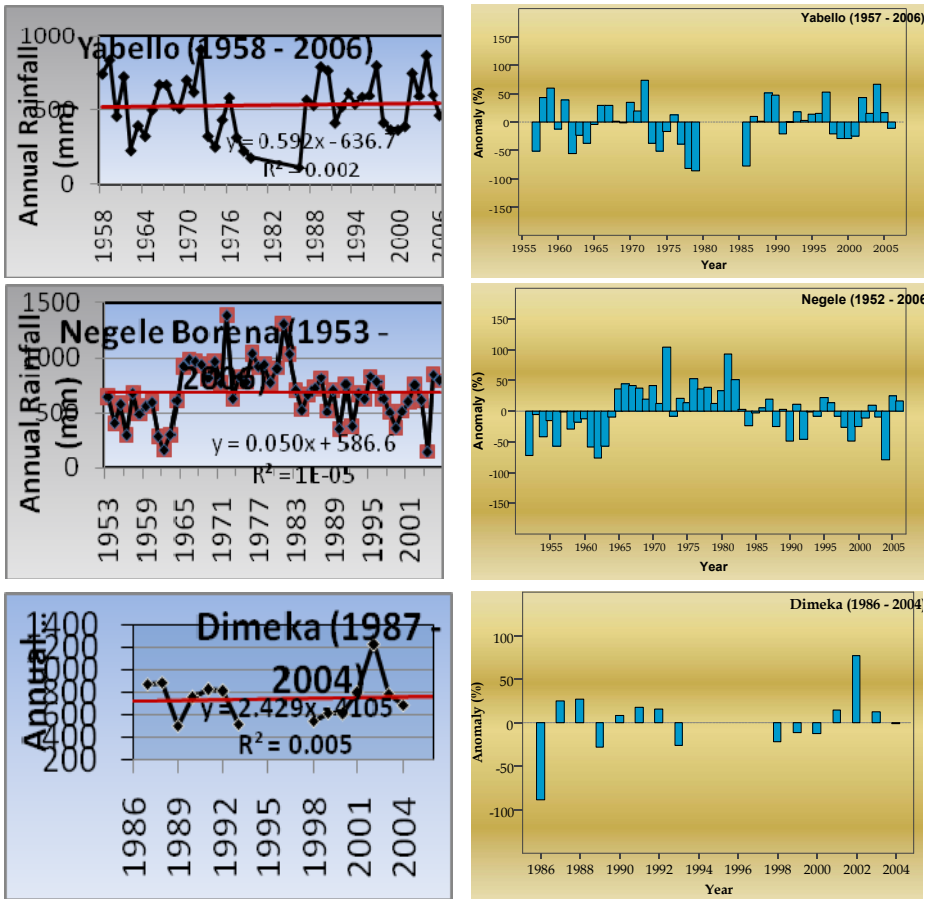
IPCC (2007) noted that climate change is causing major social and economic development setbacks in Ethiopia and urged the need to pay attention to the problem. In this regard, Ethiopia has recognized climate change as a threat to its national development aspirations and thus ratified the UNFCCC (in May 1994), and the Kyoto Protocol (in February 2005). Within these frameworks, Ethiopia prepared National Adaptation Programs of Action and identified priority areas for development interventions and adaptations. The country has also a number of environmentally oriented policies, strategies and action plans that can directly or indirectly contribute to the objectives enshrined in the UNFCCC. Despite such developments, most development policy and strategy documents hardly captured the threat of climate change.

5. Major findings and discussions

5.1 Patterns of the local climate

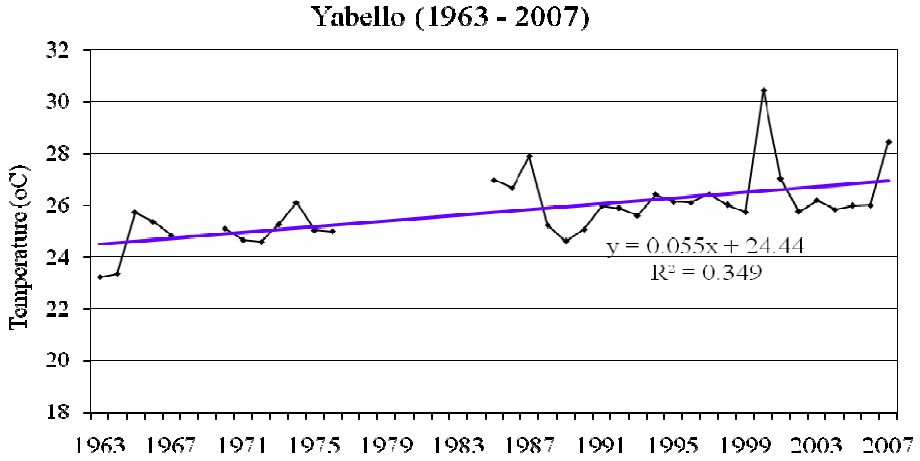
Analysis of the patterns of the local climate (rainfall and temperature patterns) in the study area over the last five decades reveals that there has been increased rainfall variability and temperature rise (Figures 2 and 3). Rainfall distribution in the area is generally characterized by high degree of inter-annual variability. Further, analysis of the linear trend of annual rainfall indicates a slight increase in Borena and South Omo zones, but a decrease in Guji zone (Figure 2). According to NMA (2007), the average annual rainfall trends in the past four or five decades showed a declining trend in the southern lowlands and other water stressed regions of the country.

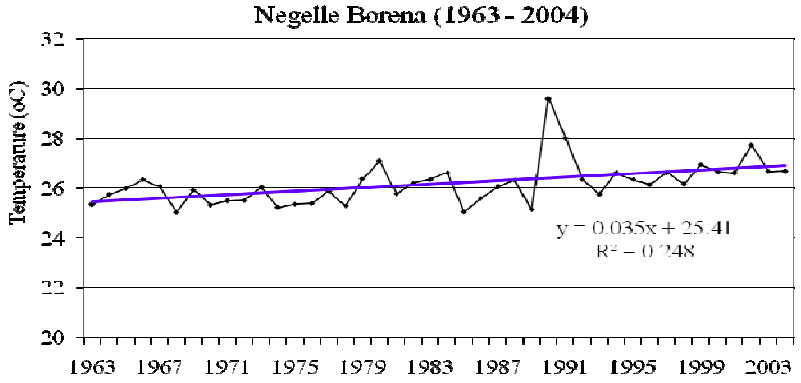
Figure 2. Patterns of rainfall distribution in the study area

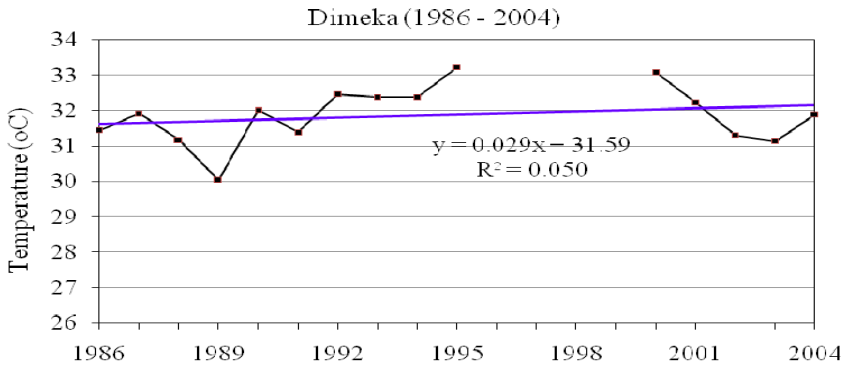


The temperature pattern also shows an increasing trend of warming in all the three areas over the past decades (Figure 3). It is well recognized that small increases in temperature can result in measurable impacts on the health of human beings and livestock as well as the availability of water, food and feed resources. Hence, the changes in the patterns of rainfall and temperature have already created pressure on the available water, forest, and range resources thus exacerbating food and feed shortages and making the environment more vulnerable and less resilient to future climatic changes. As a result, the people in the area are exposed to the risks of several climate related hazards such as drought, flooding, epidemics, wildfire and pestilence.

Figure 3: Patterns of annual temperature distribution in the study area







5.2 Climate change-induced hazards

Drought

Although drought is not a new phenomenon in the study area, it has become severe and frequent in recent years. As compared to past decades, the drought cycle is repeated almost every year or two, giving no time to recover from its impacts. Particularly, the last ten years have seen more frequent and prolonged droughts. During the recent drought, the rains were not only insufficient but also extremely unpredictable. For example, the rainfall during the main rainy season of 2008 was late by more than two weeks and stopped too early. The rain lasted from 2 to 15 days in most of the places of the study area and there were some areas that have not received rainfall at all.

Plate 1: Animals affected by drought (Borena) and pastoralists displaced by flooding (South Omo) in 2008

Flooding

Many places of the study area are prone to the risks of flooding. In particular, South Omo zone is most flood-prone as it is drained by big perennial rivers (Omo and Woito) that descend from the humid central highlands of the country. Repeated flash and seasonal floods from the Omo River have caused widespread destruction of life and property and massive displacements. For instance, in August 2006, the floods in Daasenech Woreda of South Omo zone caused the death of 364 people and 3000 heads of livestock and the displacement of over 15,000 people. The floods also destroyed several villages, infrastructure, and agricultural fields. In Hamer Woreda also, flooding of the Woito river caused the displacement of 4000 people and destroyed about 444 ha of cropland. Further, the floods hindered land preparation activities for the next cropping season in the area. In addition to direct loss of life and property, the floods have led to the outbreak of fatal diseases such as diarrhea and malaria.

Diseases and pests

Climate change has direct and indirect impacts on the prevalence and spread of diseases and pests. Over the past years, the area has experienced increased incidence and spread of diseases and pests. Further, the changes have led to the emergence of new human, livestock and crop diseases types that have never been known in the area. The causal link between climate change/variability and outbreak of human diseases such as malaria, cholera, Rift Valley Fever and meningitis is established (Bouma et. al*.,* 1997; Haines et. al., 2006; McMichael, 2006; Sachs and Malaney, 2003). In the study area, malaria is a common disease in Daasenech and Hamer (South Omo), Liben (Guji) and Wachilie (Borena) Woredas. However, in recent times the disease is widely spreading in other areas that have been least affected before, for example in Wadera Woreda. Even in places where malaria was

common, the disease has become more severe and fatal. Furthermore, the community indicated that new diseases, which include cold, respiratory and intestinal diseases, are affecting them.

The prevalence of livestock diseases has also intensified and caused increased loss of livestock, decline in their productive and reproductive capacity, and reduced market values. More than 70% of the households in South Omo and Guji, and 56% in Borena indicated that livestock diseases have intensified in recent years as compared to the past. With recurrent and extended droughts, existing and newly emerged livestock diseases are causing more illness and livestock deaths. These newly emerged diseases affect camels and goats, which are considered as most resistant to droughts. During severe droughts household are forced to move their livestock to distant places, potentially exposing their herds to different environments with health risks to which they have never been exposed. Changing patterns of the local climate has caused crop damages and failures due to moisture stress, diseases and pest infestations. For example, in Wadera Woreda (Guji), due to late onset and insufficient rains, there happened total destruction of crops during the 2006/7 cropping season. In Liben Woreda of Guji Zone, significant crop losses and destruction of pasture have resulted due to the prevalence of unusual armyworm infestations. Locust and armyworms have devastated croplands and most important potential grazing areas in Yabello, Arero and Abaya woredas. More than half of the survey households in all the three zones indicated that the prevalence of crop diseases and pests has increased in recent years. Zonal and Woreda agricultural experts also confirmed increased intensity of crop diseases and pests in the area.

5.3 Impacts of climate change-induced hazards

5.3.1 Impacts on livelihoods and social relations

The hazards induced by climate change have diverse impacts on the people and the environment. The changes have had serious impact on livestock and crop production in the study area over the past years. Droughts and diseases are resulting in loss of livestock and erosion of basic household assets. Households have experienced considerable loss of livestock during the past years. In Borena, for instance, the average number of livestock per household has declined from 10 oxen, 35 cows and 33 goats 20 years ago to 3 oxen, 7 cows and 6 goats at present. Similarly, in South Omo the number decreased from 30 cows, 38 goats and 36 sheep 20 years ago to 21 cows, 23 goats and 21 sheep at present. Shortage of adequate fodder and underfeeding of animals increased vulnerability to disease risks associated with drought and climate stress. The problem is exacerbated by shortage of veterinary services and poor infrastructure. According to informants in three zones, the decline

in animal productivity and reproductive capacity is the most serious risk they are facing today. They narrated their experience in terms of underfeeding of animals and falling productivity.

> *….in the past we had good pastures around. Now the fields are barren and availability of pasture is limited to few pockets. In the past, a young cow used to conceive at the age of three years and gives birth to calves frequently. Now cows stay four to five years without conceiving. They do not give us as much milk as we need. Even if they do give birth to calves, they can't feed them, let alone provide extra milk for us. In addition, the aroma, taste, color and thickness of the milk has changed and become poor quality.*

Table 2 shows drought-induced livestock deaths during 2006 and 2008 in Borena Zone. According to information obtained from the office of Agriculture of Guji Zone, about 3000 cattle and 3000-4000 camels have died in Liben Woreda alone in 2007/08. The death of camels has happened just in a matter of one month (March-April, 2008) and such unprecedented incident was caused by unidentified disease.

Table 3: Drought-induced animal deaths in Borena (2006/07 and 2007/08)

Woreda	Cattle		Goats		Sheep		Camels		Total	
	2006	2008	2006	2008	2006	2008	2006	2008	2006	2008
Arero	19,537	8,102	7,565	1,899	1,100	325	2,014	283	30,216	10,609
Yabello	600	7,396	250	1,552	93	-	13	-	956	8,948
Teltelle	2,937	1,099	6,818	200	3,405	-	19	-	22,127	2,598
Dire	56,464	-	31,038	-	18,942	-	943	-	107,387	-
Miyo	41,022	2,174	18,328	464	7,231	-	362	-	66,943	2,638
Moyalle	22,842	747	5,000	1,798	235	-	3	77	30,718	2,622
Total	143,402	19,518	68,999	5,913	31,006	325	3,354	360	246,761	26,116

The situation is worsening from time to time thereby exposing a considerable portion of the households to food shortages. Over two-thirds of the interviewed households indicated that increased intensity of drought and food insecurity in their localities. This has been leading to rising trends in poverty levels and dependency on external aid of food and non-food items. Table 3 portrays the number of people in need of emergency food aid between June and November 2008. Arero, Moyalle, Teltelle and Yabello woredas were the worst hit in the zone. Poorly developed rural markets that have weak links to facilitate the exchange of livestock with food crops intensified the problem.

Our life is tied with our livestock, but we are losing them terribly
(Alka Urgema, Hamer)

…..I am a respected old man in this Kebele. I have seen so many changes and new incidents in my life. But I have never seen a time as this season diseases killing camels without symptoms of illness…my first ever experience to see a when livestock disease spread without control causing significant loss of our livestock. New drought that led to camel death. If things continue like this, we are afraid that we will all die. As a result milk was not sufficient for the family. Water is very scarce and there is no grass for our livestock; we have nowhere to go. Our life is tied with our livestock, but we are losing them terribly. We are worried how to save our herds from death because of the drought.

Table 4: Population in need of emergency food aid in Borena (June-November, 2008)

Woreda	Population in need of food aid	% of the total in need in the zone
Arero	44,000	10.3
Moyalle	52,530	12.4
Teltelle	50,761	11.9
Yabello	52,000	12.2
Total (Borena zone)	**425,138**	

Source: Borena Zone DPPA 2008

Furthermore, the degradation of natural resources creates competition and leads to conflict and tension. More than 60% of the households in South Omo and 50% in Borena and Guji stated drought as the main cause for most of the conflicts. The conflicts are usually triggered during dry seasons that cause increased mobility as the competition for water and pasture becomes stiffer. For instance, violence which broke out between Borena and Konso (in the Segen's river valley) in March 2008 has led to the loss of many lives, the displacement of 27,000 people and raiding and looting of 1500 heads of cattle. More than 44% of the households in South Omo and about 25% in Borena and Guji have suffered from conflict related livestock raiding in the last five years (2004-2008). In Borena a household has lost on average 20 goats and 1 camel, in Guji 19 oxen and 5 camels and in South Omo 6 oxen, 6 cows and 13 goats. Due to raiding, a household has lost up to 150, 92, and 80 heads of livestock in Borena, South Omo and Guji zones, respectively. Escalated conflicts could have deleterious long-term social, economic and environmental repercussions. Apparently, traditional institutions have become weaker to deal with prevailing conflicts in the area. Eighty-one percent of the households in Borena indicated that the traditional conflict management institutions have became weak, ineffective and less credible. On the

other hand, in South Omo, 85% of the households stated that traditional institutions are still intact and effective in managing and resolving conflicts. In spite of this, however, it is only 14% of households in South Omo who appeal to the traditional institutions at times of conflict; the remaining households appeal to formal government institutions.

5.3.2 Impacts on women and children

Women and children are most vulnerable and affected by the impacts of climate related hazards. The hazards create additional burden on women as they have multiple household responsibilities. For instance, in Arero Woreda of Borena Zone, women have to spend on average 12 to 14 hrs a day to fetch water and fodder for small ruminants and calves during drought years. Children, especially girls, are forced to drop out of school during droughts, flooding and conflicts. Recent conflicts in March/May 2008 have caused massive displacements and over 1,500 children were forced to drop out of school in Borena zone. Further, in some places of Borena and Guji Zones where there happens chronic food shortage, young children assist their parents by collecting wild fruits and roots for household consumption and to generate income.

Plate 3. The multiple responsibilities of pastoral and agro-pastoral women

5.3.3 Impacts on the environment and natural resources

The aggressive encroachment of undesired thorny and woody species on grazing areas has resulted in the degradation of rangeland resources. Bush encroachment is particularly severe in Borena and Guji zones. Estimates indicate that about 40% of the Borena rangelands were affected by bush encroachment by the mid-1980s (Assefa et al., 1986; Coppock 1994). According to survey results, about 90% of the households in Borena and Guji and 75% in South Omo indicated that the condition of rangelands is deteriorating over time. Most of the high potential grazing areas particularly in Arero (Borena) and Liben districts (Guji) are heavily degraded. The replacement of productive and high value grass species with low quality feed resources and unpalatable weeds have greatly reduced pasture availability and quality.

Table 5: Condition of rangelands over time (% of the responses)

Condition of range lands	Borena	Guji	S. Omo
Deteriorated	91	89	75
Improved	4	9	20
Remained the same	6	2	5
Total	100	100	100

Source: Field survey 2008

Discussions held with informants and experts in the study area confirmed that bush encroachment is the single most important factor degrading range resources. According to them, the problem appears to be beyond their control and has become a serious threat to livelihoods. It is widely believed that the official ban on bush fire by the government in the 1970s has facilitated the process of bush encroachment in the area (Bille and Eshetu, 1983; Corra, 1986; Coppock 1994). According to pastoral elders, the loss of these species has reduced milk yield and quality while also exposing livestock and goats to diseases which some of the types could be fatal. The changes in the climatic system have also caused reduced water availability in wells, ponds and springs. In the study area, stress from water scarcity is increasing over time. During drought years, pastoralists should travel to distant places to graze and water their livestock. On average, in the past three years a pastoral household in South Omo needs to travel for 30 kms to get access to good pasture and 26 kms to water livestock. The corresponding figures in Guji are 27 and 24 kms and in Borena 18kms.

Table 6: Average distance traveled (km) to get water and pasture for livestock

	To water livestock			To get pasture		
	Borena	**Guji**	**S. Omo**	**Borena**	**Guji**	**S. Omo**
Drought season						
During the last 3 Years	18.4	24.4	25.6	18.6	27.4	29.0
During the last 10 years	12.9	20.0	24.9	12.5	21.6	27.8
During the Derg period	19.8	16.1	26.6	17.2	12.5	27.9
Non-drought years						
During the last 3 Years	7.2	14.9	24.7	7.7	14.7	9.5
During the last 10 years	9.3	10.7	5.1	12.8	10.4	7.2
During the Derg period	8.8	25.8	5.8	9.0	5.0	7.0

5.4 Complicating factors

The impacts of climate change does not just depend on the actual variations in temperature, precipitation etc. themselves, but also on the social and economic systems of affected communities to cope with the impacts of the changes. In addition to the direct impacts of climate change induced-hazards, various other factors complicate the problem and reduce the adaptive capacity of communities to the changes. The main complicating factors in the study area include weak livestock market, lack of preparedness, demographic pressure, unfavorable socio-cultural practices, lack social services, lack of education and early warning information. The physical and market infrastructure in the area is poorly developed or non-existent, and the main market places are not within easy reach of most of the households. On the other hand, during drought years, the price of cereals rises while that of livestock falls thereby worsening the terms of trade for pastoralists. Although early warning units and committees are present at the Kebeles and Woreda levels, they are poorly organized and inefficient with negligible impact. Lack of awareness and limited availability of educational and health services constrained communities to prepare against and adapt to the impacts of the changes. In the study area, there are unfavorable socio-cultural perceptions and practices which make some household members more vulnerable to the impacts. For instance, women lack control over important household assets such as cattle and camel, land, beehives, and cash reserves for use at times of severe disasters.

6. Responses to climate change

6.1 Local/community responses

Households and communities in the study area employ a range of indigenous strategies to cope with the changes and/or adapt to it. In response to the degradation of rangelands and declining livestock productivity, crop cultivation has spread to areas that have never been under cultivation. Opportunistic farming is used to avoid the potential risks of sole dependence on livestock. With severe droughts and other climate related risks, households have become increasingly under pressure to sell or exchange their livestock. According to survey results, about 78% of the households in Borena, 40% in Guji and 33% in South Omo reported an increasing trend of livestock selling since recent times. Normally, households start responding to the problem by selling small ruminants, mainly goats and sheep. However, with increased intensity of the hazards, they are forced to sell cattle that are the main sources of their livelihoods and social prestige in the community.

Resource sharing is a tradition that has long been used as a safety-net mechanism to support vulnerable members of the community to cope with the disasters. Established mechanisms of support range from simple sharing and provision of milk and other food items to contributing heads of livestock in order to restock the herds of affected families. Households who received the support in turn contribute to the community by helping others though labour work and livestock herding demonstrating mutuality in the support system. Income diversification is another emerging coping strategy in the area. Such activities range from daily labor in urban areas and commercial farms to selling of charcoal, firewood and wild fruits. Women mainly conduct petty trade while few young men involve in traditional gold and salt mining activities. During acute disasters, households change their normal food intake and adjust their consumption to the available household resources. Consumption smoothing usually involves adjusting diets to cheap food items, supplementing with edible wild plants and fruits, and reducing the amount and frequency of meals.

Pastoralists traditionally use varies types of resource management strategies to cope with and adapt to changing climatic conditions. Rangelands are divided into different uses, such as dry and wet season grazing, considering the season and nature of the climate. These practices are undertaken to avoid overgrazing, allow regeneration of pasture, and in response to climatic variations within and between months in a year. The grazing pattern is regulated by availability of water, pasture, and the size and structure of herds. Traditional institutions make decisions regarding which resources (rangeland or water) to use when and by whom. Herd diversification and splitting are used as coping strategies against the impacts of climate change and variability.

Diversification offers sustained supply of various livestock products, allows the manipulation of different ecological potentials of livestock, and helps to spread risks associated with changing climatic conditions. In general, there is a shift from the production of grazers (cattle and sheep) to browsers (camels and goats) as browsers are relatively drought resistant. Herd and household mobility, as opportunistic and more flexible mechanisms for coping with the impacts of climate change, are commonly employed household and community strategies. Such types of mobility are used to optimize the utilization of natural resources and in response to emergencies such as disease outbreak, flood, drought and conflict. Although long distance mobility is a long-standing tradition of the pastoralists, its duration and frequency has hanged in response to increased climatic tress. Long-distance and extended mobility has gradually been replaced with short-distance and frequent movements.

Nevertheless, with increased intensity of the problem and its impacts, the traditional coping mechanisms are becoming obsolete or incapable to reduce damages and build their resilience. Some of the strategies such as cultivation of unsuitable areas, overgrazing, charcoal making and fuel-wood selling are not only unsustainable but would also cause further degradation and desertification. Hence, institutional support is vital to reduce impacts of the hazards and curb unsustainable trails of household and community responses against the impacts.

6.2 Institutional responses

Various NGOs operate in the study area with invaluable contributions in terms of land management, water harvesting practices, rangeland rehabilitation, micro-finance and credit schemes, conflict resolution, etc. They have been particularly designing and implementing development projects related to asset protection, livelihood diversification, social service provision, natural resource management, and disaster risk reduction. Though the contributions are encouraging, most of these efforts suffer from lack of cooperation and fragmented approaches. Furthermore, climate change is not well integrated and factored in the development activities of the NGOs. This coupled with short project duration to address proximate impacts has in some cases led to the promotion of inappropriate and unsustainable technologies.

The government has also a significant role to play. Indeed, the government of Ethiopia has adopted policies, strategies and action programs aimed at poverty reduction, environmental protection and sustainable development. However, the country has no an explicit policy on climate change yet. The threat of climate change as a development agenda is hardly captured in most of the policy and strategy documents. Instead, government response has been sectoral, short lived and biased

towards emergency aid which in most cases is insufficient and not delivered on time. The early warning system of the country is narrow in its approach and is biased towards capturing the threats of drought and food insecurity in an emergency situation. In addition, lack of synergy among the various sector offices has hindered integrated and collaborative efforts to effectively mobilize communities and manage their resources. Without strong coordination and cooperation between all actors and stakeholders, and creation of operational synergies, neither the indigenous coping strategies nor the interventions of external factors will sufficiently address the complex impacts of climate change.

7. Conclusion and recommendations

7.1 Conclusion

Ethiopia is one of the poorest countries most vulnerable to the impact of climate change. Although symptoms of the problem are widespread in many places of the country, the southern lowlands are most affected and will suffer more. Historical climate data in the area reveals that there has been increased rainfall variability and temperature rise. As the result, the people are exposed to the risks of several types of disasters such as drought, flooding, epidemics, wildfire and pestilence. There is increased frequency and spatial coverage of the hazards; existing hazards are intensifying and new types are emerging with deleterious effects on lives and resources. Chronic food shortages, unstable livelihoods, and conflict over increasingly scarce and fragile resources major impacts of the disasters. Repeated flash and seasonal floods have caused considerable destruction of life and property and induced massive displacements. Moreover, the incidence and spread of diseases and pests has intensified; new human, livestock and crop disease types that have never been known in the area have emerged. Camels and goats, which are normally considered more resistant to droughts and diseases, are affected by newly emerged and unidentified diseases. Crop damage has become widespread due to pest infestations and occurrence of new types of pests and worms. The disasters have caused increased vulnerability to poverty, food insecurity and loss of productive assets. For instance, the number of livestock held by pastoralist households has shrunk over the past two decades. Shortage of adequate fodder and underfeeding of livestock reduced not only the number of livestock but also productivity and resistance to diseases. The problem is exacerbated by shortage of livestock health facilities, services and poor infrastructure. The impacts of the hazards transcend beyond mere decline in crop and livestock production, rather become the cause of tense social relations triggering ethnic and tribal conflicts. In the study area, the conflicts have intensified over time as available resources shrunk due to climate change and lead to the loss of human lives and property. Women and children are

particularly most affected due to the changes in many respects. Weak livestock market, lack of preparedness, demographic pressure, unfavorable socio-cultural practices, lack of education, health and other social services, poor infrastructure, and weak early warning information complicate the problem

Households and communities employ a range of indigenous strategies to cope with the changes and/or adapt to it. However, the strategies are becoming incapable to reduce damages. Some of the strategies such as cultivation of unsuitable areas, overgrazing, charcoal making and fuel-wood selling are not only unsustainable but would also cause resource degradation and desertification. Hence, institutional support is vital to reduce impacts of the hazards and curb unsustainable trails of household and community responses against the impacts. Various NGOs operate in the study area focusing on land management, water harvesting practices, rangeland rehabilitation, micro-finance and credit schemes, conflict resolution, etc. The projects of the NGOs have invaluable contributions in relation to household asset protection, livelihood diversification, social service provision, natural resource management, and disaster risk reduction. Though the contributions are encouraging, most of these efforts suffer from lack of cooperation and fragmented approaches, short project duration, and weak cooperation among each other. on the part of the government, there are various policies, strategies and action programs aimed at poverty reduction, environmental protection and sustainable development. Unfortunately, the country has no an explicit policy on climate change nor does climate change well captured in the existing policies. Government response has instead been sectoral, short lived and biased towards emergency aid.

7.2 Recommendations

Focus on shift from technology to people: The impacts of climate change-induced hazards fall disproportionately on the socially venerable and least adaptive small farmers and livestock herders, thus making adaptation to climate change impacts a matter of urgent need, social justice and of empowerment. After all development is about and for people. Projects based on technical inputs and top-down, exclusionary decision making processes are bound to fail. Participation and enablement is the key to success, allowing small farmers and pastoral households to accrue the benefits from an improved, more sustainable and secure livelihood. It is therefore important that both governmental and non-governmental institutions work realistically together to make their development interventions people focused, participatory and enabling.

Promote research on heat tolerant, disease resistant and early maturing crop varieties so as to help vulnerable pastoral and agro-pastoral households avoid the

risk of sole dependence on livestock and drought prone or less heat tolerant temperate and disease prone crops. In this case, diversifying seed and genetic structure and composition can be an effective defense against numerous climate related hazards including diseases and pests.

Develop integrated/holistic disaster risk reduction and early warning system: The early warning system of the country is narrow in its approach and is biased towards capturing the threats of drought and food insecurity in an emergency situation. The system should be reoriented and broadened to capture other emerging threats to livelihoods and ecosystems from climate change induced-hazards in the country including floods, human, livestock and crop diseases, pests and noxious weeds.

Focus on raising awareness, knowledge management and information dissemination: With the growing feeling and revealing local evidences that climate change is already occurring and affecting pastoral and agro-pastoral communities in the southern lowlands of Ethiopia, there is strong need to raise awareness and disseminate relevant information in order to have all stakeholders involved understand the multifaceted impacts of climate change and the urgency of factoring it into their development programmes and actions.

Focus on feed rehabilitation and integrated rangeland management*:* Establish regular supervision and monitoring of range condition, vegetation type, and productivity and management problems. Ii is vital to recognize and integrate traditional range management knowledge and practices (rotational grazing, herd diversification, splitting and flexibility), area enclosure, dry season reveres, alternative feeding and hay making practices.

Focus on animal health and disease prevention and control: In view of the expansion of animal diseases and the emergence of newly emerging varieties, it is crucial to develop systematic monitoring and periodic assessment systems, and disease prevention and control programs.

Protect assets and build and diversify local livelihood options*:* Protecting vital livestock, range and environmental resources is crucial to develop local adaptation capacity, resilience and resistance to the impacts of climate change-induced hazards. Given the diverse impacts of climate variability and change, it is also equally important to broaden available livelihoods options to diversify income streams, absorb surplus labor, reduce over-dependence on livestock or natural resources, and reduce exposure to climate shocks. Alternative livelihood sources with focus on non-pastoral livelihood options including the protection and collection of non-timber products

(gums, incense, etc…), bee keeping, opportunistic farming, poultry, petty trade and other urban-based income-generation activities which can cut unsustainable production and the immediate daily dependence on natural resources.

Target and empower women and other vulnerable groups: Women in the study area are both victims and active managers of their local environment. Their role in the spheres of the household economy and the reproductive and productive arenas is innumerable and immensely critical. The deterioration in the productivity or carrying capacity of the rangelands or environmental resources will affect them first. Measures that empower women in decision making in the household and community spheres are very important and urgently needed.

Promote climate friendly development initiatives: Development actors in the area should factor climate change as a major component of their activities. It is necessary to consider local realities and sustainability issues in the design and execution of development projects and programs. Furthermore, collaboration among the various development actors operating in the area is imperative in order to streamline activities, effectively manage human and financial resources, and successfully meet intended objectives.

Build local capacity: Building local capacity to collect, analyze and interpret climate data and share results at the local and national levels will improve local weather forecasts, seasonal climate predictions, risk, and impact assessments. There is also need for interdisciplinary research and knowledge management to boost understanding on local adaptation, livelihood enhancement and mitigation options.

Mobilize adequate and stable financial resources: Strengthen the capacity of relevant government institutions in order to secure available funds from international donors and be able to effectively and efficiently utilize to build the resilience of vulnerable communities and ecosystems to the impacts of change.

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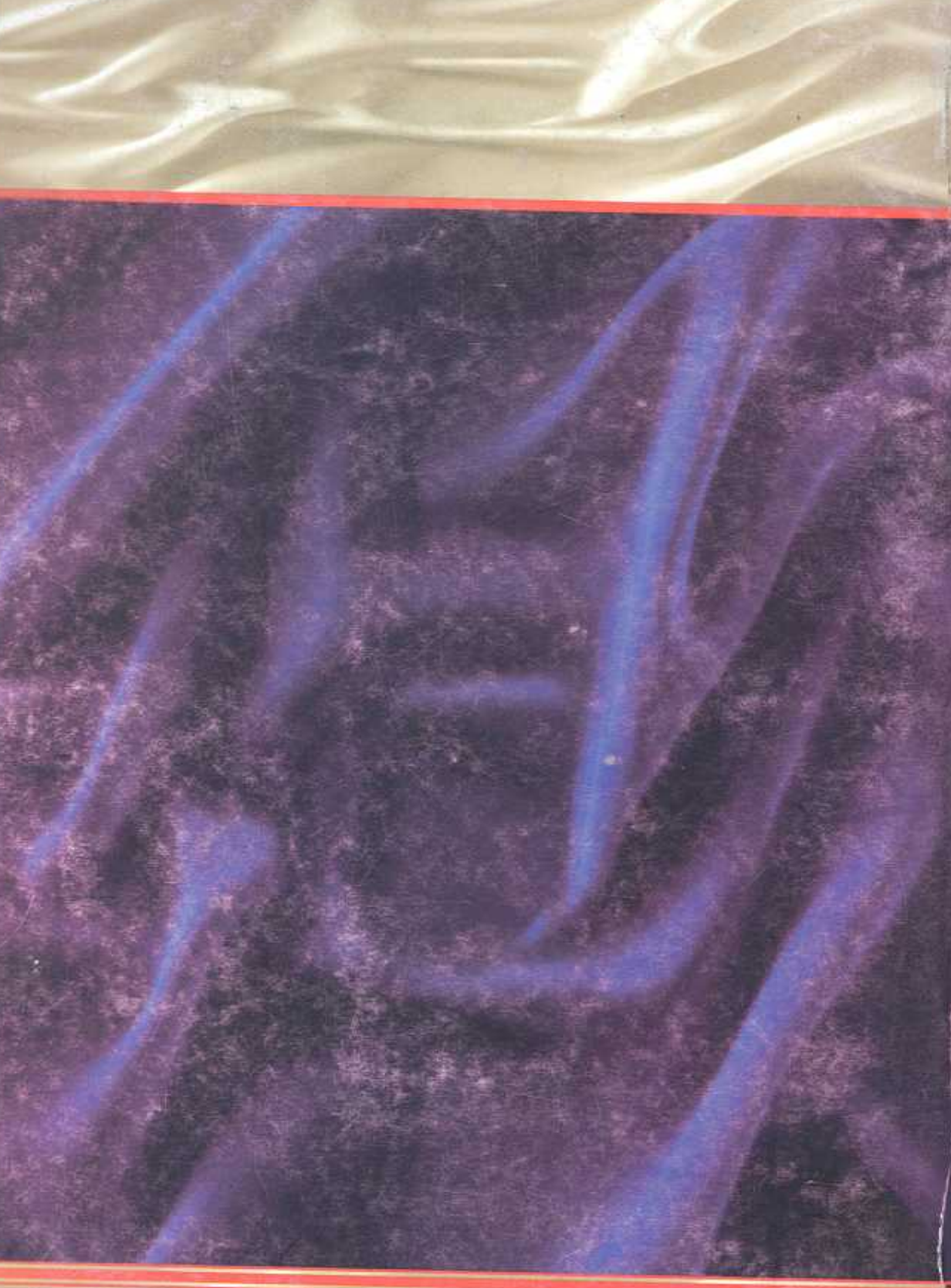

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