

Ethiopian Economics Association (EEA)



PROCEEDINGS OF THE SIXTH ANNUAL CONFERENCE ON THE EASTERN ETHIOPIA ECONOMIC DEVELOPMENT

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FOREWORD

The Ethiopian Economic Association (EEA) and its Jigjiga Dire Dawa and Haramaya Chapters are happy to issue the proceeding of the Sixth Annual Conference on the Eastern Ethiopia Economic Development which was organized on December 9, 2017 at the ZM International Hotel meeting Hall, Jigjiga. EEA organized this important regional conference as one of its objectives of broadening its activities and coverage at regional level so as to contribute to the economic advancement of regional state through enhancing economic policy formulation capability; the dissemination of economic research findings; promotion of dialogue on critical 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.

The Annual Regional Conferences that the Association has organized in collaboration with its Jigjiga Dire Dawa and Haramaya Chapters have created important forums for presenting and discussing development issues that are highly relevant to the Regional Socio-economy in this part of the country. These forums have also provided incentives for researchers to conduct research and present their findings on regular basis. Indeed, the Annual Regional conferences were organized in an interdisciplinary fashion, thereby widening the interactive coverage involving both economists living here in the Eastern part of the region and those living outside this region and non- economists who are working and experiences on the region. The Sixth Annual Regional Conference on Eastern Ethiopia Economic Development has contributed towards a deeper understanding of the regional economy and the complex challenges it faces. The conference attracted about 80 participants including members of Regional Parliament, higher officials and expertise from Dire Dawa BoFED, Somalie Regional State BoFED and Hareri Regional State public servants, Jigjiga, Dire Dawa and Haramaya Universities, NGOs, private sector representative and EEA members in the Eastern Ethiopia. The participants of the conference expressed their satisfaction on the organization of the conference and the content of the papers presented. They reflected that the papers largely focused on local

issue that can contribute to the development of the Eastern part of Ethiopia. They also recommended that the issues raised in the discussion are critical that need to be taken by policy makers and implementing organs of the respective offices of the regions.

In this publication, all papers which were presented at the Sixth Annual Conference reviewed by external reviewers and comments and suggestions including editorial comments were communicated to authors for improvement. Finally, those papers which passed all the review and editorial process published in the Proceeding of the Eastern Ethiopia Economic Development.

At this juncture, I would like to take this opportunity to express my heartfelt gratitude, on my own behalf and on behalf of the Ethiopian Economic Association, to the many people and organizations that made the conference resounding success. First and foremost, I thank the authors of the papers and the audience whose active participations made the Conference meaningful. The staffs of the Economics Department of the Dire Dawa University, Haramaya University and Jigjiga University and the staff of EEA Secretariat deserve a special recognition for their passion and perseverance in managing the conference from inception to completion.

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 Friedrich Ebert Stiftung of Germany and the Think Tank Initiative of International Development Research Center (IDRC) of Canada.

Finally, I would like to extend my sincere gratitude to senior regional government officials from Dire Dawa City Administration, Somalie Regional State and Hareri Regional State, who spared their busy schedule and participated in the conference.

Tadele Ferede (PhD)
President of the Ethiopian Economics Association

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TARIKU BIRHANU

Determinants of Credit Default: The Case of Microfinance Borrowers in Rural Dire-Dawa

Afework Teklu Betemariam¹

Abstract

This study was conducted with the objective of identifying factors that determine repayment performance among microfinance borrowers in rural Dire-Dawa. In order to achieve this objective, primary data was collected through multistage sampling procedure from 170 randomly selected respondents using structured questionnaire. Descriptive statistics was used to describe the demographic and socio-economic attributes of defaulters and non-defaulters and a two-limit Tobit regression was used to identify factors influencing loan repayment performance and intensity of loan recovery. The descriptive statistics result indicates that about 85.3 percent of the sample borrowers were defaulters while only 14.7percent were non-defaulters. The average loan repayment rate was 52 percent in overall with 47 percent for male borrowers and 55 percent for female borrowers. There was significant difference between defaulters and non-defaulters in terms age, educational level, occupation, land size and demographic cycle.

The results of the econometric model have also indicated that educational level, occupation, wealth status, timeliness of loan release, repayment period suitability, loan size, training and agro-ecology significantly and positively influencing loan repayment while family size, loan diversion and credit experience negatively influencing loan repayment performance of borrowers. Based on the findings, continued investment in primary and secondary education, building the capacity of borrowers through a comprehensive package of skill trainings, regular revision of loan size, further designing ways to release loan timely and making repayment schedules more suitable to customers, promoting technologies suitable for moisture stress area were recommended to improve loan repayment performance and sustainability of credit services in the study area.

Key words: Credit, loan diversion, loan recovery, loan repayment rate and loan repayment period.

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1. Introduction

1.1 Background

Financial markets are characterized by asymmetric information. Lenders lack information about characteristics of borrowers. As a result, financial markets in developing countries face three major problems i.e. adverse selection, moral hazard and weak enforcement of contracts. Thus formal financial institutions discriminate against the poor and women (Ray, 1998). This has led to the search for alternative financial service delivery systems for the poor.

The concept of providing subsidized credit to the poor was started since 1950s by governments and donor agencies. However, such efforts were not successful because of low repayment performances and inability of institutions to be financially viable after donors quit. Coupled with this, the concept of providing subsidized credit to the poor was challenged as most developing nations adopted Structural Adjustment Programs (SAP) that emphasizes a paradigm shift from state intervention to market oriented economy (Johnson and Rogal, 1997). Therefore, the popular alternative of launching microfinance institutions came into being (Ghatak and Guinnane, 1999).

The performance of MFIs is evaluated based on their level of outreach, sustainability and impact. Outreach is conceptualized as the extent to which microfinance institutions succeeded in reaching their target clients (the poor, women, the underserved segment of the population, etc) and the degree to which they have met their clientele's demand for financial services (Conning, 1999). Hence, outreach addresses the supply side of the credit market. Financial sustainability, on the other hand, is the capacity of financial institutions to generate enough profit to be economically viable. It is measured in terms of the capacity of institutions to generate enough revenue to cover overall costs of the institution (Zeller and Meyer, 2002; Ledgerwood, 1999; Guli, 1998). Loan repayment is an important criterion in assessing if a credit program is financially sustainable (Schrieder and Manohar, 1999). In developing countries, however, the probability of default is very high due to weak legal machinery to enforce contracts and due to little opportunity to take collateral before advancing loans (Ray, 1998).

Low repayment performance jeopardizes the financial sustainability of MFIs. In Ethiopia, MFIs have been taken as instruments to facilitate adoption of yield improving agricultural technologies through providing financial services to the poor who have little access to formal banks. Awunyo-Vitor (2012) has reported in his studies that large rate of default has been a major problem in agricultural credit delivery and sustainability and consequently large proportion of formal financial institutions has suspended agricultural credit. Thus a key issue in the sustainability of agricultural credit delivery hinges on improved loan repayment. It is therefore, important for financial institutions to devise means to reduce the levels of loan default. This can be achieved if they know the factors that influence loan repayment.

1.2 Statement of the Problem

In most developing countries, credit is the pivot on which the development of any sector rests. Microfinance institutions differ from other financial institutions mainly because their services are directed towards the lower income group of the society. They are particularly established to meet the credit demand of poor households who are often not well-served by the organized formal financial market mainly due to lack of appropriate and adequate collateral (Stiglitz, 1993). This has created opportunity for the poor to be involved in income generating activities that allow them to accumulate capital and improve their standard of living.

The positive impacts of MFIs on the socio-economic welfare of the poor, however, can only be sustained if the MFIs can achieve good performance in terms of both outreach and financial sustainability. Recently, financial sustainability of MFIs has been one of the critical elements that captured the attention of many researchers throughout the globe as many countries did aggressively on outreach by opening up various MFIs in different geographical regions they have. The financial sustainability of MFIs is a necessary condition for institutional sustainability and their continuity to service the demands of the poor. But this depends largely on their ability to recover their loans as efficiently and effectively as possible. In other words, to be financially viable, microfinance institutions must ensure high portfolio

quality which is characterized by high repayment rate (100 percent) or at worst low default rate, full cost recovery and efficient lending system.

However, where there is low recovery rate or high default rate, financial institutions raise provisions for loan loss that decrease their revenue and reduce the funds for new lending. As Hunte (1996) clearly puts it default problems destroy the lending capacity as the flow of repayment declines, transforming lenders into welfare agencies, instead of viable financial institutions. Default rates are the amount of loans not collected on current and past due loans for a given reference period, for loans taken from credit institutions vary from country to country, region to region and sector to sector. But all credits of developing countries share a common characteristic i.e. all suffer from a considerable amount of default rate (Kashuliza, 1993).

Although the performance of MFIs in Ethiopia has been impressive in terms of outreach since their establishment (i.e. by reaching many through opening-up microfinance offices in the different parts of the country), they are experiencing considerable amount of default rate. According to literatures, default rate is found to be 24% in DECSI (Welderufael, *et al.*, 2015), 3.8% in ACSI (MIX market) and 4.7 % in AdCSI (Fikirte, 2011) which are the largest microfinance institutions in Ethiopia. These three microfinance institutions account for 65% of the market share in terms of borrowing clients and 74% by loan provision. The default rate in Dire Microfinance Institution, the area of interest for this research, has also been 5%, 4% and 3% for the years 2013, 2014 and 2015, respectively (DMFI, 2015). However, the seemingly decreasing trend may not reflect the reality as writing-offs defaulted loans could minimize default rate while the default might still be high. Similar studies further show that many rural credit schemes have sustained heavy losses because of poor loan collection and yet many of them have been dependent on government subsidy to financially cover the losses they face through loan default. All these are clear indications of the existence of non-repayment in loan portfolios of Ethiopian Microfinance Institutions which may have series repercussion on the wider social, economic and national economy in the future unless something can be done.

Therefore, whether default is random or influenced by erratic behaviors or by certain factors in a specific situation needs an empirical investigation so that the findings can be used by micro financing institutions to shape their credit program

for the better (Khandker *et al.*, 1995). This paper aims to analyze the underlying problems restraining timely repayment of microfinance credit by borrowers.

There lacks careful empirical investigation regarding the factors affecting loan repayment problem or default of borrowers and loan recovery in the context of microfinance institution in Ethiopia, particularly in Dire-Dawa. However, few studies in Oromiya region (Jemal, 2003), Addis Ababa (Fikirte, 2011), Jimma (Hamdu, 2014), and Dire Dawa (Medhin, 2014; Belay, 2002) attempted to provide some insights into the socio-economic characteristics which have significant associations with borrowers' credit default or repayment performance. Among these studies, some are focused on borrowers' characteristics and few focused on institutional factors and still others tried to include few characteristics related to both borrowers and institutional factors. However, none of the studies gave equal weight to all factors related to loan repayment problem, i.e. demographic, socio-economic and institutional (loan and lender) including other factors that cause borrowers to default. Most importantly, however, all the studies mentioned above have methodological problems, particularly in terms of using relevant covariates and models for analysis. For example, the variable demographic cycle has never been considered in previous studies and many studies have used logit model collapsing the outcome (dependent) variable into dummies the disadvantage of which was discussed in research gap and model specification part of this study document in detail. Moreover, the factors influencing loan repayment among borrowers may not only differ by programs but also differ from area to area depending on the domestic business and economic environment. Therefore, this study intends to fill these gaps in determining the factors that affect loan repayment and intensity of loan recovery.

2. Research Methodology

2.1 Research Design

The study made use of descriptive research design with both quantitative and qualitative methods to examine the determinants of loan repayment among microfinance borrowers in rural Dire-Dawa, Ethiopia. Descriptive research design was found to be most appropriate because it presents facts concerning the nature and status of the situation as it exists at the time of the study. In

addition, this approach tries to describe present conditions, events or systems based on the impressions or reactions of respondents of the research.

2.2 Data Type, Source and Collection

The study used both primary and secondary data. The primary data was collected from a sample of microfinance borrowers (both defaulters and non-defaulters) in rural Dire-Dawa between the periods June 1-10, 2016. The main data collection instruments employed in the study were structured questionnaires and interviews. First, a total of six enumerators who have first degree and who have experience in collecting data for Central Statistical Authority Dire-Dawa Branch in the rural area were employed to conduct the interview. Second, orientation training was provided to the recruited enumerators to aware the objectives of the study, content of the questionnaire, the way to approach respondents and conduct the interview and afterwards the questionnaire was tested in the field. Third, the necessary adjustment was made to contextualize and simplify some items in the questionnaire following the feedback from the field. Finally, through the survey, data pertaining to determinants of repayment performance among rural microfinance borrowers in Dire-Dawa was collected. More specifically, data on demographics, socio-economic, institutional and other factors were collected for the purpose of the study. The study also made use of secondary data obtained from different published and unpublished documents of Dire MFI reports, MIX market data base, academic journals, etc.

2.3 Sample Size

The required sample size was determined using proportionate to size method by Anderson et al. (2007).

$$n = \frac{pqZ^2}{E^2} \tag{1}$$

Where:

n = sample size

P = proportion of the population containing the major interest i.e. proportion of defaulters from a total population of borrowers was estimated 50 percent,

$$q = 1 - p$$

Z = confidence level ($\alpha = 0.05$)

E = acceptable/allowable error

In cases where the proportion of the population of interest is not known, literatures recommend to take 50 percent i.e. $p = 0.5$. Since it was difficult to determine the proportion of the defaulting borrowers from a total of borrowers of the institution which was the major variable of interest for this study, p was considered as 50 percent. Accordingly, q , Z and E were computed as $q = 1 - 0.5 = 0.5$, $Z = 1.96$ and $E = 0.075$, respectively. This resulted in a total sample size of 170 respondents.

2.4 Sampling Method

In Dire Dawa administration, nine urban kebeles and four rural clusters were reportedly having access to microfinance credit services. However, borrowers of the four rural clusters were the main focus of this research since the study aimed at identifying determinants of credit default among rural microfinance borrowers. The unit of analysis for this research was individual borrowers who took loan from Dire Microfinance between 2014 and 2015 during which the loan matured in 2015. The list of borrowers who have taken loan from each of the cluster offices disaggregated by *kebele* was the sampling frame for the study.

The research employed a multi-stage sampling technique to identify sample respondents that represent the study population. In the first stage, 3 clusters were selected purposively out of the available 4 clusters where Dire Microfinance Office provide loan to rural borrowers using its 4 satellite rural branch offices as the study of interest was rural microfinance borrowers around Dire-Dawa. Three (3) clusters were selected because of the encountered difficulty of accessing data of borrowers of Jeldesa cluster which was closed years before. Of the 3 clusters, Wahil and Biyoawale clusters were categorized under *Woynadega* agro-climatic zone whereas Asseliso and Hulahulul cluster were classified as *Kola*. Therefore, agro-climatic differential of the study area was considered in selecting study units. In the second stage, proportional sampling or probability proportional to size method (PPS) was

employed to decide the number of individual borrowers to be surveyed from each cluster and to give more weight to those clusters which have higher number of individual borrowers. In addition, 6 kebeles (Biyoawale, Wahil, Legeoda Gudunfeta, Asseliso, Hulahulul and Boren Dejen) were selected randomly from the three clusters. In the last stage, 170 sample individual borrowers were selected from the three clusters using simple random sampling method to make sure that every member of the study population has equal chance of being selected. A structured questionnaire, pre-tested in the field, was used to collect primary data.

2.5 Methods of Data Analysis

Descriptive statistics such as mean, standard deviation and percentages were used to characterize the socio-economic attributes of defaulters and non-defaulters among microfinance borrowers in rural Dire-Dawa. Independent t-test was used to test mean difference among continuous variables and Pearson's chi-square tests for categorical variables was run to compare groups with respect to variables of interest.

Moreover, a two-limit Tobit model was employed to determine intensity of loan repayment or default and factors that significantly influence repayment performance among rural microfinance borrowers. STATA software version 13 was used for analyzing the data on the determinants of credit default of both the descriptive statistics and Tobit model.

2.6 Model Specification

In this study, the value of the dependent variable is repayment ratio which was computed as the ratio of amount of loan repaid to the total amount borrowed from Dire Microfinance Institution between 2014 and 2015. The value of the dependent or outcome variable ranges between 0 and 1; therefore, a two-limit Tobit model was chosen as appropriate econometric model to determine loan repayment or default in the study area. The two-limit Tobit model was originally presented by Rossett and Nelson (1975) and discussed in detail by Maddala (1992) and Long (1997). The model is derived from an underlying classical normal linear regression and can be represented as follows:

$$y^* = \beta'X_i + \varepsilon_i, \varepsilon_i \sim N[0, \sigma^2] \quad (1)$$

Denoting Y_i as the observed dependent (censored) variable

$$\begin{cases} Y_i = 0 & , \text{if } Y^* \leq 0 \\ Y_i = Y^* & , \text{if } 0 < Y^* < 1 \\ Y_i = 1 & , \text{if } Y^* \geq 1 \end{cases} \quad (2)$$

Where:

Y_i = the observed dependent variable, in this case repayment rate (ratio of amount repaid to the amount due)

Y_i^* = the latent variable (unobserved for values smaller than 0 and greater than 1)

X_i = is a vector of independent variables (factors affecting loan repayment default and intensity of loan recovery)

β_i = vector of unknown parameters

ε_i = residuals that are independently and normally distributed with mean zero and a common variance σ^2 and $i = 1, 2, \dots, n$ (where n = number of observations)

The model assumes that there is an underlying repayment ratio equal to $(\beta X_i + \varepsilon_i)$ which is observed only when repayment ratio is between 0 and 1; otherwise qualifies as an unobserved latent variable. The dependent variable is normally distributed and its value ranges between 0 and 1.

By using the two-limit Tobit model, the ratio of repayment was regressed on the various factors hypothesized to influence loan repayment performance/default of borrowers in the study area.

The Tobit model has an advantage in that its coefficients can be farther disaggregated to determine the effect of a change in the i^{th} variable on changes in the probability of being non-defaulter (McDonald and Moffit, 1980) as follows:

1. The change in the probability of repaying the loan as an independent variable X_i changes is:

$$\frac{\partial \Phi(\delta)}{\partial X_i} = \phi(\delta_U) \frac{\beta_i}{\sigma} \quad (4)$$

The change in intensity of loan recovery with respect to a change in an explanatory variable among non-defaulters is:

$$\frac{\partial E(Y_i/U > Y_i^* > L, X)}{\partial X_i} = \beta_i \left(1 + \frac{\delta_L \phi(\delta_L) - \delta_U \phi(\delta_U)}{\Phi(\delta_U) - \Phi(\delta_L)} - \left[\frac{\phi(\delta_L) - \phi(\delta_U)}{\Phi(\delta_U) - \Phi(\delta_L)} \right]^2 \right) \quad (5)$$

Marginal effect of an explanatory variable on the expected value of the dependent variable is:

$$\frac{\partial E(Y/X_i)}{\partial X} = \beta_i (\Phi(\delta_U) - \Phi(\delta_L)) \quad (6)$$

Where:

X_i = is explanatory variable

$\Phi(\delta)$ = the cumulative normal distribution

$\delta = \frac{\beta_i X_i}{\sigma}$ = the Z-score for the area under the normal curve

β_i = a vector of Tobit maximum likelihood estimates

σ = standard error of the error term (standard deviation given from the conditional distribution of the latent variables Y_i^*)

$$\delta_L = \frac{L - X_i \beta}{\sigma}$$

$$\delta_U = \frac{U - X_i \beta}{\sigma}$$

L and U are threshold values (L = 0 and U = 1)

ϕ and Φ are probability density and cumulative density functions of the standard normal distribution, respectively.

2.7 Definition of Variables and Hypothesis

Dependent variable (RPYMTRATIO): The dependent variable is repayment ratio which is measured as the ratio of the amount of loan repaid to the total amount of loan taken from formal sources of credit i.e. Dire Microfinance. It is a continuous variable the value of which ranges between 0 and 1.

Independent variables: Review of theoretical literatures on factors affecting repayment performance, past research findings and researcher's knowledge of

the study area were used to establish working hypothesis for this study. Among a number of factors which have been related to affect repayment performance, in this study, the following demographic, socio-economic, institutional and other factors were hypothesized to explain the dependent variable i.e. repayment ratio.

Table 1: Definition of hypothesized explanatory variables included in the empirical model

Variables	Code	Variable Type	Hypothesis (H ₀)	Measurement
Gender of borrowers	GENDER	Dummy	- for male, + for female	1 for male, 0 otherwise
Age of borrowers	AGE	Continuous	+	Age of borrowers in years
Education level	EDULVL	Categorical	+	1 for illiterate, 2 primary, 3 for elementary & 4 for secondary
Marital status	MARSTATUS	Dummy	+	1 for married, 0 otherwise
Family size	FSIZE	Continuous	+/-	Number of household members
Demographic Cycle	D_CYCLE	Categorical	+/-	1 for startup, 2 for expansion, 3 for contraction stage in demo. cycle
Dependency ratio	DEPDCYRATIO	Continuous	-	Proportion of children in the household
Occupation	OCCUP	Categorical	+/-	1 for farmer, 2 for agro-pastoralist, 3 for trader, 4 for civil servant, 5 for mix of farming & trading
Wealth status	WSTATUS	Categorical	+/-	1 for poor, 2 for middle, 3 for rich
Land size	LSIZE	Continuous	+	farm size in hectares
Availability of Farm Labor	AV_F_LABOR	Continuous	+	number of male HH members in productive age
Number of Oxen Availability	Oxen	Continuous	+	number of draft oxen during the production year
Other Livestock holding	OTHER_LIVHLDNG	Continuous	+/-	Number of livestock other than oxen
On-farm Income	ON_INCOM	Continuous	+	Yearly income from on-farm
Off-farm Income	OFF_INCOM	Continuous	+/-	Yearly income from off-farm & non-farm
Credit experience	CREXPC	Categorical	+/-	number of times a given client has taken loan
Loan diversion	LONDIV	Continuous	-	ratio of the loan diverted to the total loan amount received
Timeliness of loan release	TIMLOANRLSE	Dummy	+	1 for on time, 0 otherwise
Repayment period suitability	RPYTPSUIBTY	Dummy	+	1 for suitable, 0 otherwise
Loan size	LOANSIZ	Continuous	+/-	amount of loan released
Credit rationing	CRATIONG	Continuous	+/-	percentage of the loan received
Interest rate	INTRATE	Continuous	-	Percentage of interest rate
Loan supervision	LNSPN	Categorical	+	1 for one visit, 2 for two visit & 3 for three visit
Training	TRNG	Dummy	+	1 for yes, 0 otherwise
Distance from lending institution	DISFLI	Continuous	+	1 for yes, 0 otherwise
Agro ecology	AGROECO	Categorical	+ for 1 & - for 0	1 for <i>woyna dega</i> & 0 to <i>kola</i>

3. Result and Discussion

3.1 Descriptive Statistics Analysis

The descriptive statistics result presented in table 3 and 4 shows the demographic and socio-economic attributes of sample microfinance borrowers in the study area. Out of the total 170 borrowers interviewed, 145 (85.3%) were defaulters and the remaining 25 (14.7%) were non-defaulters. Among the defaulters, 27 (18.62%) were complete defaulters while 118 (81.38%) repaid 8 to 86 percent of the total loan of which they borrowed. The main reason accounting for 60 percent of the defaulters was lack of profit from the investment, for 29 percent of them was diverting loans for household consumption and for the rest 10 percent failure of crop production. The average loan repayment was 47 percent for male borrowers, 55 percent for female borrowers and 52 percent in overall. The finding justifies the intensity of the problem of loan default in the study area which is actually much higher (48 percent) than what is reported by the institution (an average of 6 percent for the last 5 years). This can happen for two reasons: one, by writing-offs defaulted loans which could minimize default rate while the default might still be high. Secondly, by suspending loans for risky borrowers.

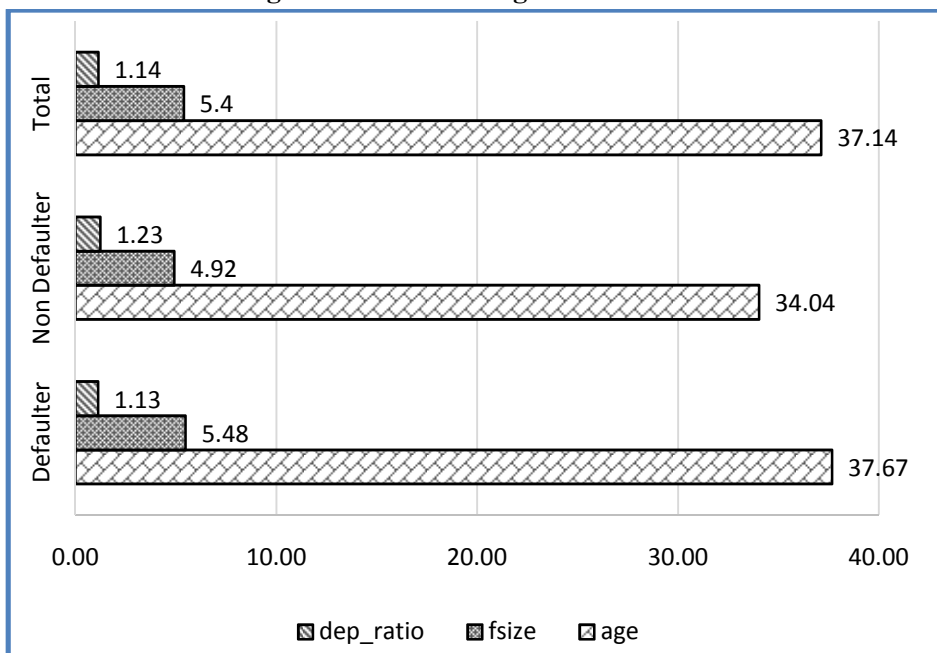
3.1.1 Demographic Characteristics of Sample Borrowers

The sample was composed of both male and female borrowers. Of the total sample respondents, 114 (67.06 percent) were females and 56 (32.94 percent) were males. Proportion of females in both default and non-default group were high i.e. 67 and 64 percent, respectively compared to their male counterparts. The difference in terms of gender among the two groups was not significant (Table 3).

The mean age of borrowers was 37.13 years with the minimum and maximum ages of 22 and 58 years, respectively (Table 3). The average age of non-defaulters was 34 years, while that of defaulters was 38 years with significant mean difference at 1% level. On the other hand, the average family size of the sample households was 5.4; higher than the national average of 5 persons (CSA, 2007). The largest family size was 9 and the smallest was 2. The

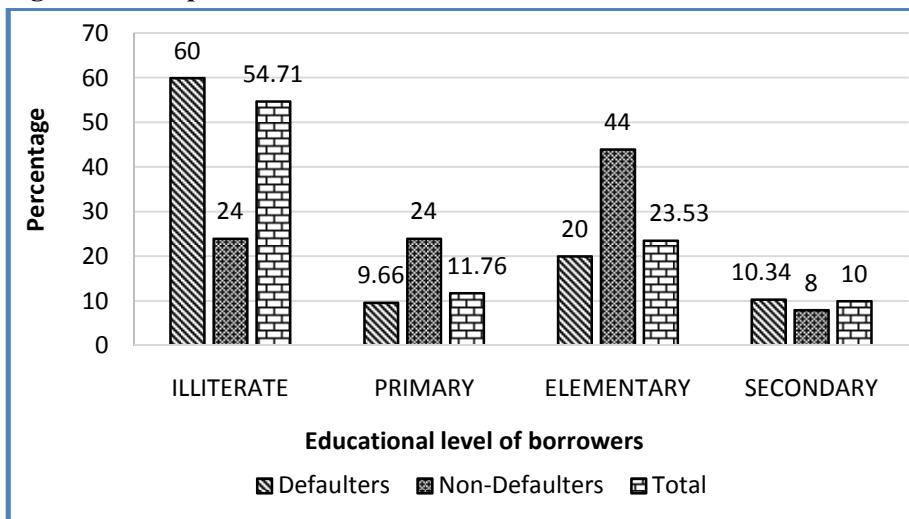
average family size of non-defaulters was 4.92 while that of defaulters was 5.48 with no significant difference between means of the two groups (Table 3).

Figure 1: Comparison of age, family size and dependency ratio of defaulting and non-defaulting borrowers



The survey result also revealed that 54.18 percent of the sample borrowers were illiterate whereas the remaining 11 percent, 23 percent and 10 percent attended primary, elementary and secondary education, respectively. Of the total sample respondents, 51.18 percent of the defaulters were illiterate while only 3.53 percent of the non-defaulters were found to be illiterate. There is significant difference between defaulters and non-defaulters in terms of their literacy level with a p-value of 0.003 (Table 3). As can be observed from Figure 2 below, majority of defaulters accounting 60 percent were illiterate borrowers while that of non-defaulters (44 percent are those who attended elementary education).

Figure 2: Comparison of education level of defaulters and non-defaulters

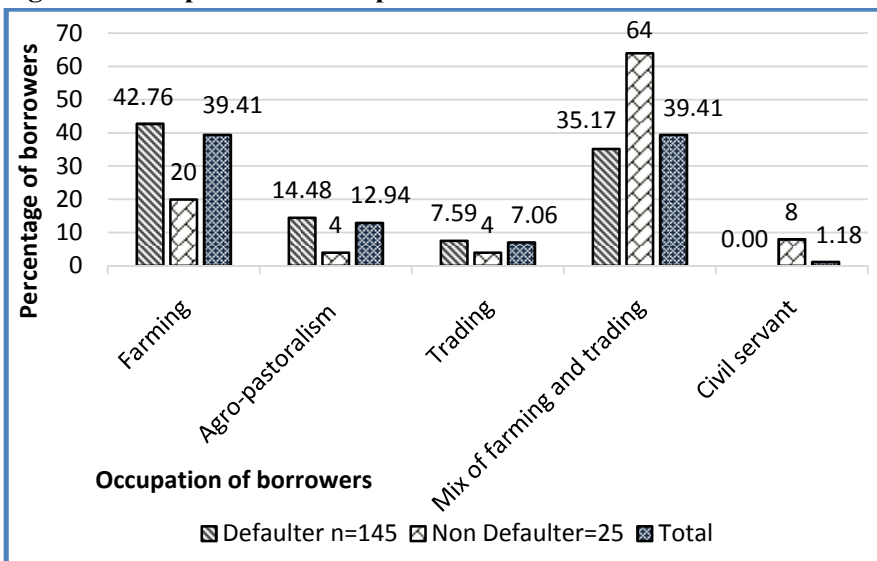


The majority of defaulting borrowers were farmers (42.67 percent) while that of non-defaulting were those who use both farming and trading as their livelihoods (64 percent). The mean repayment rate of borrowers who practice mix of farming and trading was higher (0.67) compared to those engaged in only farming (0.34), agro-pastoralism (0.55) and trading (0.50), with the exception of civil servants. The difference between defaulting and non-defaulting borrowers in terms of occupation was significant at 1 percent level (Table 3). This result clearly indicates that risk of default is high among farmer borrowers.

Table 2: Mean repayment rate of borrowers compared to their occupation

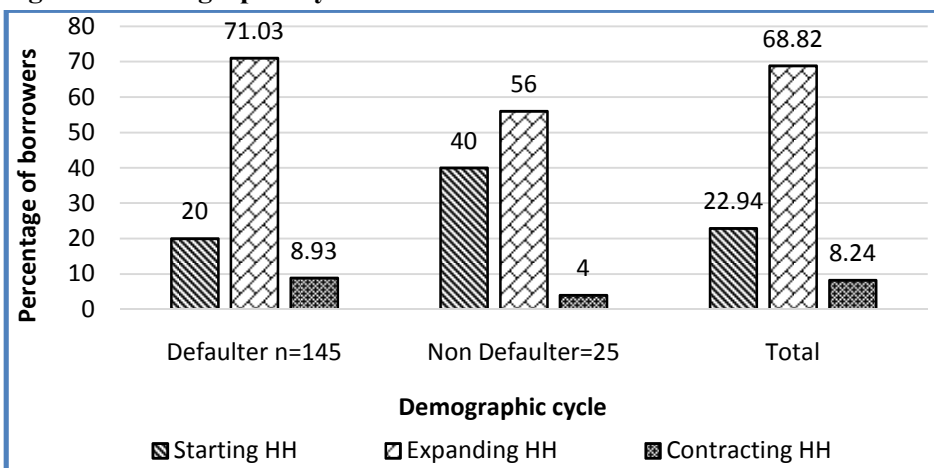
Occupation	Mean (repayt_ratio)
Farming	0.34
Agro-pastoralism	0.55
Trading	0.5
Mix of Farming & Trading	0.67

Figure 3: Comparison of occupation of defaulters and non-defaulters



Concerning the demographic cycle, the majority of defaulting borrowers are expanding households (71 percent) while those of non-defaulting borrowers are starting households (40 percent). The difference between the two groups was significant at 10 percent.

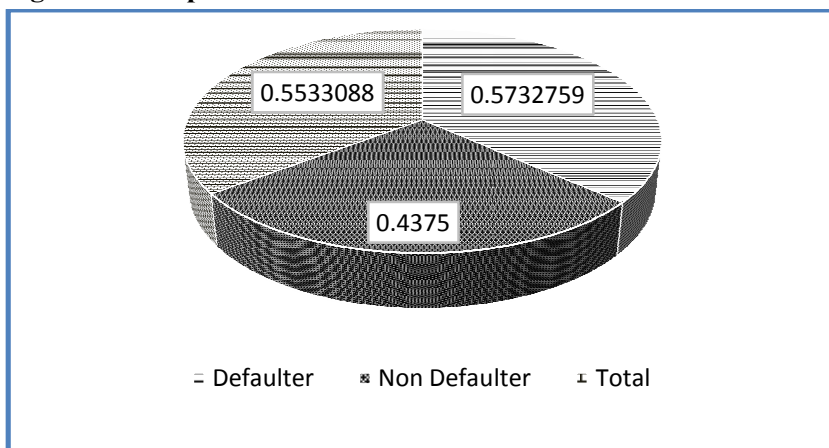
Figure 4: Demographic cycle of defaulters and non-defaulters



3.1.2 Socio-economic factors of Defaulters and Non-Defaulters

Land is one of the basic assets on which the livelihoods of many farm households depend in rural areas. The average size of farm land owned by the surveyed borrowers was 0.55 ha, the minimum and the maximum being 0 and 1.25 ha, respectively. Non-defaulters cultivated on average smaller land (0.43 ha) than defaulters (0.57 ha) with significant mean difference at 5 percent level (Table 3). This is mainly due to the fact that the households could not produce due to shortage of rainfall in the area for the last two consecutive years. Therefore, large land would not necessarily result in improved income for repayment in the absence of other alternative income sources.

Figure 5: Comparison of mean land size of defaulters and non-defaulters

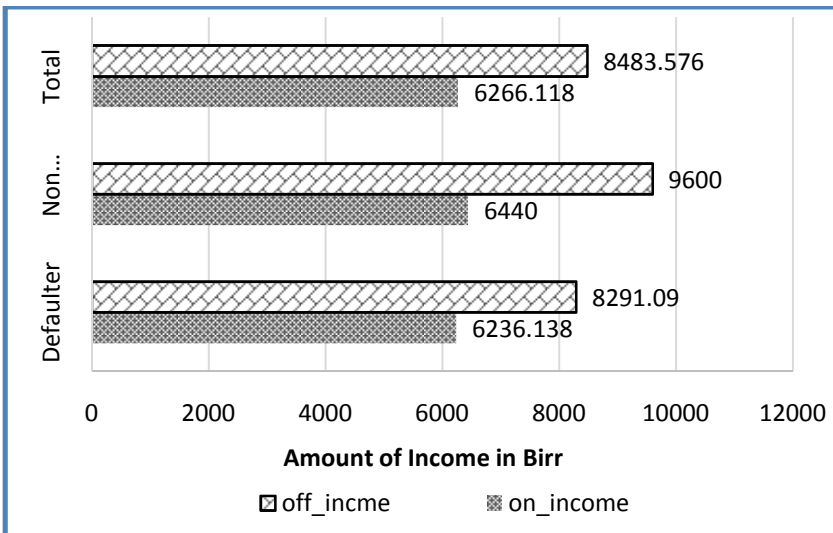


During the survey, respondents were asked if they have rented in or rented out land in the recent past years. In response, none of them said they have rented in or rented out land in any form. However, they mentioned that there was a traditional land renting through sharecropping arrangement which was called *Hirta* in local language (Oromiffa) long years before. Moreover, with regard to availability of farm labor, there is traditional labor sharing arrangement which is termed as *Guza* in local language. A group of 10 to 15 individuals which may be composed of friends, neighbors, and relatives assist farm activities of households in peak agricultural seasons usually for a whole day. In exchange, the household provides lunch, tea, coffee and chat to the visiting team.

Availability of oxen for traction power does not have significant effect on loan repayment or default (Table 3). This is mainly attributed to the fact that having oxen is not a must to plough land in rural Dire-Dawa as in the case in the Northern Ethiopia. As per respondents, if there is an ox in the household, every member of the household would share it for cultivation. It is common to plough land by labor using tools in the absence of oxen as the mean land size of farm households was 0.55 ha in the study area.

Non-defaulters earned higher on-farm and off-farm income than defaulters. Mean on-farm income of non-defaulters was Birr 6,440 while that of defaulters was Birr 6,236. Similarly, mean off-farm income of non-defaulters was Birr 9,600 whereas defaulters earned Birr 8,291. However, there was no significant difference between defaulters and non-defaulters in terms of on-farm and off-farm income.

Figure 6: Comparison of on-farm and off-farm income of defaulters and non-defaulters



The mean loan size extended to borrowers was 3,900 Birr with minimum being 1,000 Birr and maximum 10,000 Birr. About 97.65 percent of borrowers took loan for productive purposes while only 2.35 percent of them borrowed for consumption purposes. The purpose for which the loan was taken has no significant association with being defaulter or non-defaulter. The

loan size extended for consumption purpose was 1,000 Birr and for productive purpose it ranges between 2,000 and 10,000 Birr depending on the type of business chosen by borrowers. Dire MFI provided the credit mainly for shoats and cattle fattening, barber shop, vendor shop, chat selling, vegetable selling, etc.

Out of those borrowers who have taken loan for productive purposes, 31.32 percent of them utilized or diverted portion of the loan for non-intended purposes. The mean loan amount diverted for non-intended purposes was 1,215.38 Birr with minimum and maximum being 500 Birr and 3,000 Birr, respectively. The result of the t-test for mean difference confirmed that there is strong and significant association between loan diversion and loan repayment at 1% significance level (Table 3). The finding also shows out of 30.59 percent of borrowers who diverted loan, 98.08 percent were found to be defaulters.

The mean distance of the nearest MFI rural branch office from the borrowers' residence was found to be 5.12 kilometers. On average, non-defaulters travel about 1.67 km while defaulters travel about 5.71 km to reach to the nearest MFI branch office in the surveyed area. This clearly indicates that the more borrowers are living farther from the branch offices, the lesser the repayment of the credit or the higher the default. The mean difference between the distances covered by non-defaulters and defaulters was statistically significant at 1 percent significance level (Table 3).

Table 3: T-test for mean difference between defaulters and non-defaulters for continuous variables

Variables	Defaulter		Non Defaulter		t-value	p-value	Total	
	Mean	St. Dev	Mean	St. Dev			Mean	St. Dev
age	37.66897	9.838315	34.04	7.828793	2.0548**	0.0468	37.13529	9.63533
fsize	5.482759	1.90067	4.92	1.800926	1.431	0.1616	5.4	1.891745
dep_ratio	1.129717	0.7957429	1.23336	0.802168	-0.5973	0.5544	1.144959	0.7951561
lsize	0.573276	0.285685	0.4375	0.270031	2.3018**	0.0276	0.5533088	0.2867466
oxen	0.475862	0.7461267	0.32	0.556776	1.2231	0.2284	0.4529412	0.7221087
othr_livestock	7.965517	5.754725	7.96	4.81733	0.0051	0.9959	7.964706	5.613692
on_income	6236.138	5005.46	6440	5120.771	-0.1844	0.8548	6266.118	5007.738
off_incme	8291.09	11616.13	9600	9170.514	-0.6316	0.5314	8483.576	11275.32
loan_size	3865.517	1438.864	4100	1984.313	-0.5658	0.5760	3900	1526.492
loan_div	428.9655	709.8432	40	200	5.4600***	0.0000	371.7647	673.8763
c_rationg	731.0345	2517.316	2360	6033.794	-1.3301	0.1953	970.5882	3302.189
dis_fli	5.715655	4.546683	1.67084	2.639249	6.2324***	0.0000	5.120829	4.546182

Source: Computed from the survey data

Note: ***, **, * denotes significance at 1%, 5% and 10% level, respectively

Table 4: Chi-square test for categorical variables

Variables	Defaulter n=145		Non Defaulter n=25		Chi X2-value	P-value	Total	
	Freq	Percent	Freq	Percent			Freq	Percent
gender								
Male	47	32.41	9	36			56	32.94
Female	98	67.59	16	64	0.1241	0.725	114	67.06
edu								
Illiterate	87	60	6	24			93	54.71
Primary	14	9.66	6	24			20	11.76
Elementary	29	20	11	44			40	23.53
Secondary	15	10.34	2	8	14.1185***	0.003	17	10.00
Dcycle								
Starting HH	29	20	10	40			39	22.94
Expanding HH	103	71.03	14	56			117	68.82
Contracting HH	13	8.93	1	4	5.0567*	0.080	14	8.24
Occupation								
Farming	62	42.76	5	20			67	39.41
Agro-pastoralism	21	14.48	1	4			22	12.94
Trading	11	7.59	1	4			12	7.06
Mix of farming and trading	51	35.17	16	64			67	39.41
Civil servant	0	0.00	2	8	21.0978***	0.000	2	1.18
Wstatus								
Poor	59	40.69	4	16			63	37.06
Medium	78	53.79	19	76			97	57.06
Rich	8	5.52	2	8	5.6403	0.130	10	5.88
av_f_labor								
Yes	135	93.1	23	92			158	92.94
No	10	6.9	2	8	0.0396	0.842	12	7.06

Note: ***, **, * denotes significance at 1%, 5% and 10% level, respectively

Source: Own computation from field survey

Out of the total borrowers included in this study, 133 (78.24 percent) of them have got training related to saving, loan utilization and the overall rules and regulation of the lending institution while 37 (21.76 percent) borrowers did not get any training at all. There is positive and significant association between training and loan repayment performance as can be seen from the Pearson chi-square statistics i.e. ($\chi^2 = 5.4323$, $p=0.020$) at 5 percent significance level.

Although describing institutional and other factors are not the main objective of this section, timelines of loan release, repayment period suitability, credit experience and availability of other credit sources were not significantly associated with repayment performance. In the contrary, loan supervision and training was found having significant association.

3.2 Econometric Analysis

3.2.1 Factors Influencing Loan Repayment

The overall performance of the Tobit model can be observed from the Pseudo R-squared value in Table 9 below. The result indicated that the model predicted 55.96 percent of the variation in the dependent variable (repay or default) with the value of Pseudo R² = 0.5596. The likelihood ratio (LR) statistics of 148.14 with a Chi-squared (χ^2) distribution at 19 degrees of freedom is significant at 1 percent level. In addition, a value for the log likelihood ratio (-58.301217) indicates good model fit. All of the variables took the expected sign indicating appropriate model specification.

The estimated results of the Tobit model and the marginal effects are shown in table 9 and 10, respectively. A total of 13 explanatory variables were ultimately considered in the econometric model and except the availability of other alternative credit sources, all the remaining 12 variables were found to significantly influence probability of being non-defaulter and intensity of loan recovery among the surveyed households. These were education, occupation, family size, wealth status, off-farm income, timeliness of loan release, repayment period suitability, loan size, loan diversion, credit experience, availability of training and agro-ecology of the area. Since the value of 4 explanatory variables have shown high variation i.e. their standard deviation

was higher than their mean values, their values was converted into natural logarithm.

As anticipated, education (edu) as a whole is positively and significantly associated with loan repayment rate at 5 percent significance level. This is in line with the expectation that educated borrowers are more efficient in resource allocation and easily adapt to changing circumstances. Specifically, for a change in category of education from illiterate to primary and primary to elementary by one unit, the loan recovery rate increases on average by 14.31 and 14.36 percent, respectively while the probability of loan non-default increases by 2.92 percent and 3.32 percent, accordingly. The first change is significant at 10 percent while the later at 5 percent level (Table 5).

Table 5: Maximum likelihood estimates of the Tobit model

repay_ratio	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
edu						
PRIMARY	0.1580211	0.0903787	1.75*	0.082	-0.0205491	0.3365912
ELEMENTARY	0.1576913	0.0673046	2.34**	0.020	0.0247109	0.2906717
SECONDARY	0.1199442	0.0948598	1.26	0.208	-0.0674798	0.3073681
occup						
AGROPAST	0.374036	0.0892319	4.19***	0.000	0.1977317	0.5503403
TRADING	-0.0668303	0.1333248	-0.5	0.617	-0.3302533	0.1965927
MIX	0.3020918	0.085208	3.55***	0.001	0.1337378	0.4704458
fsize	-0.0345458	0.0148269	-2.33**	0.021	-0.0638407	-0.0052509
wstatus						
POOR	-0.0679455	0.0592128	-1.15	0.253	-0.184938	0.049047
RICH	0.347181	0.1225528	2.83***	0.005	0.1050414	0.5893207
lnoff_incme	0.0118931	0.0040353	2.95***	0.004	0.0039201	0.0198661
timloanrlse						
TIMELY	0.2835952	0.0726496	3.9***	0.000	0.1400541	0.4271363
rpay_suitability						
SUITABLE	0.1342452	0.0729416	1.84*	0.068	-0.0098728	0.2783632
lnloan_size	0.2207288	0.0627396	3.52***	0.001	0.096768	0.3446897
lnloan_div	-0.0074503	0.0039932	-1.87*	0.064	-0.0153402	0.0004395

cre_exp						
TWO TIMES	-0.3288371	0.0988019	-3.33***	0.001	-0.5240498	-0.1336245
THREE TIMES	-0.1593759	0.1514186	-1.05	0.294	-0.4585486	0.1397968
trng						
YES	0.2100476	0.0708805	2.96***	0.004	0.0700019	0.3500933
agro_eco						
WOYNADEGA	0.3462805	0.0606445	5.71***	0.00	0.2264591	0.4661018
othrcr_source						
YES	0.1121879	0.0716342	1.57	0.119	-0.0293468	0.2537226
_cons	-2.030916	0.5328186	-3.81	0.000	-3.083658	-0.9781732
Number of obs	=	170			Pseudo R2	=
					0.5596	
LR chi2(19)	=	148.14			Log pseudolikelihood	=
					58.301217	-
Prob> chi2	=	0.0000			σ (sigma)	=
					0.2846381	
Obs. summary:	26 left-censored observations at repayt_ratio<=0					
	118 uncensored observations					
	26 right-censored observations at repayt_ratio>=1					

Source: Computed from survey data

Note: ***, **, * denotes significance at 1%, 5% and 10% level, respectively

-

Occupation, in overall, was found to have positive and significant effect at 1 percent level on repayment performance of borrowers. The sign for this variable was not predetermined a priori as there were possibilities where credit experience can be associated with repayment ratio (the dependent variable) both positively and negatively. The marginal effect from tobit regression particularly indicates that for a unit change in a category of borrower's occupation from farming to agro-pastoralism and from trading to mix of farming and trading increased repayment rate on average by 31.97 and 27.26 percent, respectively for the overall sample. The same change decreases probability of non-default by 4.8 percent and 7.37 percent, correspondingly (Table 5). This is mainly because borrowers who earn their livelihoods from agro-pastoralism and mix of farming and trading are better-off than those who depend on a single source of livelihood i.e. farming or trading. Both changes are significant at 1 percent level.

The result revealed an existence of negative influence of family size (fsize) on repayment performance implying that an increase in household size by one person decreases repayment performance by 3.18 percent and the probability of being non-defaulter by 0.92 percent. The possible explanation for this could be the more the household size, the larger the idle labor as the average available land for farming in the surveyed area is very small, i.e. 0.55 ha. Under such circumstances, more members imply more burdens on the household which may force loan diversion to household consumption or non-intended purposes thereby leading to low repayment performance. This result is in line with the study findings of Firafis (2015) and Jemal (2002) who found household size negatively impacting loan repayment performance of microfinance borrowers in Harrar and Kuyu. In the contrary, Afolabi (2008) found positive relationship between family size and loan repayment and attributed it to the respondents' extensive utilization of family labor in the farming activities.

Wealth status (wstatus), which was one of the socio-economic factors, was found to affect loan repayment performance positively and significantly at 5 percent level. The sign for this variable was not determined a priori as there were possibilities where wealth status can be associated both positively and negatively with repayment ratio. As per the econometric result, being rich

increased the probability of being non-defaulter by 3.88 percent and increased rate of repayment on average by 29.47 percent for the entire sample respondents and by 20.97 percent among non-complete defaulters. In the contrary, being poor negatively related with repayment rate but the effect was not significant.

Off-farm income (*lnoff_income*), which includes non-farm income in this study, is another economic factor that positively and significantly affected loan repayment performance of borrowers in rural Dire-Dawa at 1 percent level of significance (Table 5). This might be due to the fact that off-farm activities serve as additional source of income for rural borrowers and the cash generated from these activities could back up the farmers' income to settle their debt even during bad harvesting seasons and when repayment period coincides with low agricultural prices. A percentage change in off-farm income increases probability of being non defaulter by 0.32 percent and increases the rate of loan repayment on average by 1.09 for the entire respondents and by 0.8 percent among non-complete defaulters (Table 5). However, this result is contrary to Bekele's (2001), findings that off farm income were negatively related with loan repayment performance of rural borrowers.

Timeliness of loan release (*time_loanrls*) is found to have positive and significant effect (at 1 percent level) on repayment performance as expected. As per the econometric model result, when loan is released timely, the probability of being non-defaulter increases by 11.79 percent (Table 5). Similarly, releasing loan timely increases the rate of repayment on average by 25.66 percent for the entire sample respondents and by 18.63 percent among non-complete defaulters. The possible explanation for this is that when loans are dispersed on time, it is less likely that the loan is diverted for non-intended purposes.

Repayment period suitability (*rpay_suitability*) was one of the institutional factors hypothesized to influence loan repayment positively. Accordingly, repayment period suitability has positive and significant effect on repayment performance at 10 percent level. The econometric model result revealed that suitable repayment period increases the probability of being non-defaulter by

4.66 percent and increases rate of repayment on average by 12.32 percent for the entire sample respondents and by 9 percent among non-complete defaulters. The possible explanation for this is when repayment period is suitable for borrowers, it allows enough time to utilize loan properly. As per the respondents, loan repayments are made yearly for oxen fattening, semi-annually for shoats fattening and monthly for petty trading.

Loan size (*lnloan_size*), which is one of the institutional factors, was also found to significantly and positively affect loan repayment rate at 1 percent level. This suggests that as loan increases in size, borrowers are more likely to repay their loans. In other words, borrowers with bigger loans are more likely to repay their loans than those with smaller loans. A one percent change in loan size, increases repayment intensity on average by 20.32 percent and probability of non-default by 5.91 percent (Table 5).

Loan diversion (*lnloan_div*) was hypothesized to negatively impact loan repayment performance of borrowers. Accordingly, the variable was found to have significant and negative effect on loan repayment at 10 percent level. The implication is that those borrowers who divert loans to finance consumption may face shortage of finance to engage in income generating activities and ultimately default loans due to lack of profit. The marginal effect after tobit regression indicates that diverting loan by one percent decreases probability of repayment by 0.2 percent and decreases repayment rate on average by 0.69 percent for all observations and by 0.5 percent among non-complete defaulters.

Credit experience (*cre_exp*) of the borrower with the lending institution also matters on loan repayment rate as reflected by significant and negative relationship at 1 percent level (Table 5). The sign for this variable was not predetermined a priori as there were possibilities where credit experience can be associated with repayment ratio (the dependent variable) both positively and negatively. As per the econometric model result, a unit change in category of borrower's experience with the lending institution from one to two times reduce the probability of being non-defaulter by 19.6 percent and decreases rate of repayment on average by 28.87 for overall observation and by 20.74 percent among non-complete defaulters. However, the change in experience of borrowers from two to three times was not significant enough to explain repayment performance.

Table 6: Marginal effect of factors influencing loan repayment

Variables	Effect of change in the independent variable on probability of being non-defaulter	Effect of change in the independent variable on dependent variable for non-complete defaulters	Effect of change in the independent variable on dependent variable for all observations
	$\frac{\partial \Phi(\sigma)}{\partial X_t}$	$\frac{\partial E(Y/L < Y < U, X)}{\partial X_t}$	$\frac{\partial E(Y_t)}{\partial X_t}$
repay_ratio			
edu*			
PRIMARY	0.0292	0.1040	0.1431
ELEMENTARY	0.0332	0.1046	0.1436
SECONDARY	0.0238	0.0795	0.1092
occup*			
AGROPAST	0.0480	0.2280	0.3197
TRADING	-0.0215	-0.0450	-0.0615
MIX	0.0737	0.1977	0.2726
fsize	-0.0092	-0.0233	-0.0318
wstatus*			
POOR	-0.0194	-0.0458	-0.0625
RICH	0.0388	0.2097	0.2947
lnoff_income	0.0032	0.0080	0.0109
timloanrlse*			
TIMELY	0.1179	0.1863	0.2566
rpay_suitability*			
SUITABLE	0.0466	0.0900	0.1232

Inloan_size	0.0591	0.1488	0.2032
Inloan_div	-0.0020	-0.0050	-0.0069
cre_exp*			
TWO TIMES	-0.1960	-0.2074	-0.2887
THREE TIMES	-0.0674	-0.1058	-0.1452
trng*			
YES	0.0832	0.1394	0.1914
agro_eco*			
WOYNADEGA	0.1103	0.2265	0.3125
othrcr_source*			
YES	0.0243	0.0748	0.1025

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Source: Computed from survey data

Training was also another crucial institutional factor hypothesized to influence loan repayment performance positively. Accordingly, training was found to have positive and significant impact on repayment performance of borrowers. Training increases probability of being non-defaulter by 8.32 percent and increases repayment rate on average by 19.14 percent in overall and by 13.94 percent among non-complete defaulters. The possible explanation for this is that borrowers who have received training are better in managing their business and make efficient use of loans. However, the type of training reported by all DMFI borrowers in the surveyed area was not comprehensive enough to enhance their business skill as per respondents.

Agro ecology (*agro_eco*) was one of the factors which significantly influence loan repayment performance of rural microfinance borrowers at 1 percent level. The coefficient of agro ecology for *weynadega* area was found to have positive sign indicating a positive impact on loan repayment. The econometric model result revealed that being resident in *weynadega* agro-ecological area increases the probability of being non-defaulter by 11.03 percent (Table 5) and increases the rate of repayment on average by 31.25 percent for the entire sample respondents and by 22.65 percent among non-complete defaulters. The reason behind this is that rural borrowers in a relatively good rainfall area (*Biyoawale, Wahil and Legeoda Gudunfeta*) have the opportunity to diversify and grow cash crops that would help them generate better income to pay the loans more than farmers and agro-pastoralists living in moisture stress areas (*Aseliso, Hulahulul and Boren Jeden*).

4. Conclusion and Policy Implication

This study was conducted to identify the factors affecting loan repayment and to determine the extent of default in the repayment of loans provided to microfinance borrowers in rural Dire-Dawa. The descriptive statistics result indicated that about 85.3 percent of the sample borrowers were defaulters and only 14.7 percent are non-defaulters. The average loan repayment rate was 52 percent in overall with 47 percent for male borrowers and 55 percent for female borrowers. The t-test showed that there is significant difference between defaulters and non-defaulters in terms of age, family size, land size and loan diversion and distance from lending institution. The chi-square test

also revealed that education, occupation, demographic cycle, loan supervision, training and agro-ecology have significant association with loan repayment.

The results of the two limit Tobit model also showed that, from a total of 13 explanatory variables used in the regression model, 12 variables were found to have statistically significant effect on loan repayment performance of borrowers. Among these, education level, occupation, wealth status, off-farm income, timeliness of loan release, repayment period suitability, loan size, training and agro-ecology have positive effects on repayment performance of borrowers. Each of these factors will therefore enhance loan repayment abilities of rural borrowers. On the other hand, family size, credit experience and loan diversion have negative effects on loan repayment. The aforementioned factors are, therefore, critical in improving repayment performance in the study area.

To enhance repayment performance, it is important to consider the following policy implications. As shown in our analysis above, educational level particularly primary and elementary education has a positive and significant effect on loan repayment illustrating the importance of human capital dimension in shaping the success of financial institutions. Therefore, there should be a continued investment in education sector in terms of expanding schools in the rural part of Dire-Dawa, particularly primary and elementary school.

Occupation was the other variable that has positive and significant impact on loan repayment. The findings indicate that borrowers who practice mix of farming and trading were found to have better repayment performance compared to farmers, agro-pastoralists and traders. Therefore, context specific income diversification strategies should be designed and implemented to enhance the financial capability of rural households.

Off-farm income was also found to have positive and significant contribution on loan repayment performance of borrowers. Therefore, the administration should focus in creating off-farm and non-farm employment opportunities for rural households as on-farm activities mainly depend on natural rainfall which is subject to climate risk.

Wealth status, particularly being rich was found to influence loan repayment significantly and positively. However, this does not mean that Dire MFI should favor the rich rather it should give due care and the necessary support for the poor. This is because MFIs, in principle, are designed to improve financial access to the poor who have no physical collateral.

Timeliness of loan release and repayment period suitability are also among the factors which significantly and positively impact repayment performance of borrowers. Therefore, Dire MFI should continue and always strive in designing ways to release loan timely and make repayment schedules suitable for its customers.

Loan size was found to be critical institutional factor that positively and significantly affect loan repayment. Therefore, Dire Microfinance should regularly revise its loan size taking into account the inflation rate and purchasing power of the money to allow an amount of loan sufficient enough for households to engage in a business. Loan diversion was also another important factor that hinders repayment performance. The descriptive statistics result further showed that the majority of defaulters accounting 60 percent have provided loss of profit as a reason for defaulting their loan. Therefore, repayment performance of borrowers can be enhanced by building their capacity through different business skill development trainings.

Training has also significant impact on loan repayment positively. Due to the training borrowers were able to understand how they can access loans, allowable loan size for different business choices, the repayment modality and the amount of money they are expected to payback including the service charge by the end of loan term. If the orientation type of training has significant contribution to loan repayment in DMFI, there is no doubt improved trainings could further enhance repayment performance of borrowers. Recent studies in the field of microfinance are advocating the importance of integrating financial services with non-financial services to improve their clients' performance. These non-financial services include entrepreneurial and business skill trainings. Therefore, Dire Microfinance should develop and provide a comprehensive package of trainings which

includes entrepreneurship, business skill development, financial management and bookkeeping.

Agro ecology was also found to significantly and positively affect loan repayment. Borrowers who reside in *Woynadega* agro-climatic area had better loan repayment performance than borrowers who reside in moisture stress area. Therefore, the administration should promote technologies suitable for moisture stress area and scale up Natural Resource Management /NRM/ interventions in order to improve repayment performance of borrowers in the study area.

References

- Afolabi, J. A. (2008). Analysis of Loan Repayment Performance among Small Scale Farmers in South Western Nigeria - a discriminant approach. *Journal of Social Science*, 17 (1): 83-88.
- Awunyo-Vitor, D. (2012). Determinants of Loan Repayment among Farmers in Brong Ahafo Region of Ghana. *Journal of Development and Agricultural Economics*, 4(13) 339-445
- Bekele, H., Kassa, B. and Mulat D. (2003), Factors Influencing Repayment of Agricultural Input Loans in Ethiopia: The Case of Two Regions (Amhara and Oromiya Regional States), *African Review of Money, Finance and Banking*, pp.117-142.
- Conning, J. (1999). Outreach, Sustainability and Leverage in Monitored and Peer-monitored Lending. *Journal of Development Economics*, 60(1): 601-631
Dire-Dawa Micro-finance Institution 2011, Annual Report
- Fikirte, R. (2011). Determinants of Loan Repayment Performance: A Case Study in Addis Credit and Saving Institution, Addis Ababa Ethiopia, Master's Thesis, Wageningen University, Netherlands.
- Firafis, H. (2015). Determinants of Loan Repayment Performance: Case Study of Harrari Microfinance Institutions, *Journal of Agricultural Extension and Rural Development*, Vol.7 (2), pp. 56-64.
- Ghatak, M and T. Guinnane. (1999). The Economics of Lending with Joint Liability: A Review of Theory and Practice, *Journal of Development Economics*, 60, 195-228.
- Gulli, H. (1998). Microfinance and Poverty: Questioning the Conventional Wisdom. Microenterprise Unit, Sustainable Development Department, Inter-America Development Bank, Washington D.C.
- Hamdu, K. M. (2014). Determinants of Credit Default: Microfinance Institutions in Jimma Zone, Jimma Ethiopia, *Research Journal of Economics and Business Studies*, Vol. 3, No.7, pp. 44-49.
- Hunte, C. K. (1996). Controlling Loan Default and Improving the Lending Technology in Credit Institutions: AEMFI, Saving and Development, Vol. 20 (1), pp. 45.
- Jemal, A. (2003). Microfinance and Loan Repayment Performance: A Case Study of the Oromiya Credit and Saving Institution (OCSSCO) in Kuyu, Master's Thesis, Haramaya University
- Johnson, S. and B., Rogal. (1997). Microfinance and Poverty Reduction, Oxfam Publication
- Kashuliza, A. (1993). Loan Repayment and Its Determinants in Small Holder Agriculture: A Case Study in the Southern Highlands of Tanzania, *Eastern Africa Economic Review*, Vol. 9(1), pp. 213-238.

- Khandker Shahidur R. and Baqui Khaily, and Zahed Khan. (1995). *Grameen Bank Performance and Sustainability*, World Bank Discussion Papers, No. 306, The World Bank, Washington D.C.
- Ledgerwood, J. (1999). *Microfinance handbook: An institutional and financial perspective*. Washington DC: The World Bank
- Long, S. (1997). *Regression Models for Categorical and Limited Dependent Variables*, Thous and Oaks, CA: Sage Publications
- Maddala, G. S. (1992). *Introduction to Econometrics*, Second Edition, Macmillan Publishing Company, New York.
- Mc Donald, J. and R. Moffitt. (1980). "The Uses of Tobit Analysis." *Review of Economics and Statistics*. 62: 318-321
- Medhin, M. (2015). *Determinants of Loan Repayment Performance of Rural Women Based Saving and Credit Cooperatives Members: The case of Dire-Dawa Administration*, Master's Thesis, Haramaya University, Haramaya.
- Ray, D. (1998). *Development Economics*. Princeton University Press, Princeton, New Jersey.
- Rosett, R. and Nelson, F. (1975). Estimation of the Two-limit Probit Regression Model, *Econometrica*, 43 (1): 141-146.
- Schrieder, G. and S., Manohar. (1999). Impact of Finance on Poverty Reduction and Social Capital Formation: A Review and Synthesis of Empirical Evidence. *Savings and Development*, 23(1): 67-93.
- Stiglitz, J. E. (1993). *Peer Monitoring and Credit Markets, The Economics of Rural Organizations, Theory, Practice and Policy*, Published for the World Bank, Oxford University Press.
- Welderufael, L. L., Tesfatsion, S. D. and Gedifew, A. W. (2015). Factors Influencing MFI Group Loan Repayment Performance: A Case of MSEs' Service Sector in Mekele City, Ethiopia, *Research Journal of Finance and Accounting*, ISSN, Vol. 6, No. 5, pp.159.
- Zeller, M. and R., L. Meyer. (2002). *The Triangle of Microfinance: Financial Sustainability, Outreach and Impact*. The Johns Hopkins University Press, 2715 North Charles Street. Baltimore, Maryland.

Effect of Cropland and Livestock Ownership on Child Labour in Eastern Ethiopia]: Empirical Examination of the *Wealth Paradox*

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Abstract

The study examined the relationship between child labor participation and household wealth (in terms of livestock and cropland) considering representative sample smallholders from four (Kurfa Chelie, Kersa, Fedis and Melka Bello) districts in Eastern Hararghe Zone of Oromia regional state of Ethiopia. The descriptive statics showed that average family size was 5.45 persons per household, which was larger than the national average (4.9) in 2016. In the study area, children with the age of 4-14 years constituted 43.3% of the total population. Children of this age interval were the subject matter of this study. Around 23% of sampled households spent less than 2,471.22 Birr per annum per adult equivalent, which is an amount based on the inflation adjusted poverty line. Households in Fedis district experienced the worst poverty head count score wherein 44% of them could not satisfy the minimum living standard requirement. Double hurdle model result revealed that livestock and crop landholding of smallholders significantly affect child labor participation in domestic work. This finding implies that possession of larger livestock and cropland would not initiate children to budget more time for their education. The model result also showed that household head's education level significantly reduced domestic labor participation of children in the study area. Thus, this research recommended that there should be improvement in education and awareness level of households in the study area to improve child school enrollment. The wealth paradox about child labor holds true for smallholders in eastern Ethiopia.

Keywords: Child labor, Livestock, Cropland, Wealth paradox, Household, Ethiopia

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1. Introduction

Child labour exploitation is one of the development challenges that most developing countries experienced commonly. Worldwide, 218 million children of ages 5-17 are involved in child labour (ILO, 2017) wherein 126 million work in hazardous conditions. In Sub-Saharan Africa alone 29% of the labour force sourced from children with ages of 5-14 (ILO, 2000). Persistent poverty and labour intensive nature of the economic activity are the pillar reasons for the child labour prevalence and low schooling (FAO, 2006) in Ethiopia wherein 85% of the population is dwelling in rural areas. Significant proportion of the population in the country is youth even though there is lack of employment opportunities (Guarcello *et al.*, 2006).

In Ethiopia, children below 18 years comprise half of the total population and majority of them engaged in any form of economic activities (Guarcello and Rosati, 2007). Thus, the country can be considered among nations having the highest rates of child labour in the world. One-half of all the 5–14 years children (more than 7.5 million) were at work in the different economic sectors of the country in which agriculture takes the largest proportion (Lorenzo and Furio, 2007). Four out of five economically active children are in agriculture while only 12 and 4% are in services and manufacturing, respectively. About 80% of the rural children (5-14 years) participated in any sort of the economic activities, but only 15% of the urban children. The participation rate of male children exceeds that of female by 20%, although this difference does not take into account domestic chores such as water and fuel wood collection, activities solely performed by female children (Guarcello *et al.*, 2006). Although there is substantial variation with contributions ranging up to 50%, about 4-7% of household income in Ethiopia on average contributed by children (John, 2002). This finding suggests that child labour participation has significant income contribution, which is a striking result against the perception of ‘children's labour has very low importance’. Based on those findings, children with age interval of 6-15 years budgeted 58.9% of the working hours for domestic work and only 18.1% for school.

Moreover, figures reported by most international agencies overlooked domestic chores and work on family farm, which takes a prominent share of child labour in most African countries including Ethiopia. Studies done before had not consistent result wherein some argued that poverty is the main cause of child labour; while others evidenced that greater wealth is the reason behind. Majority of the studies supported the positive relationship between household poverty and child labour implying lower child labour participation for wealthier families. On the other hand, Bhalotra and Heady (2003) using data from Pakistan and Ghana, found that larger poverty does not lead to greater child labour. They proposed an interesting analysis on the mere effects of farm size on child labour, *Wealth Paradox*. The hypothesis argued that children from land rich households frequently found in domestic work than those from land poor ones. Resource rich households may expect lower return from child schooling and might prefer to send their children to work than resource poor ones do. It follows that, if the household own larger cropland and livestock, it would expect lower return from child schooling. Child schooling could be inferior good to them and they might choose child labour as the best venture for the benefit of the household. This argument tells us that it is difficult to conclude a priori whether household wealth has a positive or negative effect on child labour in a particular setting.

Economic activity participation of children rises sharply with age, while 40% of the youngest (5-9 years) involved at their early age (Guarcello *et al.*, 2006). Household demand for labour has been identified as the most important reason for children school dropout in Ethiopia (Takashi, 2000). Children's productivity often constitutes a vital component of household survival and their marginal productivity is about 0.5 -0.67 that of an adult (John, 2002). According to the country's recent child labour survey, 85% of them were found to be engaged in some kind of domestic activities and only 38% were attending school (CSA, 2009). It was also found that more than 40% of the children aged 13-17 years never attend school while 33% combined work and schooling. The labour intensive agricultural economy of the country may be the core reason for the significant child labour participations in Ethiopia (Cockburn and Dostie, 2007; Edmonds and Pavcnik, 2005).

Given this, a better understanding of the nature and trade-off between child labour and schooling in rural Ethiopia is essential to formulate policies aimed at curbing the high incidence of child school dropout. Thus, this study examined the role of household wealth (Cropland and livestock) on child labour participation in domestic work in Eastern Hararghe. Similarly, the study investigated to what extent does household wealth associated with child school enrolment.

2. Methodology

2.1 Data Source and Method of Collection

In most statistics “child labour” is defined as work for wage, but the definition in this study includes domestic work that consists of chores done inside the house as well as works done outside including livestock management, collection of firewood, fodder and others. In this study, a child refers all individuals with age interval of 4-14 years. This age group was based on ILO convention for child labour, which is also ratified by Ethiopian government, states that the minimum age of employment should be 15 years and an individual below this should be a child.

This study used primary data collected from farm households in East Hararghe Zone of Ethiopia. The survey covered a total of 400 households in which only one household rejected in the analysis due to incomplete data. The sample selection was based on stratified method from each sample village to have representative size of households that are randomly drawn. Sample households selected from each stratum were proportional to the relative size. Variability within stratum was considered while determining how many households to be included in the sample.

Well-structured questionnaires and interviews were used to collect data from sampled households. During the survey, data on child characteristics (age, sex and biologically relationship with the household head); household characteristics including (assets and wealth, family size and composition, nature and status of employment, educational level, monthly expenditure, access to credit) were collected. Additionally, community level data about access to electricity and piped water, and distance from primary school and market were also collected. The amount of time children spent on work for

pay, family farm and domestic activities such as fetching water and firewood, cooking and caring also collected.

Additionally, focus group discussions in each stratum were arranged to collect qualitative data for methodological triangulation. The focus group discussion constituted different stakeholders as a community member, local government officials and NGO representatives. Moreover, key informant interview and discussions were used to substantiate the data collected by all the above methods.

2.2 Method of Data Analysis

The study employed both descriptive and econometric method of data analysis to achieve the predefined objective, effect of household wealth on child labour participation. There was no method of measuring household wealth; rather a proxy variable was used in the econometrics analysis. Charles, (2014) demonstrates that productivity of farm land and quality of house are useful proxies for wealth. Land is the most important store of wealth in agrarian societies (Sonia and Christopher, 2003). In developing country context cropland and amount of livestock owned by the household are the common proxies of wealth (Basu *et al*, 2010; Koissy-Kpein, 2012). Thus, this study considered those proxies in the data analysis.

In calculating the effect of land ownership on child labour, the study used total cropland cultivated, but not the total land owned by the household. Part of the land owned by the household may be rented out and this may not affect the amount of time children spent on farm activities. The amount of livestock converted in Tropical Livestock Units (TLU). Since the household may own different livestock unit such as cattle, shoat, equines, camel and others all of them were converted into TLU using the standardized level for each type.

Previous studies on child labour used a dichotomous dependent variable whether the child participate in certain economic activities or not. Moreover, those studies define child labour as child work for wage only, but this study considered hours of child labour and adopt new definition of child labour to include domestic and farm works. Since these activities consume much of children's time in rural Ethiopia the study take into account in the analysis. The equation modelled child labour as a function of child, household and

community characteristics, wealth and demographic factors (Dawit, 2010; Basu *et al*, 2010).

The Double Hurdle Model

Solomon *et al*, (2010) adopted double hurdle model unlike the typical binary dependent variable models for studying the dichotomous issue of the probability and intensity of adopting a new technology. The model has been widely used in the analysis of labour supply behaviour and commodity demand (Smith, 2003). Double hurdle model is simple generalization of the Tobit model (Cragg, 1971). The model assumes that two hurdles should be passed to report a positive hours of work. The first hurdle relates to the child participation in domestic work, and the second on the level/intensity of work. Zero values may be reported in both decisions. The possibility of zero outcomes in the second hurdle arises from the individuals' deliberate choices or random circumstances.

The model can be written as a participation equation:

$$d_i^* = Z_i \alpha + \varepsilon_i \quad (1)$$

$$d_i = \begin{cases} 1 & \text{if } d_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

Where d_i^* is a latent variable that takes a value of 1 if the parents' reported a positive value on children's hours of work and zero otherwise; Z_i refers vector of regressors; and α is a vector of parameters to be estimated. If the first "hurdle" is crossed, the second hurdle describes the length of hours the child work. Thus, intensity of work for positive outcomes:

$$H_i^* = X_i \beta + \mu_i \quad (3)$$

$$H_i = \begin{cases} H_i^* & \text{if } H_i^* > 0, d_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (4)$$

Where, H_i is children hours of work, X_i is a vector of regressors and β is a vector of parameters that could be estimated. The error terms are assumed to follow a bivariate normal distribution.

$$\begin{pmatrix} \epsilon_i \\ \mu_i \end{pmatrix} \sim N \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & \sigma^2 \end{pmatrix} \right] \quad (5)$$

The log-likelihood function for the double hurdle is given by: (6)

$$\ln L = \sum_{i=0} \ln \left[1 - \Phi \left(\frac{-\alpha_i}{\sigma} \right) \right] + \sum_{i>0} \ln \left[\Phi \left(\frac{\alpha_i}{\sigma} \right) \frac{1}{\sigma} \phi \left(\frac{\mu_i}{\sigma} \right) \right]$$

The first term in equation (6) corresponds to contribution of all the observations with observed zero. In this case, the zero observations are coming not only from participation decision but also from hours of work. The probability in the second term is the product of the conditional probability distribution and density function coming from the censoring rule and observing non-zero values, respectively (Cameron and Trivedi, 2005). In this model, the former denotes probability of participation in domestic work, and the latter indicates the intensity of work, positive hours.

The log-likelihood of the double-hurdle model originally proposed by Cragg (1971) was separable. It was equivalent to a combination of truncated regression and probit model, provided the assumption of independence between the error terms ϵ_i and u_i , stated in equation 5 above. Thus, without loss of information, it is possible to maximize the log likelihood function of the double hurdle model in a two-steps procedure through estimating a probit model on the binary outcome of domestic work participation and thereafter applying a truncated-normal regression on the intensity of participation (McDowell, 2003). The model can also allow correlation between the error terms (ϵ_i and u_i) (Fennema and Sinning, 2007). This time the two decisions (participation and intensity (hours of work)) are estimated simultaneously to account feedback effect from participation to intensity of work and vice versa. It is assumed that ϵ_i and u_i are distributed as a bi-variants normal distribution:

$$\begin{pmatrix} \epsilon_i \\ \mu_i \end{pmatrix} \sim BVN \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{pmatrix} \right] \quad (7)$$

Thus, the log likelihood of the dependent double hurdle model becomes: (8)

$$\ln L = \sum_{i=0} \ln \left[1 - \Phi \left(\frac{-\alpha_i}{\sigma} \right) \right] + \sum_{i>0} \ln \left[\frac{\Phi \left(\frac{\alpha_i}{\sigma} \right) \phi \left(\frac{\mu_i}{\sigma} \right)}{\Phi \left(\frac{\alpha_i}{\sigma} \right)} \right]$$

However, this correlation is often difficult to estimate with precision (Smith, 2003). Smith argues that the dependent double hurdle model contains too little statistical information to support estimation of dependency, even if dependency is truly present. Thus, the assumption of independent errors is commonly utilized in the double-hurdle model. If the error terms ε_i and u_i are independent ($\rho=0$), the independent double hurdle model of Cragg (1971) could be obtained. The Tobit model can be regarded as a nested version of the independent double hurdle model with $(z_i' \alpha) = 1$ in equation (1) above.

The dependent variable is the children participation in domestic work, which is constructed from the sum total of average hour spending of child labour in chores that includes farming, water fetching, firewood collecting, caring of their younger sibling and shepherd. Denoting all explanatory variables as X_i , the following equation specify the model used in the regression.

$$\text{Child Labor} = \beta' X_i + \varepsilon_i \quad (9)$$

3. Results and Discussion

3.1 Descriptive Result

This part of the study describes the detail about households' characteristics included in the survey, their social indicators and variables that examine economic wellbeing.

3.1.1 Socio-economic characteristics of households

The respondents included in the survey had household head with age interval of 18-80 years, in which 85.7% of them were 30 or more. Regarding to the gender base classification 23.56% of the households was female headed. Average family size of the study area was 5.45, which was greater than the national average rural family size (4.9 per household) (CSA, 2008). From the four sampled districts (Kurfa Chelie, Kersa, Fedis and Melka Bello) the first one had the largest family size of 6.17 per household and followed by Melka Bello 5.29 average family size. This statistics is in line with Ethiopian Demography and Health report (2008), which ranks East Hararghe as one of the densely populated areas in the country.

Children (with the age interval of 4 - 14 years) constitute 43.3% of the total family size for households in the study area. As far as educational status is concerned the study area is characterized by large proportion of illiterate household heads. About 97% of the sampled household heads had elementary school or below educational achievement.

Table 1: Education background of the sampled households

Indicator variables	Kurfa Chelie	Kersa	Fedis	Melka Bello	All
Number of illiterate	20.8	17.6	0.00	13.3	13.28
Elementary	71.3	81.4	100	84.8	83.96
Secondary	6.90	0.01	0.00	0.02	2.50
Above secondary	0.01	0.00	0.00	0.00	0.003
Total	100	100	100	100	100

Source: Own Survey, 2015

Table 2 clearly shows that households of the study area had relatively young household head average age of 40 years approximately. Additionally, households of the study area had lower education level, relatively large dependency ratio, which may create difficulty in reducing poverty and child school dropout problem of the study area.

Table 2: Descriptive statistics of potential covariates

Variable description	Mean	Std. Dev.	Min	Max
Child labour (in hours)	4.38	4.4	0	16
Age of household head	39.78	10.76	18	80
Household head education	2.29	2.22	0	13
Cropland owned (in hectare)	0.76	0.63	0.025	4
Hours spend on education per day by child	2.68	2.59	0	10
Livestock (in TLU)	2.60	2.61	0	35.5
Adult family member	2.31	1.44	1	6
Dependent family members	3.15	1.67	0	10

3.1.2 Households' poverty profile

This study used the poverty line estimated by Bogale (2011) for the poverty analysis in the study area. The author estimated that household expenditure on basic needs including food, clothing, education and medical care is 1,468.00Birr per annum per adult equivalent. This threshold level of household expenditure determined by

considering smallholders in the Eastern Hararghe highlands. The study used this threshold level of expenditure because of the fact that it is a better poverty line estimate as compared to the national level since it takes into account the area's special features. After considering this, all the required inflation adjustment has been made using World Bank (2017) inflation for years 2012, 2013, 2014, 2015, and 2016, which were 22.77, 8.08, 7.39, 10.13 and 7.27% per annum, respectively. Accordingly, this study considered 2,471.22 Birr per annum per adult equivalent as a poverty line of expenditure.

Table 3: Households' poverty gap and severity

District	Sample size	Head count ratio (P_0)	Poverty gap index (P_1)	Severity of poverty Index (P_2)
Kurfa Chelie	101	0.079	0.039	0.027
Kersa	102	0.240	0.063	0.033
Fedis	91	0.439	0.098	0.032
Melka Bello	105	0.209	0.123	0.096
Overall	399	0.230	0.081	0.048

Table 3 clearly shows that the overall sample head count ratio of the study area was 0.23, which explains that around 23% of households spent less than what they needed to fulfil their minimum living standard requirement. By decomposing the result into districts Fed is experienced the worst poverty head count score that is 43.9% of the households could not satisfy their minimum living standard requirement, followed by Kersa (24%) and Melka Bello (20.9%).

Moreover, the study estimated the poverty gap index and severity, and those results also reinforce severity of the problem in the study area (Table 3). From the overall sample estimate of poverty gap, on average index 8.1% of the poverty line amount or 200.17Birr is required to take out the poor in the study area above the threshold poverty line. However, poor households from Melka Bello district require more than the average amount to free from the deadlock of poverty. There would be in need of 12.3% of the poverty line (303.96 Birr) on average to break the poverty trap in this district. For the other districts, Fedis, Kersa and Kurfa Chelie, respectively about 9.8% ((242.18Birr), 6.3% (155.69Birr) and 3.9% (96.38Birr) of the minimum expenditure would be required to take the poor out of poverty (Table 3). Though it lacks intuitive appeal World Bank (2005) had similar results about the overall severity of poverty index in eastern Ethiopia.

3.1.3 Households' wealth status

Households of the study area possessed different wealth status and living standard based on the following proxies (Table 4). The livestock holding, measured in terms of Tropical Livestock Unit (TLU), was considered as one proxy variable for wealth of households in the study area, and the wealth varied from 0 to 35.5TLU, which shows that there was huge difference among households. Majority of the households (99%) in the study area possessed livestock of below 10 TLU. The other proxy variable considered for measuring wealth for households in the study area was estimated value of their home wherein the value ranges from 2,000Birr to 200,000Birr and the average value was about 20,307Birr (Table 4).

Table 4: Summary of wealth proxy variables

Variable	Minimum	Maximum	Mean
Livestock (in TLU)	0	35.5	2.60
Land holding (in hectare)	0.25	4	0.76
Value of resident home	2,000Birr	200,000Birr	20,307.52Birr
Value of groundwater well	230Birr	50,000Birr	9,124.41Birr

The study also considered another most important asset as a proxy for wealth that is groundwater, well of borehole. If the household possessed this important asset it can produce the most important cash crop of the area, *Khat*, throughout the year. This asset creates a visible wellbeing difference between those who have it and not. The survey data indicated that about 6% of the sample households possessed this important asset, which demands huge budget up to 50,000 Birr (Table 4). Since population of the area is dense, households had very small plot of land on average 0.76 hectares per household. They tried to compensate the production capacity of the limited plot of land by producing better yielding cash crops, particularly *Khat* and occasionally they practiced intercropping that enable them to produce multiple crops.

3.1.4 Children as a source of family labor

About 86% of the surveyed households had at least one child with age of 4 - 14 years. Those children engaged in various economic activities like farming,

firewood and water fetching, shepherding and taking care of siblings. Only 3.7% of the children engaged fully on their education. This clearly shows that households in the study area like many of the developing world use their children as a source of labour to supplement the adult family labour for activities that require less physical exertion.

Table 5: Average hours spend by child on different activities

Type of Activity	Average hours per day
Education	4.8
Shepherd	3.97
Caring for sibling	3.5
Farming	3.0
Firewood fetching	1.96
Water Fetching	1.42
Other activities	2.5

Source: Own Survey, 2015

Table 5 clearly indicates that children spend their time on various economic activities combined with formal education. From the daily activities education take the lion’s share of children’s time spending followed by the shepherd and taking care of younger siblings. However, the child labour force participation is not even between the poor and non-poor households (Table 6).

Table 6: Child labor allotment by the poor and non-poor households

Activities	Combined	Poor	Non-poor	t-value
Farming	0.66	0.63	0.67	0.22
Water Fetching	0.53	0.35	0.59	2.25**
Firewood fetching	0.63	0.4	0.70	2.36***
Caring for sibling	0.5	0.6	0.12	-0.69
Shepherd	2.06	1.76	2.15	1.42*
Child Labor hour	4.45	3.82	4.65	1.51*

Note: ***, ** and * refers 1%, 5% and 10% level of significance, respectively

There was significant difference on the average child labour participation between the poor and the non-poor households of the study area. The mean difference test clearly showed that children from non-poor households engage more on different activities than the poor ones.

3.2 Double Hurdle Model Estimation Result

The double hurdle model result presented below indicates that the overall F-value calculated is significant at 1% significance level, which indicates that the variables included in the regression have coefficients that are jointly different from zero. Many of the explanatory variables are with the expected sign despite some of them are insignificant in affecting the dependent variable, child labour participation. The study considered cropland as a proxy for household wealth since the crop production is hoe practice smallholders of the area do not need oxen to plough. Thus, livestock are not as such critical like the cropland in the farm practice of the area, which was the base for considering cropland as sole proxy in measuring household wealth in the study area.

Cropland holding has positive and significant effect on intensity of child labour participation in the different domestic activities for their parents in the study area (Tier 2 of Table 7). This implies that children from wealthier households in terms of cropland, which is the main proxy for household wealth, spend more hours on family labour as compared to children from poor households. Children from wealthier households do not have the guarantee to spend more time on their education rather they could be forced to budget more time for domestic activities. Koissy-kpein, (2012) indicated that children of land rich household are more likely to work in family farm compared to children from poor household in Sub Saharan African countries. Households with larger cropland perform better in terms of the welfare indicators. Nkamleu, (2006) has got similar findings about interaction of child labor for work and household's productive cocoa land in Côte d'Ivoire. Bhalotra and Heady (2003), describe the counter-intuitive situation where children in land rich households are more likely to work and less likely to attend school than children from land poor households. Those scholars argued that productive assets such as cropland affect child labour participation in two opposite directions: a negative wealth effect, where large landholdings generate higher income and making easier for household to forgo the income generate by child labor. A positive effect, in the absence of a perfect land and labor market, owner of large cropland who are unable to hire farm labour have an incentive to employ their own children. In this regard child labour could be a substitute for the hired and family labour. These all imply that the cropland holding of the household does not be a guarantee to improve school enrolment of children from smallholders.

Table 7: Double hurdle estimation result (dependent variable, child labour participation)

Dependent variables	Variable description	Coefficient	Z-value	
Child labour participation (Tier 1)	Sex of household head	-2.60	-0.29	
	Age of household head	-5.25	-1.11	
	Household head education	-5.99*	-1.73	
	Cropland owned	-24.64	-1.57	
	Hours for education per day by child	3.89	1.54	
	Livestock in TLU	219.0***	6.13	
	Household's poverty status (Poor was base)	-21.0*	-1.87	
	Adult family member	-1.37	-0.68	
	Location dummy♣	Kurfa Chelie	17.10***	3.13
		Kersa	-22.89	-0.46
		Fedis	5.06	0.37
	Household head age square	0.064	1.02	
	Dependent family members	0.306	0.21	
Constant	102.0	1.15		
Intensity of participation (Tier 2)	Cropland owned	3.76**	2.36	
	Constant	-12.59*	-1.75	
Sigma	Constant	6.46***	4.7	
		Wald χ^2 (13)	58.01	
		Prob > χ^2	0.000	

Note: ***, ** and * refers 1%, 5% and 10% level of significance, respectively

♣ Melka Bello district was the base in constructing dummy variable

The other variable that is a proxy for wealth of the household, livestock measured in terms TLU, affect children participation decision positively and significantly. This result implies that children from households that have larger livestock would have more probability of participating in child labour than the poor ones. The coefficient estimate shows that possession of larger livestock increase the probability of children participation in the labour force. The other dummy variable, which categorizes households into poor and non-poor, also affect child labour participation decision positively. Since the base variable is poor, the negative and significant coefficient indicates that the poor households have lower probability to use labour force. Similarly, location dummy variable have significant effect on child labour participation decision for children from Kurfa Chelie. As it has been discussed above Kurfa Chelie is the best performing district as far as poverty profile measurement is

concerned. In terms of child labour participation Kurfa Chelie has strong and positive probability as compared to the base district, Melka Bello.

One of the household's demographic characteristics, household head years of education level, affect children's child labour participation decision negatively and significantly as to the model result (Table 7). The model result implies that children from households headed by educated individuals had better probability of school enrolment. Shafiq, (2007) had similar findings "*higher parental education is associated with higher schooling and lower child labor participation.*" Children from poor, socio-economically backward households highly participate in child labor (Shafiq, 2007; Subhash, 2011). As it has been expected when the household head has better education or awareness, (s)he will send her/his children to school instead of using them as family labour. The coefficient estimate also provides the same result; the better household head's education the less likely to use the child labour in the domestic activities of the household (Table 7).

4. Conclusions and Recommendations

This study examined interaction of household wealth and child labour participation in Eastern Ethiopia and evaluate "*empirical evidence of the wealth paradox*" considering cross sectional data from randomly selected households at a distant location. The study found that the higher cropland the household owned or the wealthier it is the higher the probability that the child would participate as a family labour. The intensity of labour hour budgeted by children increase with the increment in the cropland of the household. Alternative source of labour should be identified to reduce utilization of child labour by farm households.

Possession of large livestock increases the probability of children to participation in labour force. This relationship shows that possession of larger livestock would not initiate households to send their children to school. Thus, the concerned part should have devotion to create awareness about modern technology adoptions that reduce human labour demand of the household to increase child school enrolment in the study area.

Household heads education level affect child labour participation negatively, which implies that increment in the education positively initiate the household to send their children to school. Thus, to increase child school enrolment and to reduce school dropout, there should be enhancement in the awareness of household heads about benefits of child education.

Generally, it is easy to conclude that the wealthier the household, in terms of cropland holding and livestock, the higher the probability of child labour force participation and the amount of time they spend on domestic activities outside their education. Finally, the study approved that the child labour and household wealth paradox really works for households in eastern Ethiopia.

References

- Basu K., Das S. and Dutta B. (2010). Child labour and household wealth: theory and empirical evidence of an inverted-U. *Journal of Development Economics*, 91(8-14).
- Bhalotra S. and Heady C. (2003). Child Farm Labour: The Wealth Paradox, World Bank economic review, pp. 197-227 Oxford University Press, UK.
- Cameron C. and Trivedi P. (2005). *Micro econometrics - Methods and Applications*, New York: Cambridge University Press.
- Charles D. O., Richard T. and Yaw Osei-B. (2014). Analysis of Rural Household Poverty and Farmers' Decision on Child Labour Nexus Using Multinomial Logit Model. *American Journal of Mathematics and Statistics*, 4(6): 248-253. DOI: 10.5923/j.ajms.20140406.02
- Cragg J. (1971). Some Statistical Models for Limited Dependent Variables with Applications for the Demand for Durable Goods, *Econometrica*, 39(5): 829-44.
- Cockburn J. (2002). Income Contribution of Child Work in Rural Ethiopia. Working Paper 2002-12. Oxford University, Centre for the Study of African Economies, Oxford.
- Dar A., Blunch N., Kim B., and Sasaki M. (2002). Participation of children in schooling and labour activities: A review of empirical studies. Social Protection discussion paper 0221, The World Bank.
- Dawit S. (2010). Determinants of Child Labour versus Schooling in Rural Ethiopia, *European Journal of Social Sciences*, 17(3):414-425.
- Edmonds E. (2007). Child labour. In J. Strauss and T. P. Schultz (eds.): *The Handbook of Development Economics* (Vol. 4), Amsterdam: North Holland.
- FAO. (2006). Meeting charts way forward to eliminate hazardous harm work for children, FAO Newsroom (<http://www.fao.org/newsroom/en/news/2006/1000394/index.html>).
- Fennema J. and Sinning M. (2007). Double-Hurdle Models with Dependent Errors and Heteroscedasticity, Heriot-Watt University and RWI-Essen, Essen.
- Guarcello L. and Rosati F. (2007). Child Labour and Youth Employment: Ethiopia Country Study, SP Discussion Paper NO. 0704, Understanding Children's Work, UNICEF.
- Guarcello L., Lyon S. and Rosati F. C. (2006). The twin challenges of child labour and youth employment in Ethiopia. Understanding Children's work project working paper series. University of Rome: Tor Vergata.

- ILO (International Labour Organisation). (2000). Questionnaire: Survey of Children Working on the Street. St. Petersburg Action Committee on the Elimination of Child Labour. ILO, Geneva.
- ILO (International Labour Organisation). (2017). Causes and Consequences of Child Labour in Ethiopia.
- ILO (International Labour Organisation). (2006). The end of child labour: within reach, International Labour Conference 95th Session (Report 1B, 2006).
- John C. (2002). Income Contributions of Child Work in Rural Ethiopia: CSAE WPS/2002-12
- Koissy-Kpein S. A. (2012). Child labor, schooling and household wealth in African rural area: luxury axiom or wealth paradox. Working Paper No 2012-08. Développement International CEPS/INSTEAD: Luxembourg: www.ceps.lu
- Lorenzo G. and Furio R. (2007). Child Labor and Youth Employment: Ethiopia Country Study: Social Protection Discussion Paper No. 0704: World Bank
- McDowell A. (2003). From the help desk: hurdle models, *The Stata Journal* 3(2):178-184.
- Nkamleu B. G. (2006). Poverty and Child Farm Labor in Africa: Wealth Paradox or Bad Orthodoxy. *African Journal of Economic Policy*.13(1): 1-24.
- Shafiq M. N. (2007). Household schooling and child labor decisions in rural Bangladesh. *Journal of Asian Economics*.18:946-966.
- Smith M. D. (2003). On Dependency in Double-Hurdle Models. *Statistical Papers*, 44(4), pp.581-595.
- Sonia B. and Christopher H. (2003). Child Farm Labor: The Wealth Paradox. *The World Bank Economic Review*, 17(2); 197-227
- Solomon A., Bekele S. and Franklin S. (2010). Does Technology Adoption Promote Commercialization? Evidence from Chickpea Technologies in Ethiopia
- Subhash B. (2011). Socio-Economic and Demographic Impact on Child Labor in India. *Journal of Alternative Perspectives in the Social Sciences*. 3(2); 376-403.
- Takashi Y. (2000). Does Food Aid Reduce Child Farm Labour Supply in Ethiopia? Mimeo, the World Bank.

Informal Land Market in Peri-urban Areas of Jigjiga City, Somali Region

Jemal Yusuf Mahamed⁴

Abstract

The inconsistency of the national land policy with the customary land tenure system, lack of institutional and legal frame work to control informal land market together to the high population immigration has increased the demand for land in the Peri-urban areas of Jigjiga city through the informal land market. This study was aimed at studying the caustic factors, extent of informal land market and identifying the main actors involved in it their role and how it contributes to irregular settlement was the main objective of this study. Descriptive research method was the method applied in this study by taking samples through probabilistic and non-probabilistic sampling technique especially key informants are selected purposively while for household respondents are selected through systematic random sampling technique and using both qualitative and quantitative research method. The finding of this study has indicated informal land market operates in a low risk environment and there are no rules and regulations are applied to control informal land market in those areas. The institutional and land administration capacity of the municipality was also weak. The population in immigration from the surrounding and other areas and lack of provision of housing and land through the formal land delivery system has increased the demand for land in the Peri-urban areas of the city. The major modality of accessing land in the city is through purchase from informal land market. The study concluded high population influx induced with the lack of provision of housing and land, the existing customary land tenure system and the weak institutional and land administration capacity of the municipality as the majors' causes of informal land market in the city. This situation has also aggravated the development of irregular settlements in the Peri-urban areas of the city. The researcher has come in to conclusion individual land owners & buyers, brokers, and government as the major actors involved in the informal land market. Finally the study has forward as the solution, the provision of housing and land for low and middle income groups, Harmonizing the existing customary land tenure system with formal one through the participation tribal and clan leaders and the community and enhancing the institutional and land administration capacity of the municipality through establishing efficient & sustainable land administration in the city.

Key words: *Informal land market, Peri-urban area, irregular settlement customary tenure*

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1. Introduction

Urban land market is inefficient and ineffective in many countries. It is over regulated and enforced some time the ability of land owner or use right holds to engage in land transaction is hugely curtailed by administrative bureaucracies (Zevenbergen et al. 2007). Maintaining efficient land markets requires the state to eliminate barriers to entry, promote competition, and avoid unnecessary regulation that restricts the operation of the market (Harvey and Jowsey, 2004). According to Knight (2010), in nations where one or more customary justice systems exist alongside the formal state justice system, a situation of legal pluralism exists. In the context of legal pluralism, the concurrent existence of two or more parallel, separate legal systems using different rules and legal paradigms to decide land cases may undermine the rule of law, lead to inequity and injustice, and foster land tenure insecurity. In Ethiopian cities the phenomenon of an informal land market is also widespread and contributes to the alarming rate of squatter development, unplanned settlements and the loss of revenue to the municipality (Serbeh-Yiadom, K. et al., 2008). Jig-Jiga city has a population with average family size 6.6 & about 94.84% of the housing units in the city are used for residential purpose and 64.95% of the households in the city live in one or two room which indicates over crowdedness and housing problem in city (WCC, 2007). Due to high urbanization there is high land use change in the last 30 years therefore built up area has increased from 2% in 1985 E.C to 44 % in 2015 E.C while grass & Shrub land has decrease from 74% in 1985 E.C to 14 % in 2015 E.C (Habtamu, A, et al., 2016). Though the above studies has tried to show haw over regulated land administration affect land transaction & how where their legal pluralism lead to inequity and injustice, creates tenure insecurity and how rapid urbanization is changing the land use of the city. They have not tried to show how the customary tenure system is related to informal land market and how this leads to irregular settlement is not well studied. In order to establish sustainable land management & administration functioning land especial for highly urbanizing Jijiga city is very essentially. Whenever there is high population growth the demand for land and the cost of providing infrastructure and service will become high in one hand due to lack of collecting tax and the haphazard growths of the city against zoning & land use plane of the city. Mostly policy and rules come from above and they are

efficient to implement because they are not based on land tenure of the community on the ground. Especially in Somali region land is a communal resource which is highly attached to identity and clan membership therefore rule and regulations coming from above are not implemented much. Though the city have distinct characteristic in relation to land tenure system than other parts of Ethiopia the how the existing traditional land tenure system is affecting the land market and how it function specifically factors aggravating informal land market, actors involved, the degree and extents of the informal land market was not well studied. Understanding this well help policy makers & researcher the ways of harmonizing the traditional land tenure system with the statutory one. Therefore the study was aimed in studying the driving factors, the extent & magnitude of informal land market, the actors involved and their role in the informal land market, & how it can induce irregular settlement in Peri-urban areas of the city was the main targets of this study.

2. Research Methodology

2.1 Description of the Study Area

2.1.1 The Geographical Location of the city.

Jigjiga City was located around 640km to the east of Addis Ababa, and about 105km to the east of the Historical walled city of Harrar near the Ethiopian border with the northern Somalia. Geographically Jigjiga city was found approximately in 9° 20' latitude and 42° 47' longitudes with an average Elevation of 5400ft (WCC, 2007).

2.2 Research Design

The main objective of this study was assessing informal land market in Peri-urban areas of Jigjiga city. Descriptive research method was employed in this study, because this research was intended to observe the extent of informal land market in the city. To achieve the mentioned objectives survey research strategy was employed in this study. Cross-sectional study design was applied because it involves observation of a sample of a population at one point in time. Descriptive research method was applied because the objective of the study was assessing informal land market and describing it. Using 95% confidence interval & through Kothari (2004) Sample size determining

method the researcher obtained 206 household respondents from 900 household residents. Then selected 206 household respondents from list of 900 households in Keble seven & nine proportionally through systematic random sampling method. Survey strategy was employed to get the necessary data from the household respondents. Both qualitative & quantitative data was obtained for this study. Quantitative data was obtained from the household respondents through survey (questioner). Qualitative data was obtained through interview purposively from key informants which are experts, responsible bodies of the municipality, Kebele chairman & other data's from brokers, traditional leaders and individuals who own land was obtained through purposively. In addition to this secondary data was also collected from published researches documents from Somali bureau of finance & economic development. The qualitative type data was analyzed using narrative analysis and quantitative type of data was analyzed using Excel, and GIS. This was later presented in the form of figures charts, tables & Map.

3. Results and Discussion

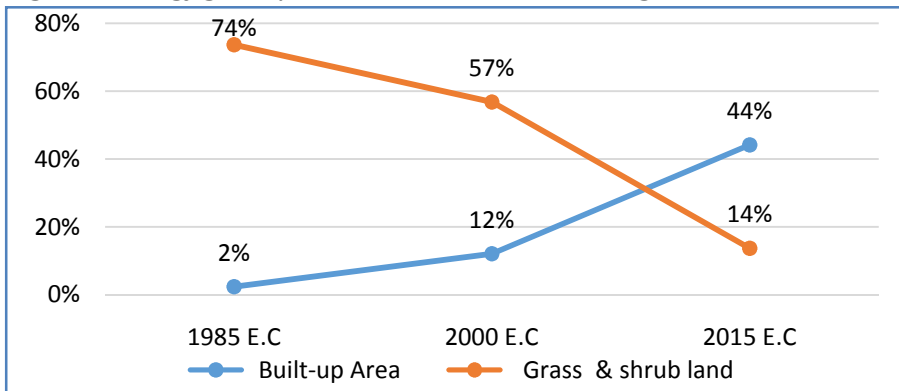
3.1 Causes of Informal Land Market in the City

3.1.1 High population Immigration from the Surrounding and other Areas

According to CSA report 2007 the total population of the city was 125,584 while in 1994 it was 65,795 showing an increase of above 70.8% over the population of 1994. According to the data obtained from field survey by the researcher out of the total 206 household respondents 26 % of the respondents was born in Jigjiga city, while 34 % of the respondents was born in areas around Jigjiga city and the majority of the respondents which are 40 % are borne in other areas. We can realize almost 74 % of the respondents who transact land in the informal land market are people immigrants from the areas around the city and other area. In the other hand, Asit is indicated in Figure 1.2 below this idea is also supported by studies done by researcher from Jigjiga university in 2015 on the cities land cover change which has indicated high land use change in the last 30 years they found that built up area has increased from 2% in 1985 E.C to 44 % in 2015 E.C while grass & Shrub land has decrease from 74% in 1985 E.C to 14 % in 2015 E.C (Weldegebriel M., et al, 2016). This indicates how urbanization in the city is high and how the demand for land has increased in the city. According the data obtained from

land development & management core process owner there was no provision of housing and land by the municipality through the formal land delivery system in addition to this there is no real estate developers who are participating in developing housing in the city. Therefore, high population immigration to the town & lack of deliver of housing by the municipality or real estate developers has induced informal land market because there was no land delivery in the formal system.

Figure 1.1: Jigjiga City land use Land Cover Change



Source: (Weldegebriel M. et al., 2016)

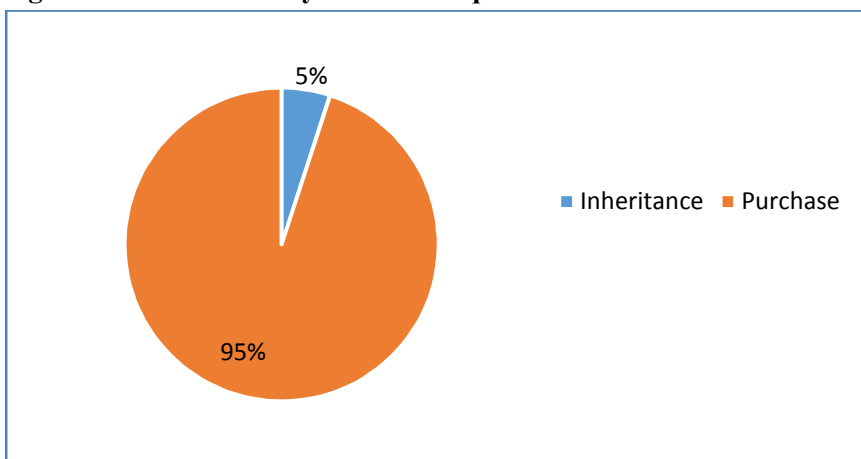
3.1.2 The Existing Customary Land Tenure System

In his survey from household respondents and interview with key informants the researcher has also found the existing land tenure system was one of the major causes of informal land market in the Peri-urban areas of the city. For example, according to the data obtained from the core process owners of Jigjiga city municipality Urban Land Development and Management, the existing land tenure system which was based on tribal interdependency was the major cause of informal land market in the city. He said: “because the attitude of land ownership which was based on communal land ownership under the tribal protection was yet deep rooted within the community surrounding the city. This system aggravates informal land market, firstly because it recognizes individual land ownership of tribe members (as a free hold), secondly it doesn’t restrict individuals to transact their own land to anybody whom they agree with”. In the other hand the tribal leaders have

said: “Most of the restrictions are on communally used pasture land and water points are shared by every members of the tribe”. They further added “Most of lands surrounding the city are dominantly used for agricultural and semi-agricultural land use. Therefore, individual land ownership was highly dominant and this situation gives individuals maximum right on their share of land parcel.” With regard to the role of the tribe in those areas they said “The role of the tribe was to assure the rights of individual tribe members in land ownership was not violated buy any body and to defend their right in case there was threat”.

The data obtained from interview with the individual land owners they said: “neither the government nor the tribe puts restriction when they land transaction in the informal land market”. The researcher has also observed from the field observation individual land owners prepare land parcels of specific size for sale and the deal on the transaction occurs in a transparent environment (on the parcel of the ‘land owner’).

Figure 1.2: The Modality of Land Acquisition



As it was indicated on Figure 1.2, from data obtained from field survey, 95 % of respondents has acquired their land through informal market and 5 % of them through inheritance from family. This shows the main way of land acquisition in the city was through purchase from informal land market from agro-pastoral community surrounding the city, from this we can realize how the land how land delivery through informal land transaction was high.

3.1.3 Availability of Restriction from the Tribe on Informal Land Market

Out of the total 195 respondents 97 % has responded there was “No” restriction and only 3 % of the respondents said there was restriction from the tribe members in the land transaction process. Even if as the general tribe was responsible to protect individuals right on land, individual members of tribe are free to transect their own share of land to any person they wished, this situation leads to low uncertainty in the informal land market. As the result of this situation increase the confidence of the buyer and easy transfer of land from seller to buyer within a short period of time. Therefore, people chose accessing land in through informal land market.

3.1.4 The Level of Uncertainty in the Informal Land Market

When we look the level of certainty of the respondents on informal land transaction process the Field survey has indicated from the total 195 household respondents 88 %of them said they there was “low uncertainty” 6 %of the respondents agree there was “moderate uncertainty” and 1 % agreed there was “high uncertainty” in the informal land transaction process. From this we can generalize that informal land market operates in a low uncertainty environment this situation increases the level of confidence between buyer and seller of land. Therefore, low uncertainty in the informal land market increases the extent of transaction in the informal ways because people feel confidence on the transaction.

3.1.5 Institutional and Land Administration Capacity of the Municipality

According to the data the researcher has obtained through the interview from experts, professionals and responsible bodies in the municipality. The municipality have no modern land registration system all most all documents related to land registration are done on a paper based. There was also weak institutional capacity to control informal land transaction there are no rule and regulations applied in the city due the existing land tenure and the sentiment of “free hold” land ownership at individual level and the tribal system which perceive land as common resource.

There was no policy or regulations applied for provision of housing or land for low and middle income group of the community especially for residential or other purpose. According urban land development and management core process owner of the town the main areas administered by the government are former areas under government administration like military camp, offices, bus stations (relinquished), Kebele rental houses. Those are the main areas delivered for investment and development under the formal land delivery system. He has also said; “the existing land tenure system was the main challenge for proper land administration in the city because the power to deliver land resides in the hand of individuals who own land as ‘free hold’ under the protection of the tribe”. The man power and professional working in urban land development and management department are not satisfactory. For example, it has no individuals who have the necessary skill and knowledge to start effective land administration like professionals who have GIS, Urban Land Development & Management background. According to the data obtained from the municipalities’ human resource department almost all the individual working in the department (urban land development and management) are diploma holders with surveying educational background. This indicates the availability of weak man power and institutional capacity of the municipality. Because establishing good land administration requires educated man power on the subject.

3.1.6 Availability of Restriction by the Government on Informal Land Market

Informal land market operates in low restriction environment from government side. The field survey result has indicated from the total 195 house hold respondents 2 % of them responded there was restriction from government and the majority of them which are 93 %has said there was “No” any restriction they have faced during land transaction process. From this we can generalize how people are free to sale or buy land like other commodity. In other hand out of the total 206 respondents 93 % of them has responded there was “no pressure” from the responsible body to obtain land ownership certificate and only 7 % of the respondents has answered “there was pressure” from the government side so as they obtain land ownership certificate.

3.1.7 Lack of Efficiency in the Provision Process of Land Ownership Certificate

The data obtained from the field survey has shown there was inefficiency in the provision of land ownership certificate by the municipality. For more elaboration the detail has been presented below.

3.1.7.1 The Cost of Obtaining Ownership Certificate from the Municipality

According to the data obtained from Jigjiga city municipality customers who come to obtain land ownership certificate they should pay money based on the type of building they are going to build and the area of land they acquired and based on the land grade of the specific site (the place where the building to be built. For example, if a person needs to have a land ownership certificate for a residential land with a parcel area of 400M² in a land grade of three (LG3) and want to build a house with an area of 3x4m² from wood he should pay 2029 birr. And if a person wants to have a title registration for a commercial site with a parcel area of 250M² in a land grade of two (LG2) and want to build a house with a size of 3x4 m² from brick he should pay 1227 birr. In the other hand out of the total 52 household respondents who have obtained land Ownership Certificate, 15%of them think they have incurred “low” cost to obtain title registration, 33 %think the cost they incurred was “moderate” and 52 %of them think the cost they spent was “high”. From this we can understand the cost of obtaining title registration was felt to be high by the respondents. When there was no pressure from government to obtain ownership certificate and when people think the cost of obtaining was high they develop property on their land without obtaining ownership certificate.

3.1.7.2 The Duration of Time It Take to Obtain Land ownership certificate.

Generally according to the data obtained from the field survey most of the respondents have said the municipality gives land ownership certificate as soon as the applicant applied to get land ownership certificate from the municipality but giving ownership certificate some time begun for a specific time and sometime stop and some time it was based on district, out of the total 206 household respondents only 25 % respondents has obtained land ownership certificate. From the total 52 household respondents who has obtained

land ownership certificate, 19% of the respondents has responded that they have obtained the land ownership certificate in “a short” time or with a less than ten days, 31% of the respondents has responded they have obtained the land ownership certificate in “moderate” time or within a time of 11-20 days, and 50% of the respondents responded that they have obtained land ownership certificate in time longer than a month or in a “long” time . This shows the majority of the respondents feel they have obtained land ownership certificate in long time. When there was inefficiency (relate to cost and time) in the formal system, and there was no restriction or punishment from the responsible body that forces people to acquire land ownership certificate people keep or develop their property without obtaining legal documents.

3.1.8 Efficiency of Land Transaction in the Informal Land Market.

With regard to the duration of time it takes to acquire land through informal land market out of the total 195 household respondents 91%of the respondents has agreed it takes less than a week or “short” time, to purchase land through the informal land market and 9%of the respondent responded it taken up to ten days (medium time) to purchase their parcel through the informal land market. From this we can realize how informal land market operates in a very efficient environment with low uncertainty & poor government control environment.

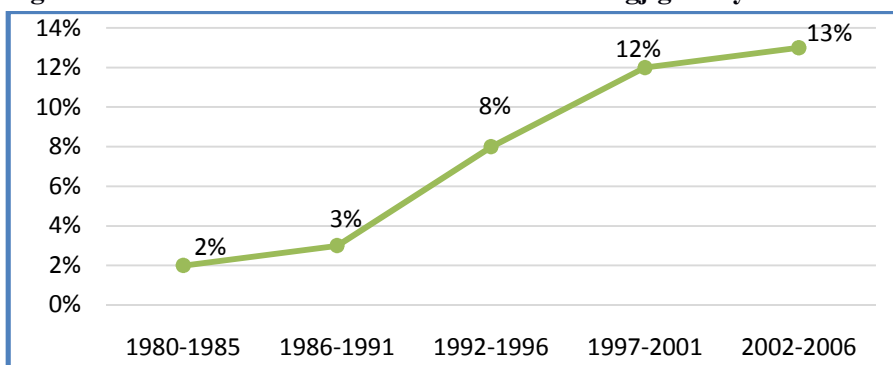
3.2 The Share of Informal Land Market in the Town.

According to the result obtained from the Field survey out the total 206 household respondents 95 % of the respondents have responded they have acquired their land through informal land transaction and only 5 %of them acquired land through inheritance. None of the respondents has acquired their land through allocation from government in the formal land delivery mechanism. In addition to this according to the interview with the core process owners of urban land development and management of the municipality there was no formal mechanism of land and housing delivery for low and middle income groups. He also said; “There are no real-estate developers who participate in providing housing in the town”. Therefore, the major way of land acquisition in the city was through informal land market through purchase from the surrounding agro-pastoralist community.

3.2.1 Trends of Informal Land Market in Town

As we can observe in figure 3.1 presented below, out of the total 195 households who acquired their land through informal land market 6 % of them has bought their land 1980-1985, 7 % of them 1986-1991, 21 % of them 1992-1996, 31 % of the respondents in 1997-2001, and 30 % of the respondents has purchased their land in the year between 2002-2006. With regard to the trends of land transaction in every five year starting from the year 1980-1985 shows 2% increment, from 1986-1991 has showed 3 % increment, from the year 1997-2001 has showed 12 % increment and finally from the year 2002-2006 it has showed 13 %. This indicates how property market with in informal ways has increased through time.

Figure 3.1: Trends of Informal Land market in Jigjiga City



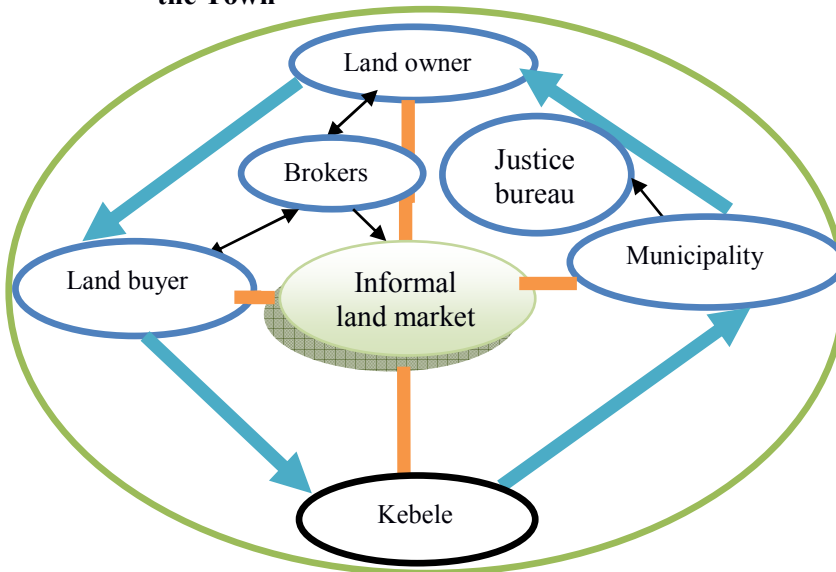
Source: Field Survey, 2014

3.2.2 The Major Actors and their Role in the Informal Land Market

According to the data the researcher has obtained from different stakeholders and field observations he made, different actors participate in every stages of informal land transaction in the city. Among the main actors are Brokers who brings buyer and seller together, individuals land owners who supplies the land market, and the government who accepts (formalizes) informally acquired land and property while not putting restriction on land transaction process are the major actors and driving force of informal land market in city. Absence of formal land delivery together with the participation of those actors in different stages of the market has decreased the uncertainty in the informal land market boosting active informal land market in city.

More than 90% of the city's residents acquired their land through informal land transaction by purchase from agro-pastoralist individuals around the city. In general term land belongs to the tribe which was the protectorate individuals land ownership, while members of tribe have the right to sell their land. Neither the government nor the tribe restricts land transaction between the buyer and the seller. Individual land owners are the main suppliers of land for the informal land market. According to the interview with individual land owners they said: "we sell our land because the town has reached to or agricultural land and they are uncertain about the future whether the government takes our land without fair compensation and, secondly because the land value has increased due to the expansion of the city therefore we sell our agricultural or pasture land in order have enough money to build a standard house, and create other economic opportunity than agriculture". The other reason was after selling the land around the city with high cost so as to buy new land for agricultural purpose as an alternative in a smaller cost" from other areas. Therefore, at current time individual land owners are the major supplier of land for the informal land market in the city.

Figure 3.1: Major Actors in Informal Land Market and How It Functions the Town



Source: Field survey 2014 (own researcher)

According field survey result from the total 205 respondents 83.5% of them acquired their land through brokers as a middle man between the seller and buyer, 10 % of the respondents acquired by direct contact with the seller of the land and 1.5 % of the respondents acquired their land through personal communication. From this we can realize brokers are one of the major stakeholders in informal land market because they participate in accelerating the transaction process. In the other hand from of the total respondents 195 respondents who has acquired land through informal land market 97% of the household respondents has “agreed” that they have “not faced” any restriction from government and only 3% has agreed that there was restriction from government in the transaction process. This indicates how informal land transaction operates in an environment with less restriction and control from government side. According to the data obtained by the researcher the process of land transaction first begun with informal agreement between the buyer and sellers on a paper. After the transaction was made the second step was the buyer requests recognition from the Kebele where he lives. According the interview the researcher has made with the chairman’s of Kebeles they said: “after the individuals (land buyer) request to get recognition from Kebele, committees from the Kebele go to the parcel of land and check the way he has acquired the land, whether it was through purchase or inheritance, by asking the neighbors or elders at the site” they also said “the witness will swear in the name of Allah to confirm that the person owns the parcel of the land” Then committee writes recognition letter to the municipality attaching to the back testimonies (transaction agreement papers etc.). Generally, we can see from this the Kebele was first step to begin acquiring legal documents from the government to the informally acquired (property) land.

The municipality was also one of the actors in the informal land market according to the interview with the core process owners of urban land development and management of the municipality the basic requirement a person need to fulfil in order to get land ownership certificate from the municipality was to bring possession testimonial letters from the Kebele they reside, paying tax based on the type of housing they are going to build and paying of 2% tax out of the total agreed up on cost to transfer from buyer to seller for bureau of justice. He has also added :“there are no rule and regulation that are applied in the city to control informal land market because it was impossible to do so due to the existing land tenure system which let individuals to sale their land easily and develop property on it, in addition to

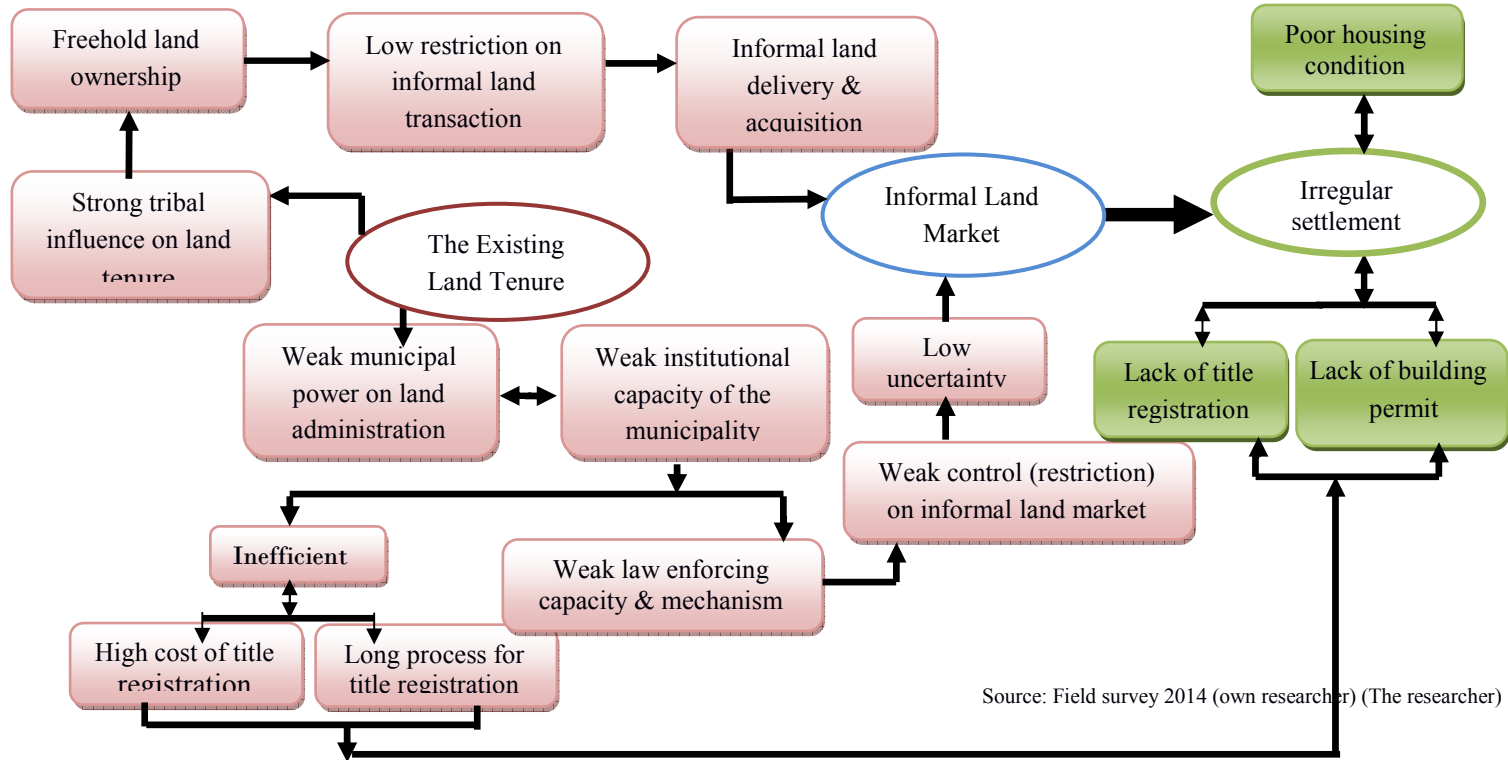
this there are no rule regulation applied to put restriction having informally acquire land without investments” With regard to the major role of the municipality in the land administration of city he said : “Titling (giving ownership certificate) the land or formalizing informally obtained land was the major role of the municipality”.

In addition to this according to the observation and interviews made by the researcher with the municipality experts and professionals. Starting from the year 2004 E.C buyers of land come to the municipality and take individual experts for consultation whether the land going to buy was in conflict (inconvenient) with the land use plan of the city or not. Individual experts from the municipality of the give the service of consultation with 300ETB payment for the service. From this we can generalize at current time the municipality either directly or indirectly participates increasing the level of confidence (decreasing uncertainty) the buyers have in the informal land market.

3.2.1.1 The role of Informal Land Market in inducing of Irregular Settlement.

As it was indicated in the in the Figure 3.1 and according to the data obtained from the field survey and interview by the researcher. Irregular settlements are not the result of a single factor rather they are the outcomes of the problems which are emanating from the existing land tenure system which was dominantly administered by the tribal system, the availability of informal land market which has come in to existence as the result of the exiting land tenure which allow individuals tribe member to transact land in the informal way under the protection of the tribe and the weak institutional and land administration capacity of the municipality. This situation has resulted inefficiency in the formal land administration system. Therefore, due to the existence low uncertainty in the informal land market, long process and high cost of obtaining title registration, weak law enforcement and implementation capacity of the municipality, low restriction on informal land market and built up property, people are going in to the informal land market aggravates irregular settlement in the Peri-urban areas. Generally, the researcher has discussed more by categorizing it in to, the existing land tenure, and modality of land acquisition and weak institutional and land administration capacity of the municipality.

Figure 3.2: Cause and Effect Relationship of the Existing Land Tenure, Informal Land Market and Irregular Settlement



3.2.1.2 The Existing Land Tenure System and Irregular settlement

According to the data obtained by the researcher from interview with the heads of urban master plan, beautification and sanitation core process owner working in of Somali region urban development construction and housing bureau. He said: “as the matter of historical fact the people surrounding the city like other areas of the region has possessed their land through the existing customary land tenure systems which was based on tribal based land ownership, this system allow individual members of the tribe to sell their land through informal land market because the surrounding areas are dominantly occupied by two major tribes which are Bartire and Yabrre this situation give individual from the two tribe to become the major supplier of land for the city through the informal system. The individuals who buy land through this system get their ownership through informal agreement which have low uncertainty in the transaction process. Then people develop property on informally acquired land without obtaining building permit against the land use plane of the city, this situation induces irregular settlement”.

Currently informal land markets are converting the agricultural and pastures land in to a residential & other land uses. Secondary data's, GPS way points taken by engineers' field observation by the researcher has indicated that people are violating the land use of the city because areas planed for recreational and greenery in the land use plan are changed in to residential areas and most of the built up areas in the Peri-urban areas of the city are very deteriorated and with a poor building quality. In addition to this, individual who possess the plot of land allow the poor people (especially daily labors) to live on plot until the owner build a house on it. Those people who reside on the plots as a protector for the site are very poor and have no the economic capacity and the right develop real property on the plot. Therefore, they build deteriorated (low cost) housing aggravating informal settlement and irregular settlements in the Peri-urban areas of the city.

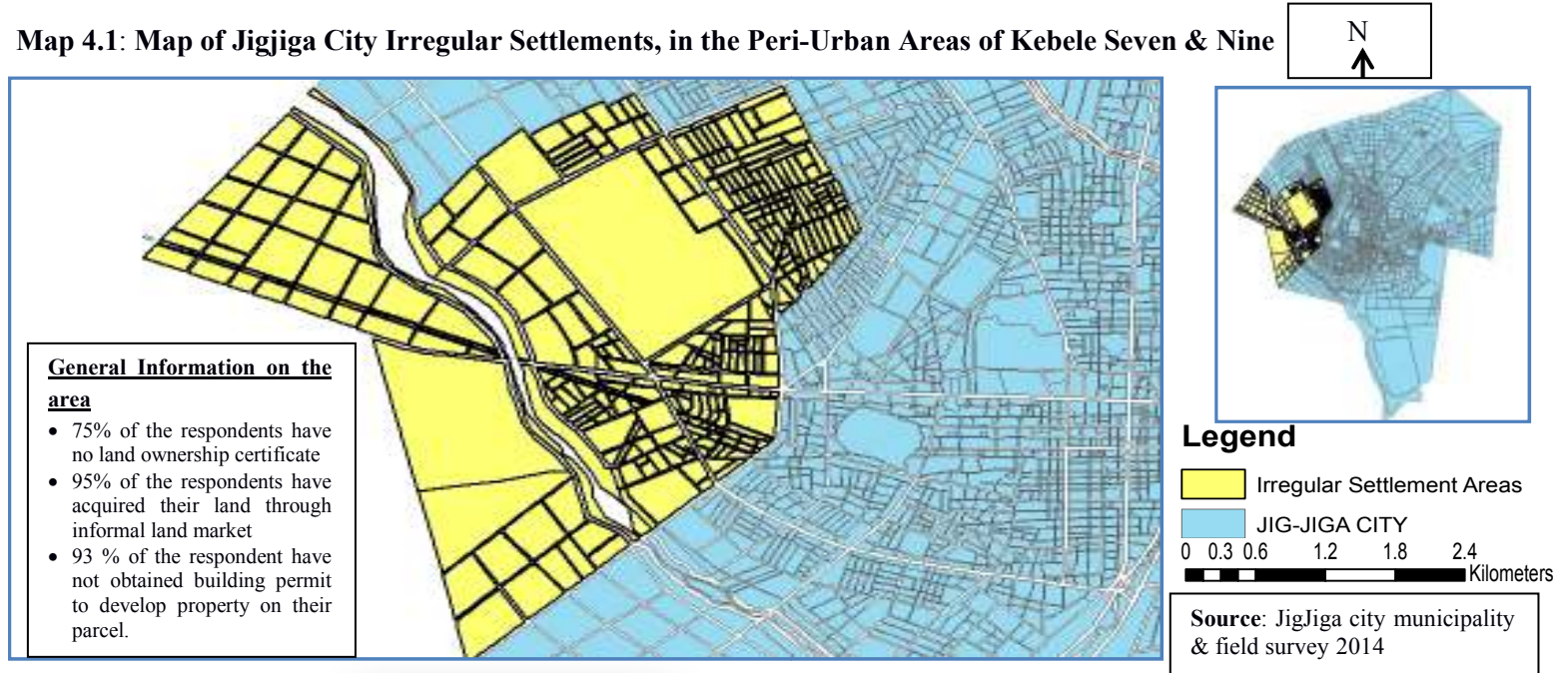
3.2.1.3 Institutional Capacity of the Municipality

The data obtained from the field survey has indicated there was inefficiency in time and cost of obtaining land ownership certificate from the municipality.

out of the total 206 respondents only 52 respondents who has obtained land ownership certificate from the municipality, 15% of the respondents has said the cost and time of obtaining land ownership certificate from the municipality was “low”, 33 % of the respondents has agreed it was moderate and 52 % of them agreed they incurred high cost and long time to obtain land ownership certificate from the municipality. In the other hand out of the total 154 respondents who did not obtained land ownership certificate 95% of the respondents agreed they are not obtained land ownership certificate due to the high cost and the long process it take to obtain land ownership certificate from the municipality and only 5% of them agreed they are not acquiring land ownership certificate because the land use plan in their area has not yet divided to specific land use. in addition to this with regard to the availability of pressure from the municipality out of the total 206 respondents 92.7% of the respondents has said there was no any pressure from government side forces them to obtain land ownership certificate at the current time and only 7.3% of the respondents has agreed there was pressure from government side forces them to obtain land ownership certificate currently. out of the total 206 household respondents 75% of the respondent agreed they “did not obtained” land ownership certificate and 25% agreed they have “obtained” land ownership certificate for their land at the current time this indicates most of the people have no land ownership certificate. In the other hand out of the total 206 households’ respondents 93% of them agreed they “did not” obtain building permit before they build their house and only 7% of them agreed they have obtained building permit before building their house. From this we can understand low level of restriction on property development in informally accessed land. Therefore, if there was low restriction on property development in informally accessed land people keep on buying land through informal land market & develop property on it without having legal permission this can aggravate irregular settlement which are against the land use and zoning plans of the city. Therefore, if there was inefficiency in the formal system people tend to acquire land through informal land market and develop properties through “illegal” means without obtaining building permit and land ownership certificate from the municipality this situation results irregular settlement in the city

The data obtained from the field survey and interview with key informant has indicated there was weak institutional and land administration capacity of the municipality to control informal land market and enforce law and policies due to the existing land tenure system in the Peri-urban areas of the city. As the result of this irregular settlements which are built without obtaining building permit and land ownership certificate are developing in the city. According the data obtained from the core process owner of urban land development and management of Jigjiga city municipality informal land market was aggravating irregular settlement in the city because there are no rule and regulations and enforcement mechanisms to informal land market and irregular settlements due to the existing customary land tenure systems which gives greater power of land administration as a general to the tribe and specifically to individual member of the tribe. This idea was also shared by head urban Master plan, city beautification and sanitation which have said: “weak institutional and land administration capacity of the municipality lack of effective legal framework and regulations to control informal land market and lack of enough professional and skillful manpower who can harmonize the existing dual land administration (the traditional & statutory). This situation has aggravated both informal land market and irregular settlement in the Peri-urban areas of the city.” He has also said: “weak institutional and land administration capacity of the municipality has induced informal land market in the city. Due to the existing poor restriction in the system has let individuals to freely construct illegal property on legal property, without obtaining land ownership certificate and building permit from the responsible body. This situation has resulted irregular settlement which are incompatible with the zoning and land use plan of the city”

Map 4.1: Map of Jigjiga City Irregular Settlements, in the Peri-Urban Areas of Kebele Seven & Nine



Source: field observation 2014

Note: According to the field observation the researcher has made most of the housing built in those area h in those areas have poor housing conditions or characteristics of informal settlement (slum)

4. Conclusion and Recommendations

4.1 The Causes of informal Land Market in Peri-urban Areas of the City

Population migration from the surrounding and other areas was one of the reasons increased the demand for land (housing) in the informal land market. There was no provision of housing and land by the municipality through the formal land delivery system. Most of the people who get access to land through the informal land market are low and middle income groups of the people. In addition to this there were no real estate developers who are participating in developing housing or other purpose in the city. The existing land tenure which was based on the tribal connection was among the major causes of informal land market in the Peri-urban areas of Jigjiga city Individuals (who are members of the tribe surrounding the city) who own land are the major suppliers of land through informal land market for the Peri-urban areas of the city. There was no restriction from the government or the tribe on informal land transaction tribe. Informal land market operates in a low uncertainty environment and it has efficient transaction process allows the transfer or transaction of property right (land) within a short time. Weak institutional and land administration capacity of the municipality was also one of the major cause informal land market in the Peri-urban areas of the city. There are no rules and regulations are enforced to control informal land market and property development on informally acquired parcels. There was inefficiency in the provision of land ownership certificate by the municipality. Government, individual land owners, land buyers, & brokers, are the major actors participate in the informal land market.

4.2 How Informal Land Market Contribute to Irregular Settlement

The existing land tenure system around the city does not put restriction on individual members of the tribe to transact their land through informal land market. Because individual land owner has the maximum right on their own share of land they own. Neither the government nor tribe restricts land transaction processes in the city. Most of the land parcels was possessed through informal land transaction because it operates in low uncertainty and efficient environment which induce informal land transaction. The weak

institutional and land administration capacity of the municipality was induced by the existing land tenure, there was weak restriction on informal land market and settlements are built without obtaining permit and title registration from the responsible body. In some of the area people who purchase their land through the informal land market allow poor peoples to live on their land. Those poor people builds low cost housings which have attribute of poor quality housing (slum). Informal land market operate in a low uncertainty environment, the traditional land tenure give strong power to administer land for the tribe and individual members of the tribe and the weak institutional and land administration capacity of the municipality has aggravated and created irregular settlements in the Peri-urban areas of the city because there are no rule and regulations are applied to control informal acquisition of land property development on it.

4.3 Recommendations

It was not easy to control the natural process of the population growth which was highly manifested by migration from the surrounding other areas of the region. Therefore in order to cope with the need for housing and land as the result of the population growth of the city there should be the provision of housing and land in the formal land delivery system based on affordable cost for the low and middle income groups of the community. Since the need for house and land cannot be only covered by the government (municipality), the municipality should encourage real estate developers to participate in the provision of housing for the low and middle income groups of the community based on affordable cost. The gap between the formal (lease) tenure system and the customary land tenure should be minimized (harmonized). The implementation of the lease system without the recognition by the surrounding people (which are members of clan around the city) con not be efficient and effective. Therefore, deep research and studies should be done in order to forward the mechanisms of harmonizing the formal and customary land tenure system. Policy, rule and regulations will be applied in those areas should be based on understanding and harmonizing the gap between the two land tenure systems. Effective awareness creation should be done by the responsible bodies and municipality for the tribe and clan leaders and in general to the people around the city. Influential tribe and clan leaders should participate in the establishments of institutional and legal frameworks on how

to use the land for the maximum (higher) benefits of the mass and the future developments of the city in line with the general policy, rule and regulation of the state.

Weak Institutional and land administration capacity of the municipality induced by the existing customary land tenure system was one of the main causes of informal land market in the Peri-urban areas of the city. The institutional and land administration capacity of the municipality should be enhanced through the provision the basic inputs to establish effective and efficient land administration. Policy, rule and regulations to control informal land market and irregular settlements should be enacted based on the harmonization of the customary land tenure system. The effectiveness and or efficiency of the municipality should be enhanced specially in the provision of land ownership certificate for the customers. There should be strong coordination between the municipality, kebeles and the people to control informal land market and irregular settlements. In general, strong attention should be paid by the responsible body for minimizing the gap and harmonizing the formal land tenure system (law, policy, rule and regulations) with the customary one and the institutional and land administration capacity of the municipality should be enhanced through the provision of basic inputs to start effective and efficient land administration system in the city.

As it was already elaborated problem and challenges related to effective and efficient land administration and issues related to informal land market and irregular settlements are not the results of simple mathematical calculation rather it was the aggregates results of forces (challenges) emanate from the long historic, deep rooted customary land tenure system of the Somali community. Therefore, in order to understand how those (the customary tenure) system work and to understand its social, environmental economic and political implication and other related was sues, deep investigation and researches should be done by researchers. Both formal and informal land market and land acquisitions modalities have their own advantage and disadvantages which needs to be meticulously studied. This research has its own limitation of time and money for in-depth study of the issue from multifaceted angles. Therefore it should be good if other researcher or interested groups study it deeply by increasing the population and sample size from multidimensional perspectives.

References

- Adams, J. and. (n.d). Urban myth vs economic explanation: an empirical analysis of land purchasing decisions in Accra. Retrieved from world Review of Science, Technology and
- Agrawal, B. (2003). Gender and land right revisited: Exploring New Perspective Via the state, Family and market. *Journal of Agrarian change*, 3(1-2), 184-224.
- Dale, P., Mahoney, R., & McLaren, R. (2006). Land markets and the modern economy. London, UK: Royal Institution of Chartered Surveyors (RICS).
- Dessalegn Rahmato. (2004). Searching for Tenure Security? The Land System and New Policy Initiatives in Ethiopia, FFS Discussion Paper No. 12, Addis Ababa: Forum for Social Studies.
- Devile, P. (1999). Harmonizing formal law and customary land right in French-speaking West Africa: International institute for Environment and Development (iid) wassue paper, 86.
- Dowall, D. E., & Clark, G. (1996). A framework for reforming urban land policies in developing countries: Washington, DC: World Bank.
- Ethiopia; 1st year, No.1 August 1995, Addis Ababa, Ethiopia.
- Farvcque-Vitkovi, C., Farvacque, C., & McAuslan, P. (1992). Reforming Urban Land policies and Institutions in Developing Countries: Washington, D.C: World Bank.
- Federal Democratic Republic of Ethiopia Government. (2002). Re-Enactment of Urban Lands Lease Holding Proclamation No. 272/2002: Federal Negarit Gazeta, Ethiopia, Addis Ababa.
- Federal Negarit Gazeta, The Constitution of the Federal Democratic Republic of Ethiopia.
- Freire, M., Ferguson, B. W., Lima R., Cira, D., & Kessides, C., (2007). The World Bank's 2005 International urban research symposium. GUD Magazine, 3.
- Harvey, J., and Jowsey, E. (2004). *Urban land Economics*. 6th ed. Hounds mills, Basingstoke: Palgrave MacMillan. Original edition, 1981.
- Kihato, C. W. (2010). Urban Land Markets: Economic concepts and tools for engaging in Africa. Nairobi
- Kironde J. M. L. (2000). Understanding Land Markets in African Urban Areas: the Case of Dar es Salaam, Tanzania Habitat International Vol. 24 pp. 151-165.
- Knight, R. S. (2010). Statutory recognition of customary land rights in Africa. Rome.
- Kombe W. J. (2000). Regularising Housing Land Development during the Transition to Market-led Supply in Tanzania Habitat International Vol. 24 No. 2 pp. 167-184.

- Kothari, C. R. (2004). *Research Methodology*. Method and techniques, 2nd Revised, ed.
- Lwasa, S. (2006). *Informal Land Markets and Residential Housing Development in Kampala: Process and Implications to Planning*. Makerere University; Unpublished PhD Thesis.
- Niguse, H. (2013). *Land Tenure and Tenure Security Among Somali Pastoralists*. Jig-jiga: Jigjiga University
- Rakodi C. and Leduka C. (2003). *Informal Land Delivery Processes and Access to Land for the Poor in Six African Cities: Towards a Conceptual Framework Working Paper 1* University of Birmingham.
- Serbeh-Yiadm, K. et al., (2008). *Land administration: law Policy, Practice in Managing Ethiopian Cities in an Era of Rapid Urbanization*, M .P. Van Dijik and J. Fransen (eds), HIS, Rotterdam.
- Sivam, A. (2002). Constraints affecting the efficiency of urban residential land market in developing countries: A case study of India. *Habitat international*, 26(4), 523-537.
- SRBoFED. (2012). *Plan For Enhanced Pastoralist and agro- pastoralist Livelihood and Revising Poverty: five year developpement plan 2003-2007EFY*, Jig-jiga, Ethiopia.
- Wadani Consaltant Company. (2007). *Jig-jiga master plan Revision & expansion plan*.
- Weldegebriel Mebrahtu Gebregergis et al.: Dynamics of Land Use Land Cover Change and Urbanization in Jigjiga Town, Ethiopian Somali Regional State, Eastern Ethiopia, *Geophysical Research*, 2016, 6(6): 127-135 DOI: 10.5923/j.re.20160606.05
- Zevenbergen, J., Frank, A., & Stubkaer, E. (2007). *Realm Property Transaction: Procedures, transaction costs and models*. Amsterdam, The Netherlands: IOS press BV.

Impacts of Land Use/ Land Cover Change on Forest Cover and its Implications for Degradation of Native Trees in Goro Gutu Woreda, East Hararghe, Oromia Regional State, Ethiopia

Oluma Chimdesa Serbesa¹

Abstract

Land use /land cover change affected forest resources. This study was aimed to understand the impact of land use /land cover change on forest cover in the study area. The study used remote sensing, questionnaire, survey and other qualitative data. The mixed concurrent triangulation research design was employed. Multistage sampling technique was used to select 371 sample household heads. Descriptive statistical analysis and thematic narration were used for data analysis. The result indicated that strong land use/land cover change that intensified over the decades has been threatened the forest ecosystem. The forest land decline from 27.65% in 1984 to 7.20% in 2016 and bare land increase from 0.82% in 1984 to 10.58% in 2016. The major causes of deforestation were high demands of wood for house construction, fuel wood, weak forest institution and regulations, economic and other biophysical and socio-economic factors. The effects of deforestation are acute shortage of fuel wood, shortage of house construction materials, soil erosion, climate change, degradation of native tree species and other forest ecosystem.

Key words: afforestation, deforestation, forest conservation, landuse/landcover change

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1. Introduction

1.1 Background of the Study

Land degradation is the result of complex inter-relationships between biophysical and socio-economic issues which affect many people and their land, especially in developing countries. Land degradation is described in terms of the loss in natural resources like soil, water, fauna and flora (Food and Agricultural Organization /FAO, 2007).

Land use is the intended employment and management strategy placed on the land covered by human agents. Also it is land management to exploit the land cover and reflects human activities such as industrial zones, residential zones, agricultural fields, grazing, logging and mining (Zubair, 2006). Land cover is the attributes of the earth's land surface captured in the distribution of vegetation, water, desert and ice and the immediate subsurface, including biotic, soil, topography, surface and groundwater. Also includes those structures created solely by human activities such as mine exposures and settlement (Lambin et al., 2003).

Land use/ land cover plays an important role in global environmental and climate change. It has effects on structure and function of ecosystem, species and genetic diversity, water and energy balance and agro-ecological potential (Codjoe, 2007). Land use change is any physical, biological or chemical change attributable to management. It includes conversion of grazing to cropping, change in fertilizer use, drainage improvements, installation and use of irrigation. Land use change is also plantations, building farm dams, pollution and land degradation, vegetation removal, spread of weeds and exotic species and conversion to non-agricultural uses (Quentin et al., 2006).

Forest serves human beings in provision of materials for construction, furniture, poles, firewood, shelter for wildlife and environmental amelioration are the most prominent. The global forest cover in 2001 was 4 billion hectares, which was 31% of total land area of the world. The five most forest rich countries (Russia, Brazil, Canada, the United States of America and China) account for more than half of the total forest area (FAO, 2010). Ten countries have no forest at all and 54 countries have forest less than 10 percent

of their total land area. Due to conversion of tropical forests area to agricultural land and other economic uses there are signs of decreasing of forest coverage in several countries (WB, 2010). Ethiopia is one of the most important centers of biodiversity in tropical Africa (Eshetu, 2002). However, these large biodiversity resources are under continuous and severe threats of destruction.

1.2 Statement of the Problem

Ecosystems are not static. It exposed to certain natural and human induced disturbance of niches' regeneration and development. In consequence, disturbances affect the distribution, structure, composition, diversity and functioning of forest ecosystem (Jentsch et al., 2002).

In Ethiopia, the destruction of forests has been most drastic in the past 100 years. In the beginning of 1900, it was estimated that about 30 to 40 percent (110 million hectares) of Ethiopia's landmass were covered with high forests. By the early 1950s, the coverage of high forests was reduced to 16 percent of the total land area (FAO, 2010). It was reported that the forest cover was 3.6 percent in the early 1980s and about 2.7 to 3 percent by 1990s (Kittessa, 2010). The annual loss of natural forest cover has been estimated to be 150,000 to 200,000 hectares.

However, the Ministry of Agriculture and Rural Development, was confirmed that the forest coverage of Ethiopia has increased from 3 percent in 2000 to 9 percent during 2010 due to the afforestation campaign launched over the country in the last ten years (but this data could not be validated with published government sources). The recent data on forest resources puts Ethiopia among countries with forest cover from 10% to 30% (FAO, 2010).

Increasing in number of farming communities and livestock populations created pressure on nearby natural resources such as soils, natural forests, bush and shrub lands, wetlands, virgin and marginal lands, water resources, biodiversity resource and other elements of ecosystem. Some studies indicated that soil erosion and deforestation are two the most environmental problems in Ethiopia. Unsustainable land use in rural area combined with urban demand

for fuel wood, home construction, furniture and climatic change contributed to forest degradation. It leads to soil erosion, land degradation, losses of some tree species and animals then ultimately to desertification and environmental degradation. So large number of tree species assessed as critically endangered on red list and urgently need conservation action (Vivero et al., 2005).

There is massive habitat degradation accompanied by large degradation of genetic resources in Ethiopia (Mulugeta and Demel, 2006). East Hararghe Zone is generally affected by severe forest degradation problems and the study area also faces similar problems. There was no more researches conducted on land use land cover changes and related impacts on forest ecosystem in Goro Gutu Woreda. In this regard, one of the main purposes of this study was to understand major shifts in land use/ land cover and related impacts on forest ecosystems especially degradation of native trees in Goro Gutu woreda, East Hararghe zone, Oromiya regional state, Ethiopia.

1.3 Objectives of the Study

The general objective of the study was to understand impacts of Land-use/ Land-Cover change, causes and its implications for degradation of native trees in the Goro Gutu woreda of East Hararghe.

The Specific objectives of the study were to:

- Identify land use/ land cover change between the period 1984 and 2016
- Assesses the causes of forest cover change
- Investigate the implication of land use/ land cover changes for degradation of native trees

1.4 Research Questions

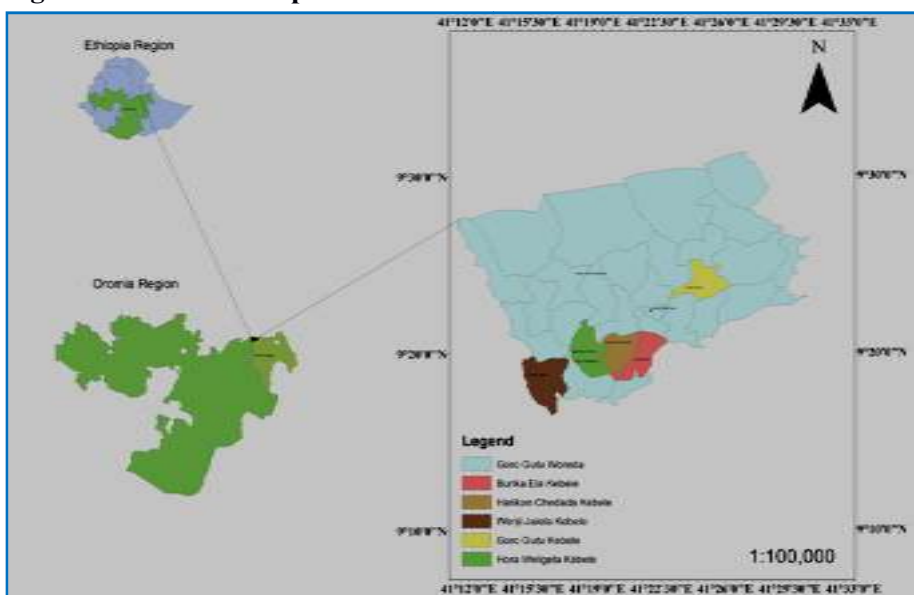
1. What were the land use/ land cover change between the period 1984 and 2016?
2. What were the causes of forest cover change?
3. What were the implications of land use/ land cover changes for degradation of native trees?

2. Materials and Methods

2.1 Description of Study Area

The study was conducted in Goro Gutu woreda which is located in East Hararghe Zone of Oromia region. Astronomically, the Woreda is located between 90° 20' 00" N to 90° 30' 00" N latitude and 41° 20' 00" E to 41° 30' 00" E longitude. The woreda shares its boundaries with Meta woreda in the East, Deder woredas in the South, West Hararghe Zone in the West and Ethio-Somali in the North (Goro Gutu Woreda Agricultural and Rural Development Office/GGWARDO, 2015).

Figure: 1. Location map of Goro Gutu Woreda



Sources: Ethio-GIS, 2014

Goro Gutu woreda composed of different land forms such as medium mountains, hills, plateaus and small valleys. Obbi, Gola, Ela, Harkoncha and Goro Gutu are major mountains and several hills indicate that more than 80% of the woreda have mountainous land forms. Generally, the woreda lies within altitudinal range of 1500 to 2650m amsl.

Goro Gutu woreda has annual temperature with range (10°C to 24°C) and annual rainfall ranging from 300mm to 400mm per year. The major rainy seasons in the woreda include spring (March to April) and summer (from mid June to mid September) (GGARDO, 2015).

According to the 2007 Population and Housing Census report, the total populations of Goro Gutu Woreda were 143,931 and estimation of Central Statics Agency in 2016 indicated 175,501 populations. The household heads in the woreda were about 28,716, this make an average family size were 6 persons. The Woreda characterized by rapid population growth, with annual growth rate of 2.6% (CSA, 2005).

The forest land makes up 10.4% (5540 ha) of the total area of Goro Gutu woreda. The majority of the population in the rural areas depends on mixed farming means livestock husbandry and crop production simultaneously.

Table.1. Land use/ land cover types of Goro Gutu Woreda

Land Use Types	Area in (ha)	Percentage (%)
Farm land	21092	39.7
Degraded bare land	8802	16.6
Common land	8512	16
Forest	5540	10.4
Other purpose	5472	10.3
Bush and valley	3665	6.9
Grazing land	40	0.08
Total	53123	100

Source: Extracted from GGWADO, 2015

2.2 Research Design

The mixed concurrent triangulation research design was employed in the study. Both qualitative and quantitative methods used in an attempt to confirm cross-validate or corroborate findings within a single study. The approach identified for its use of one data collection phase, which both quantitative and qualitative data were collected simultaneously in a shorter data collection period (Creswell and Plano, 2007).

2.3 Data Sources

The investigator used both primary and secondary data sources. The primary data were collected by questionnaires, focus group discussion, key informant interview and personal observation. On the other hand the major secondary sources were gathered from books, periodicals and seminar paper, research reports, project and official reports from the woreda's agricultural and development office and satellite photograph.

2.3.1 Satellite data

2.3.1.1 Satellite data sources

For satellite image, the past 32 years data those related to forest status were assessed. The imageries were projected to a World Geodetic System (WGS) 1984 and Universal Transverse Mercator (UTM) Zone 37 North coordinate system. Since the collected multi-temporal satellite imageries cover large area with a sensor spatial resolution of 30 meter; the kebeles shape file has been used to subset spatial extent covering the study area.

Table.2. Description of Landsat satellite imageries used for data collection

Satellite	Sensors	Date	Path/Raw	Resolution	Cloud	Sources	Application
Landsat4	TM	1984-10-07	167/53	30m	0.00		
Landsat5	TM	2000-01-27	167/53	30m	0.00	USGS	LULCC
Landsat8	OLI/TIRS	2016-03-14	167/53	30m	0.01		

The images were acquired from the period January to March, during a clear sky season in the region to reducing atmospheric and radiometric problems. Images were composed in different ways in order to identify surface features in the study area.

2.3.1.2 Resolution

Image with 30m resolution was used to support land use/land cover classification. These data were taken on the basis of 16 years interval.

2.3.1.3 Classification

There were five land use land cover types (bare, cultivated, forest, settlement and shrub land) were assessed. The land use land covers classes and their descriptions were based on the criteria of FAO 2000. The confusion minimized by identifying chat plant from forest, isolated remained forest and other land use/ land cover category were supported by field observations. This relative change in land use land cover was conducted by comparing the area of each land cover class of 1984 from 2000, 2000 from 2016 and 1984 from 2016. The image difference shows the change of the total area in each class between the study years interval. The analyzed data were presented through table, figure, chart, map and narrative using words. Finally the result of the analysis and interpretation of the data were discussed and summarized to forward recommendation on the basis of findings.

Table 3: Land use land covers classes and their description

LULC classes	Description
Bare land	Degraded uncultivated land, rocky, fragile, gully and others which are not used for cultivation and grazing
Cultivated land	Agricultural cropped plain, hill side, mountain areas which are under farm land, standing crops and harvested crops.
Forest land	Standing crown native and exotic plants and harvested trees
Settlement	Buildings, different house levels, paved roads
Shrub land	Land that cover with short height trees like bushes, grasses, herbs, scrubs (shrubs) which are scattered.

Source: FAO, 2000

2.3.1.4 Accuracy assessment

The accuracy assessment was conducted for each classification result. Thus, agreement and disagreement of the analysis were evaluated by using user's accuracy, overall accuracy and Kappa coefficient results.

2.4 Sample Size and Sampling Technique

The investigator used the formula for the marginal error to determine how large the samples were needed to attain desired degree of precision. The

confidence level 95% and 5% precision level were used as criteria. To determine and calculate the sample size indicated below and present in table 4. The sample size was drawn from Yemane (1967) cited in Israel (2012) formula:

$$n = \frac{N}{1 + Ne^2};$$

Where: n- Desired sample size

N- Target population of the study= 5,240

e- Margin of error= 0.05

$$n = \frac{5240}{1 + 5240(0.05)^2} = 371 \text{ HHH's were the sample size}$$

Table: 4: Sample size distribution

No.	Sample Kebeles	Total Number of HHH's	Number of SHHH's Respondents	Percentage (%)	Sampling Method
1.	Burka Ela	983	70	7.08	Multistage sampling
2	Harkoncha Dada	1121	79	7.08	Multistage sampling
3	Warji Jalala	1372	97	7.08	Multistage sampling
4	Goro Gutu	588	42	7.08	Multistage sampling
5	Hora Waligala	1176	83	7.08	Multistage sampling
	Total	5,240	371	7.08	

The sample household heads from each kebeles were selected by multistage sampling method. Household heads divided in to a number of homogeneous groups' strata on the bases of certain characteristics of the households head. Sex of household head, age, family income, education or any other available information used based on pre-documented information about each household head from each kebeles. Then the required sizes of sample household heads were selected randomly from each homogeneous group (stratum) and

distributed questionnaire. The purpose was to include sample household heads from different socio-economic characteristics.

2.5 Instruments of Data Collection for Primary Data

Questionnaires were used as a primary instrument to collect primary data from the selected sample household heads of five kebeles. Also key informant interview, Focus Group Discussion (FGD) and field observation were used.

2.6 Method of Data Analysis

Quantitative data obtained from the questionnaires were analyzed using descriptive statistical tools by percentage and frequencies using the Statistical Package for Social Science (SPSS) version 20. The qualitative data those collected through open ended questions, interviews, FGD, documents and field observation analysis were directly used qualitative approach which narrative using words.

Satellite image on land use/ land cover change analysis computed using ERDAS (Earth Resource Data Analysis) imagine software. The main methods of data analysis were adopted in this study were by calculation of the area in hectare and percent of the land use/ land cover types for each study year and subsequently comparing the results. There was also used GIS to compliment the display and processing of the data and used for change detection analysis of the study area. Also Microsoft excel 2010 was used to calculate rate of land use/ land cover change.

3. Results and Discussion

3.1 Land Use /Land Cover Change between the Periods of 1984 to 2016

According to satellite images of 1984, 2000 and 2016, the forest coverage of the Goro Gutu woreda highly decline from time to time. Recently data in 2000 and 2016 indicated that the forest coverage in the woreda shrink rapidly. The coverage of forest land in all five sample kebeles was decreased and other land use /land cover types change observed. There were clearly indicated that there were forest cover changes within past 32 years. Also field observation

shows that the native trees in natural forest were highly threatened and there were high dominance of exotic tree species. The isolated forest remains limited to high altitudes.

3.1.1 Classification procedures

The unsupervised classification approach based on the maximum likelihood classification was employed to classify 1984, 2000 and 2016 images separately. The classification keys used for satellite images were applied to extract different land use/ land cover images.

3.1.2 Accuracy assessment

The three statistics (user’s accuracy, producer’s accuracy and overall accuracy) were reported in the study to validate the accuracy of the classification. The accuracy report of Kappa Statistics shows that about 86% of the image classified as correct and accurate.

Table 5: The average overall producer’s and user’s accuracy assessments of land use/land cover classification

Kebeles	Years					
	1984		2000		2016	
	Overall accuracy (%)	Kappan (K [^]) statistics	Overall accuracy (%)	Kappan (K [^]) statistics	Overall accurac y (%)	Kappan (K [^]) statistics
Werji Jalala	83.78	0.79	92.64	0.91	98.80	0.97
Hora Waligela	95.33	0.93	96.88	0.95	85.67	0.82
Harkoncha Dada	95.33	0.93	97.66	0.96	96.09	0.93
Burka Ela	95.33	0.93	97.66	0.96	96.48	0.94
Goro Gutu	92.68	0.91	96.43	0.95	87.27	0.84

3.1.3 Land use land cover change trend

In the study area, rapid land use /land cover change observed over the last 32 years. The findings specify transition of land use /land cover types based on the change detection. The rate of transformation differs for the reference periods. The first reference period (1984 to 2000) shows that cultivated land

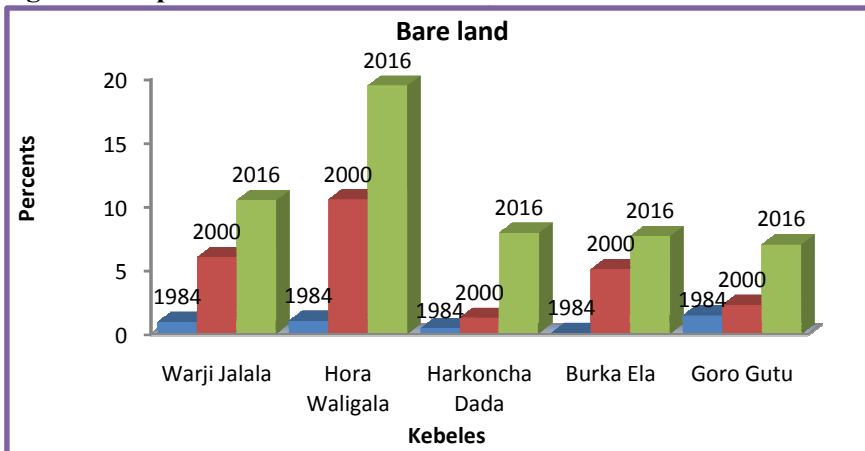
slight decline and forest land highly decreases. But highly increase bare land, settlements and shrub land.

Table 6: LULC change of five kebeles in Goro Gutu woreda from 1984 to 2016

LULC	1984		2000		2016		Net change
	Ha	%	Ha	%	Ha	%	
	Bare land	11.72	0.82	74.66	5.07	150.61	
Cultivated land	398.92	27.88	508.55	34.84	504.09	34.53	Slight loss
Forest land	356.72	27.65	126.60	8.38	89.68	7.20	Loss
Settlement	2.77	0.19	31.08	2.37	62.68	4.70	Gain
Shrub	505.00	43.43	635.52	47.67	568.26	42.84	Loss

The second period (2000 to 2016) characterized by rapid expansion of bare land and settlements, where as cultivation land nearly constant. Settlement and bare land gained from grassland and forest land. Such conversions from forest and shrub land to bare land and settlement have profound impacts on ecosystems.

Figure 2: Expansion of bare land



Bare land

In all sample kebeles (Goro Gutu, Werji Jalala, Hora Waligala, Burka Ela and Harkoncha Dada) bare land increased during 1984 to 2000 and 2000 to 2016. Intensive deforestation, habitat simplification and narrowing of certain cover types also observed. Field observation, interview and focus group discussion indicate sign of decline on native trees species.

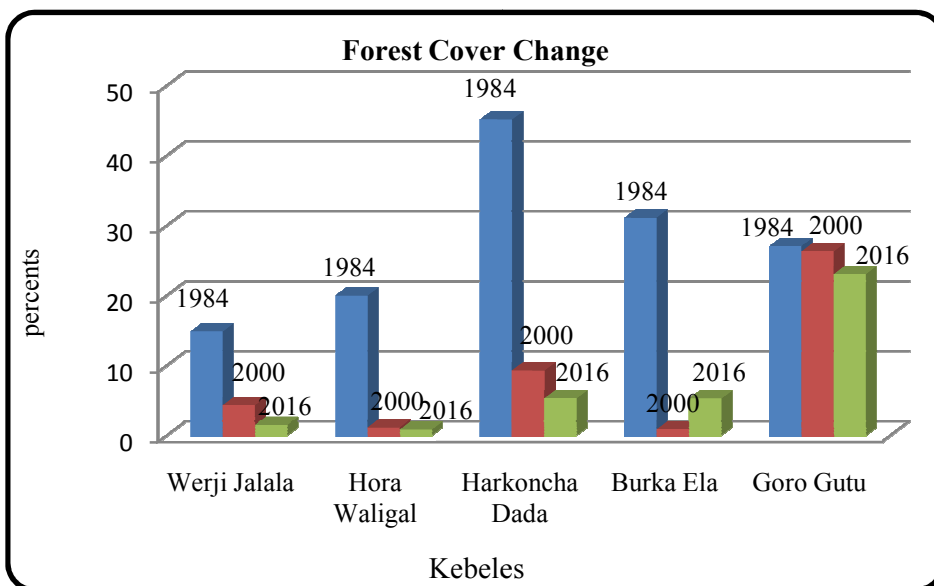
Cultivated

In Goro Gutu kebele cultivated land declined from 1984 to 2000 and Hora Waligala kebeles declined during 1984 to 2000 and 2000 to 2016. Also in Harkoncha Dada it declined from 2000 to 2016. In the course from 1984 to 2016 it decreased in Goro Gutu and Horo Waligala kebeles.

Forest land

In all sample kebeles (Goro Gutu, Werji Jalala, Hora Waligala, Burka Ela and Harkoncha Dada) forest land continuously declined during 1984 to 2000 and 2000 to 2016. Figure 4 indicates that the forest cover change in five study Kebeles during past three decades.

Figure 3: Forest land cover change from 1984 to 2016 in the study area



Settlement

In all sample kebeles (Goro Gutu, Werji Jalala, Hora Waligala, Burka Ela and Harkoncha Dada) settlement areas increased during 1984 to 2000 and 2000 to 2016 (Table,6 and 7).

Shrub land

Shrub land declined in Goro Gutu, Burka Ela and Werlji Jalala in the period 1984 to 2000 and 2000 to 2016. In Hora Waligala and Harkoncha Dada shrub land increased during 1984 to 2000 but declined during 2000 to 2016. The proportion of land use land cover classes and rate of change from 1984 to 2000 and 2000 to 2016 shown in table, 6 and 7 below.

In the study area, the speed of change and the deviating quality of disturbances of land use /land cover change over the time was reaching higher level. The disturbance of spatial pattern of ecosystems and land cover change appeared within the decades.

The comparison of the land use/ land cover statistic assisted in identifying the percentage change, trend of rate of change between the time ranges. In achieving this, the first task was to develop a table showing the area in hectares and the percentage change during the period of time (1984 to 2000, 2000 to 2016 and 1984 to 2016) measured against each LULC type. The rate of change can be calculated by subtracting observed change in old year from recent changes divided to earlier year and multiplied by 100. The formula of rate of change drawn from Solomon, 1998:

$$\text{Rate of change} = \frac{x_2 - x_1}{x_1} * 100;$$

Where: X1= earlier year data

X2=recent year data

Table 7: Proportion of land-use/ land-cover class and rate of change in percentage (1984 to 2016)

Goro Gutu												
LULC	1984		2000		2016		Rate of change					
	Ha	%	Ha	%	Ha	%	1984 to 2000		2000 to 2016		1984 to 2016	
							Ha	%	Ha	%	Ha	%
Bare land	18.27	1.48	28.46	2.31	86.76	7.05	55.77	56.08	204.84	205.19	374.87	376.35
Cultivated land	212.02	17.23	133.67	10.86	190.37	15.47	-36.95	-36.97	42.40	42.44	-10.21	-10.21
Forest land	333.15	27.07	323.68	26.30	283.67	23.05	-2.84	-2.84	-12.36	-12.35	-14.85	-14.85
Settlement	0.87	0.07	81.91	6.65	134.23	10.90	9314	9400	63.87	63.90	15328.73	15471.42
Shrub	666.18	54.13	662.76	53.86	535.46	53.51	-0.51	-0.49	-19.20	-0.64	-19.62	-1.14
Hora Waligela												
LULC	1984		2000		2016		Rate of change					
	Ha	%	Ha	%	Ha	%	1984 to 2000		2000 to 2016		1984 to 2016	
							Ha	%	Ha	%	Ha	%
Bare land	15.57	1.06	155.25	10.58	286.29	19.52	897.10	898.11	84.4	84.49	1738.72	1741.50
Cultivated land	645.08	43.98	449.73	30.66	306.63	20.90	-30.28	-30.28	-31.81	-31.83	-52.46	-52.47
Forest land	293.31	20.00	16.92	1.15	12.42	0.84	-94.23	-94.25	-26.59	-26.95	-95.76	-95.80
Settlement	4.43	0.30	40.05	2.73	77.49	5.28	804.06	810	93.48	93.40	1649.2	1660
Shrub	508.07	34.64	804.51	54.86	783.63	53.43	58.34	58.37	-2.59	-2.60	54.23	54.24
Harkoncha Dada												
LULC	1984		2000		2016		Rate of change					
	Ha	%	Ha	%	Ha	%	1984 to 2000		2000 to 2016		1984 to 2016	
							Ha	%	Ha	%	Ha	%
Bare land	5.05	0.46	14.31	1.30	87.48	7.97	183.36	182.60	511.32	513.07	1632.27	1632.60
Cultivated land	353.59	32.3	428.76	39.10	426.33	38.88	21.25	21.24	-0.56	-0.56	20.57	20.37
Forest land	495.27	45.17	101.97	9.30	58.14	5.30	-79.41	-79.41	-42.98	-43.01	-88.26	-88.26
Settlement	1.09	0.09	12.33	1.12	40.32	3.67	1031.2	1144.4	227.00	227.67	3599.08	3977.77
Shrub	241.38	22.01	539.01	49.16	484.11	44.15	123.30	123.30	-10.18	-10.19	100.55	100.59

Burka Ela												
LULC	1984		2000		2016		Rate of change					
	Ha	%	Ha	%	Ha	%	1984 to 2000		2000 to 2016		1984 to 2016	
							Ha	%	Ha	%	Ha	%
Bare land	1.53	0.12	63.54	5.11	95.85	7.71	4052.9	4158.3	50.84	50.88	1664.70	6325
Cultivated land	133.56	10.74	409.32	32.92	417.24	33.56	206.46	206.51	1.93	1.94	212.39	212.47
Forest land	387.36	31.15	110.7	0.89	65.88	5.29	-71.42	-97.14	-40.48	494.38	-82.99	-83.01
Settlement	4.77	0.38	7.74	0.62	13.41	1.07	62.26	63.15	73.25	72.58	181.13	181.57
Shrub	715.95	57.59	650.34	52.31	643.77	51.78	-9.16	-9.16	-1.01	-1.01	-10.08	-10.08
Werji Jalala												
LULC	1984		2000		2016		Rate of change					
	Ha	%	Ha	%	Ha	%	1984 to 2000		2000 to 2016		1984 to 2016	
							Ha	%	Ha	%	Ha	%
Bare land	18.18	0.98	111.78	6.05	196.7	10.65	514.85	517.34	75.97	76.03	981.95	986.73
Cultivated land	650.34	35.20	1121.31	60.70	1179.9	63.87	72.41	72.44	5.22	5.22	81.42	81.44
Forest land	274.5	14.85	79.74	4.32	28.32	1.53	-70.95	-70.90	-64.48	-64.58	-89.68	-89.69
Settlement	2.7	0.14	13.41	0.73	47.97	2.60	396.66	421.42	272.63	256.16	1676.66	1757.14
Shrub	901.53	48.8	521.01	28.20	394.36	21.35	-42.2	-42.21	-24.30	-24.29	-56.25	-56.25

In Burka Ela bare land, cultivated and settlement area increased from 1984 to 2000 and 2000 to 2016 continuously but Shrub land decreased from 1984 to 2016. Forest land decreased from 1984 to 2000 but increased from 2000 to 2016.

Figure.4. Land use/ land cover change of Burka Ela Kebele, in 1984(a), 2000(b) and 2016(c)

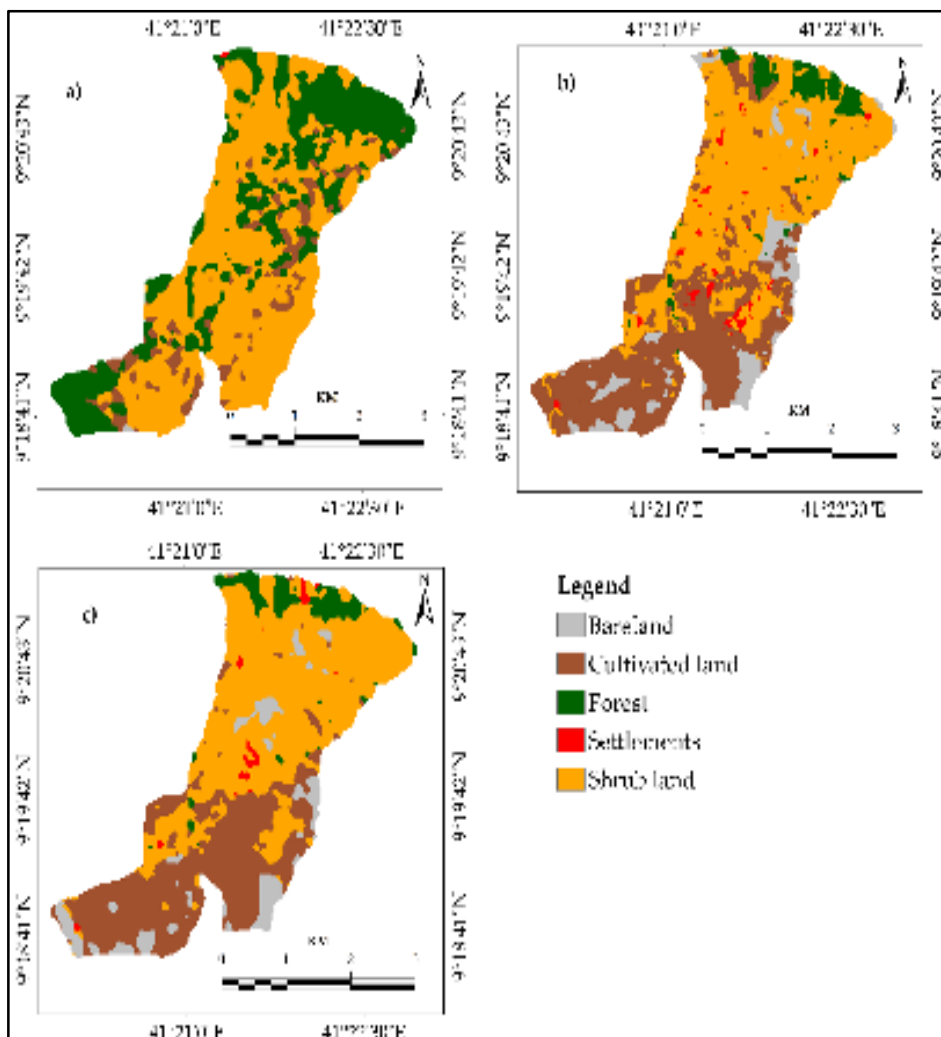
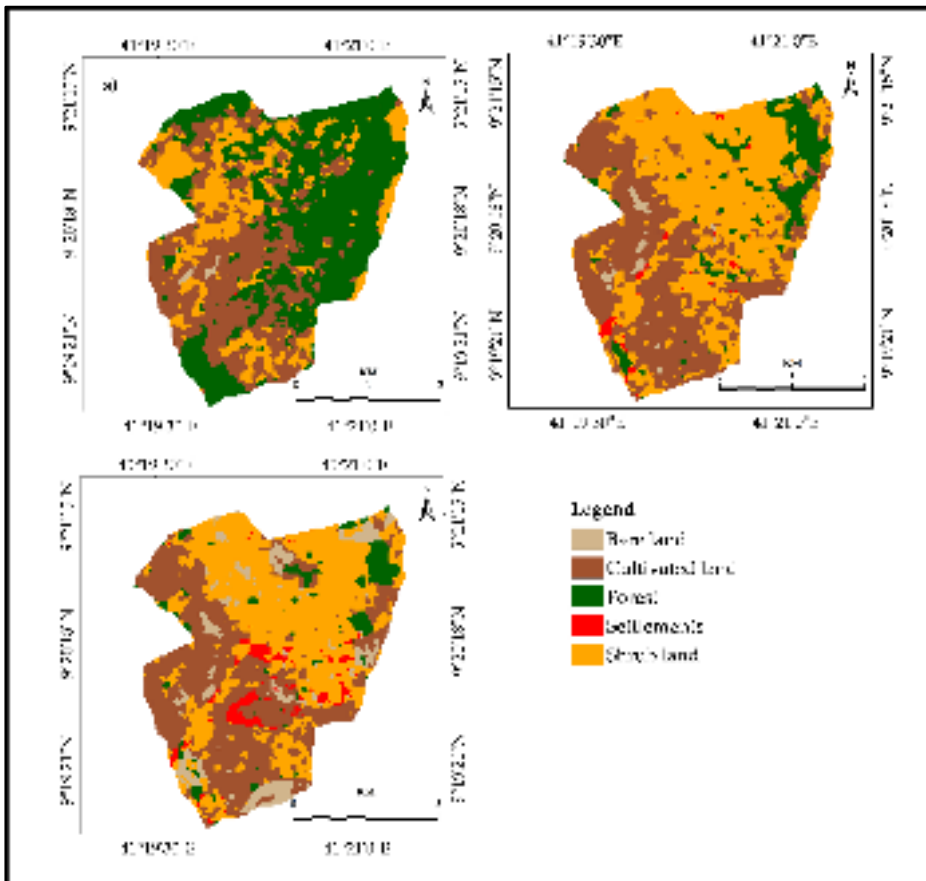


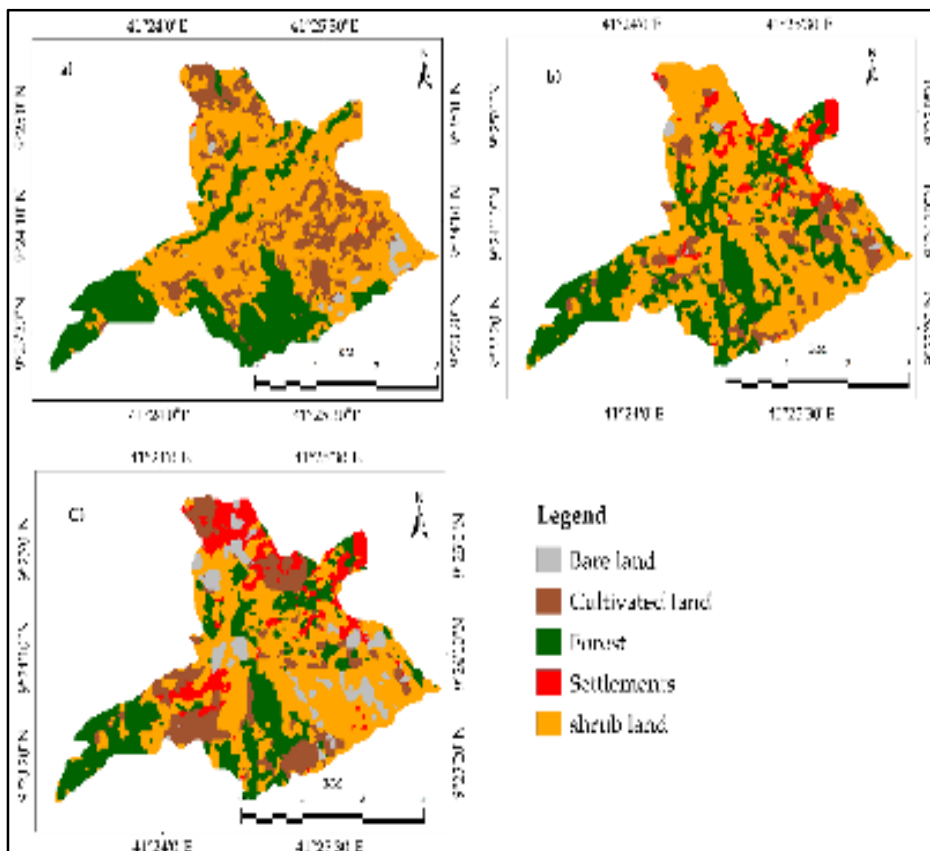
Figure 5: Land use/ land cover change of Harkoncha Dada Kebele, in 1984(a), 2000(b) and 2016(c).



In Harkoncha Dada bare land and settlement increased from 1984 to 2000 and 2000 to 2016. Cultivated and shrub land increased from 1984 to 2000 but declined from 2000 to 2016. Forest land declined from 1984 to 2000 and 2000 to 2016.

Goro Gutu Kebele bare land and settlement area gained from 1984 to 2000 and 2000 to 2016, whereas forest and shrub land declined from 1984 to 2016. The cultivated land decreased from 1984 to 2000 but it increased from 2000 to 2016.

Figure 6: Land use/ land cover change of Goro Gutu Kebele, in 1984(a), 2000(b) and 2016(c).



In Hora Waligala kebele bare land and settlement area increased from 1984 to 2000 and 2000 to 2016 but forest, cultivated and shrub land declined from 1984 to 2000 and 2000 to 2016.

Figure.7. Land use/ land cover change of Haro Waligela Kebele, in 1984(a), 2000(b) and 2016(c).

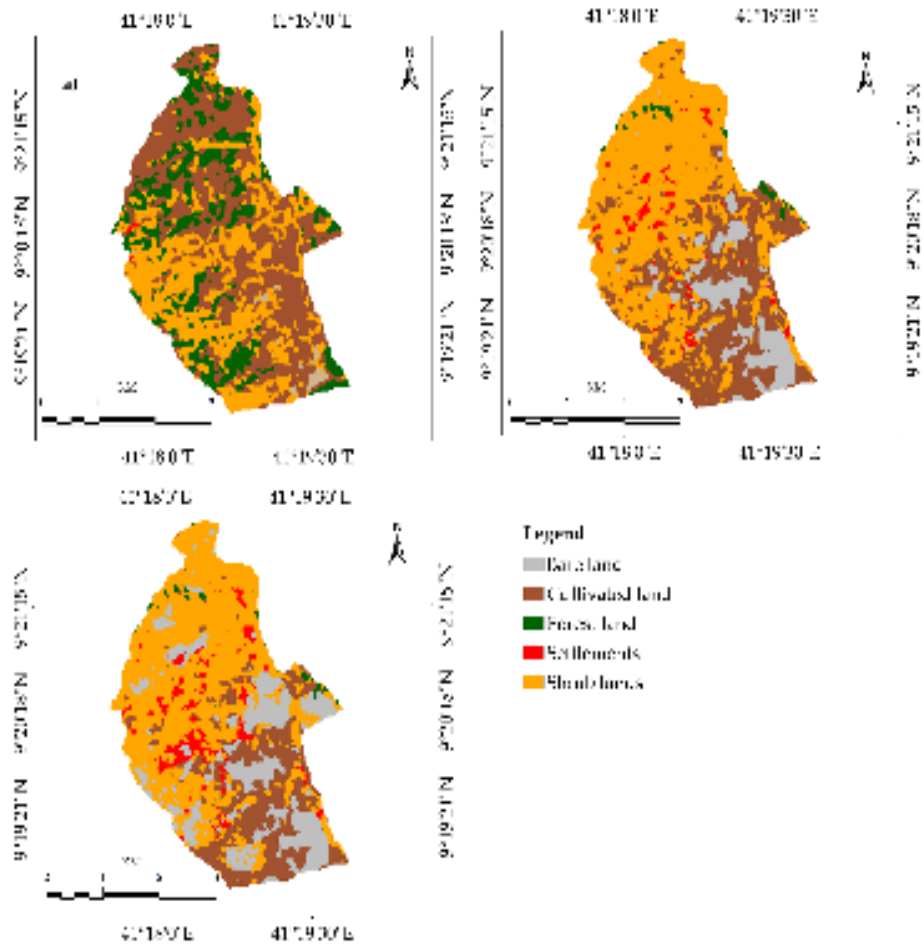
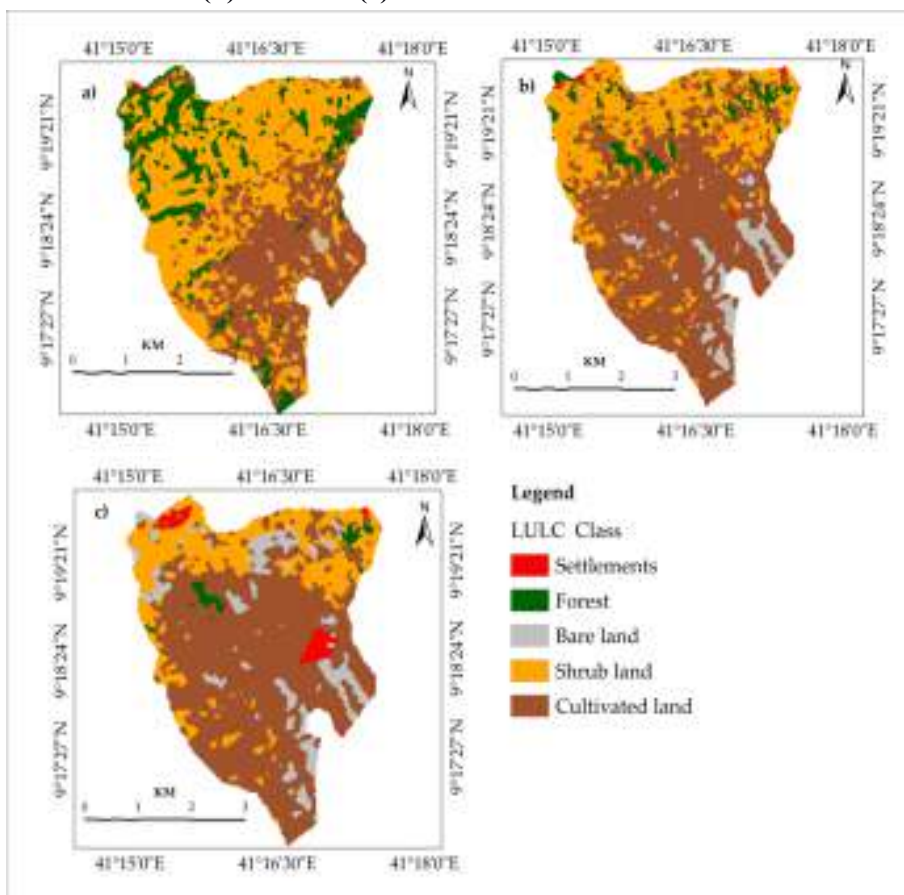


Figure 8: Land use/ Land cover of Warji Jalala Kebele, in 1984(a), 2000(b) and 2016(c).



In Warji Jalala bare land, cultivated and settlement area increased from 1984 to 2000 and 2000 to 2016 but forest and shrub land decreased from 1984 to 2016.

3.2 The Causes of Forest Land Cover Change

Proximate (direct) causes of land use change constitute human activities or immediate actions that originate from intended land use and directly affect land cover and involve a physical action on land cover. Proximate causes generally operate at the local level (individual farms participation, household's demand of wood for house construction, home furniture and fuel wood).

Underlying (indirect or root) causes are fundamental forces that underpin the proximate causes of land-cover change. They operate more diffusely from a distance, often by altering one or more proximate causes. Underlying causes are often exogenous to the local communities managing land and are thus uncontrollable by these communities.

Underlying causes are formed by a complex of social, political, economic, demographic, technological, cultural and biophysical variables that constitute initial conditions in the human-environment relations and are structural (systemic) in nature (Lambin et al.,2003).

3.2.1 Economic causes of deforestation

The types of material used by samples respondents were highly determined by their income level. The income level influences the type of energy use, house construction materials and other furniture.

Table.8: Sample household response for income level and use of wood products

Average annual income (Ethio-Birr)	Energy uses				House construction				Home furniture			
	Wood		Non wood		Wood		Non wood		Wood		Non wood	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
< 10000	90	24.3	-	-	90	24.3	-	-	85	22.9	5	1.4
10001-20000	120	32.3	-	-	120	32.3	-	-	115	31	5	1.4
20001-30000	132	35.6	4	1	133	35.8	3	0.8	130	35	6	1.6
30001-40000	10	2.7	5	1.4	11	3	4	1	9	2.4	6	1.6
Above 40000	4	1	6	1.6	5	1.4	5	1.4	4	1	6	1.6
Total	356	95.9	15	4	359	96.8	12	3.2	343	92.3	28	7.6

Source: Field survey, 2016

The income of non wood resources user exceeded the income of wood resource user due to economic and technological advances of non wood products users. Large numbers of respondents those have low income level did not use energy types, home construction materials and home furniture from non wood products. The main causes were lack accessibility/ supply, economic cases/prices and attitude to use technology (Lambin et al.,2003).

The above table 8 shows the relationships between respondent income level and use of wood products.

3.2.2 Overgrazing

The shortage of animal feed and small grazing area were common problems in livestock production of the study area. Most of them used forest area as open access grazing land for long period of time which highly affects forest ecosystem. This indicated that over grazing (large number of cattle and goats) were result in forest degradation and also decreasing animal productivity.

Table 9: Livestock ownership by sample of households

Livestock types	Frequency	CF	TLU	Percentage
Cattle	753	0.7	527.1	43.5
Goats	579	0.1	57.9	33.4
Sheep	165	0.1	16.5	9.5
Donkey	184	0.5	92	10.6
Mules	10	0.7	7	0.6
Horse	41	0.8	32.8	2.4
Total	1732			100

Sources: extracted from FAO, 1987 (Tropical Livestock Unit Conversion Factor)

3.3 The Implications of Land Use/Land Cover Change for Degradation of Native Trees

The factors contributed for land degradation were complex and diverse. Deforestation is the result of complex interaction between physical, biological and socioeconomic issues. The exposure of land to erosive forces exacerbates the deterioration of the quality of biodiversity in an ecosystem and socioeconomic conditions.

3.3.1 Demand for native trees

According to sample household response shown in the table 10, economic purposes of major native trees; 73% of respondents were used Grar (acacia abyssinica) for fuel wood especially for charcoal, 83.6% of respondents use

Wanza (cardial africa) and 83.3% of respondents use Koso (hagenia abyssinica) for home furniture. Also 97.3% of respondents were use Tid (juniperus procera) for house wall construction and 83.6% of them use Zigba (podocarpus falcatus) for home furniture and constructional purposes.

Table.10: Sample household response for economic uses of native trees

Major trees	Economic uses											
	Fuel wood		House Construction		Home Furniture		Soil conservation		Ecosystem Protection		Industry and for Others	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
Tid	1	0.3	361	97.3	4	1	3	0.8	1	0.3	1	0.3
Zigba	1	0.3	40	10.8	310	83.6	9	2.4	10	2.7	1	0.3
Woiyera	181	48.8	175	47.2	7	1.9	4	1	2	0.5	2	0.5
Wanza	5	1.3	50	13.5	310	83.6	3	0.8	2	0.5	1	0.3
Koso	2	0.5	13	3.5	309	83.3	25	6.7	20	5.4	2	0.5
Grar	271	73	10	2.7	-	-	40	10.8	45	12.1	5	1.3

Source: Field survey, 2016; NB: each question percentage was from 371 sample size

On the other hand as the idea from focused group discussion, indigenous trees were ecologically more valuable than exotics for the conservation of native flora and fauna as well as for water and soil conservation. But these trees were over exploited. Also key informant interviews indicated that natural forests in the study area have been declining rapidly due to conversion into arable lands and continued unwise and over exploitation of forest land. The native tree species highly cleared away from natural forest and its population numbers decline from time to time. There were few isolated remained forest area and have few iconic native trees. There were few naturally regenerated native tree species. There was high pressure from mixed agriculturalist of rural population and strong economic demands from nearby urban population.

Farm lands highly expanded to marginal and forest lands. Forest lands serves for open access grazing land. Additionally, major native trees were selectively cut for house construction, home furniture, fire wood and other wood products. Also these varieties of native trees species replaced by uniform exotic tree mainly Eucalyptus trees. These major native tree species which were home for endemic species of fauna were going to disappear from local

environment. As a result there needs to increase conservation work of these highly utilized species which were key part of higher altitude forests.

3.3.2 Effects of deforestation of native trees

With regard to the effects of deforestation of major native tree species; the following table indicates the response from the sample population on effects of deforestation of major native trees.

Table 11: Sample household response for effects of deforestation

Effects of deforestation of native trees	Strongly agree		Agree		Undecided		Disagree		Strongly disagree	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
Loss of native tree species	251	67.7	108	29.1	12	3.2	-	-	-	-
Destruction of ecosystem	247	66.6	103	27.8	21	5.7	-	-	-	-
Loss of ascetic value	233	62.8	126	34	11	3	1	0.3	-	-
Shortage of wood products	209	56.3	114	30.7	23	6.2	21	5.7	4	1.1
Decline of natural forest	206	55.5	112	30.3	49	13.2	4	1.1	-	-
Shortage of fuel wood	163	43.9	138	37.2	52	14	16	4.3	2	0.5
Lack of construction materials	130	35	134	36.1	91	24.5	13	3.5	3	0.8
Climate change	99	26.7	163	43.9	81	21.8	27	7.3	1	0.3
Land degradation	93	25	176	47.4	77	20.8	25	6.7	-	-
Loss of livestock production	89	24	153	41.2	109	29.3	11	3	9	2.4

Source: Field survey, 2016; NB: each question percentage was from 371 sample size

According to FGD the effects of deforestation are locally well known. The removal of forest coverage leads directly to a loss of animal habitat and native trees thus decline in animal diversity and abundance. Also increased surface runoff or dry up, soil erosion and climate change.

It is well known that, massive habitat loss or habitat degradation is accompanied by large degradation of genetic resources (Mulugeta and Demel, 2006). For instance, about 129 endemic plant species of Ethiopia and Eritrea were threatened due to forest destruction. It remarked that threatened endemic

species require special attention. If their habitats are destroyed, these plants are lost forever and wealth indigenous flora and fauna would be very difficult to replace (Tejedor et al., 2015).

3.3.3 Challenges of forest conservation

According to sample respondents Table 12, with regard to the challenges of major icon native tree conservation, 91.9% were lack of alternative energy and home construction materials, 82.2% were weak institution and policy and 80.6% were over grazing.

Table 12: Sample household response on major challenges for conservation native trees

Challenges for native tree conservation	Yes		No	
	Fre	%	Fre	%
Lack of alternative energy and constructional materials	341	91.9	30	8
Weak institutional and policies	305	82.2	66	17.8
Over grazing	299	80.6	72	19.4
Low awareness	195	52.6	176	47.4
Poverty and other economic factors	291	78.4	80	21.6
Natural (climate change, topography and land degradation)	286	77	85	22.9
Impact of the earlier regime forest management approaches	250	67.4	121	32.6
Limited nursery and technology of regeneration	251	67.7	120	32.3
Low skilled man power	201	54.2	170	45.8

Source: Field survey, 2016; NB: each question percentage was from 371

Sample size

Because of small farm land size, the forest area serve as open grazing land leads to the degradation of natural ecosystem. Also low awareness, rugged topography and periodic drought also aggravate environmental problems which hinders natural regeneration of native tree species.

According to FGD population pressure and the absences of strong forest administration system were reasons for the depletion of native tree from the forest. But there were some prospects like millennium development goal which focus upon rehabilitation of degraded lands. The rehabilitation

campaign in check dam and terrace construction and planting trees were supportable activities. But there were low attention given for native tree species. According to document analysis, few private nurseries those highly focus on coffee and other agro plantation activities, because of its beneficial activities. The only three government nurseries were poorly organized and under developed. The supply of exotic and indigenous tree species seed was very low. According to the woreda's report, there were less than 300kg exotic tree and 50kg native tree species seed supply per year in the document. But the woreda's report and realities of afforestation did not match.

The newly regenerated plants in nursery distributed for community and planted on marginal lands and deforested areas. In past ten years, around 5 million exotic and about 1 million indigenous tree species were planted per year (GGWARD, 2015). But the survival rate less than 10% for exotic trees and about 1% for native tree species. Also there is lack of national database, regular resource inventory and monitoring to provide reasonably and up to date information for current management, future planning, strategic and policy formulations. Sometimes conflicting statistics are found in different reports.

4. Conclusion and Recommendation

4.1 Conclusion

There were decline in number of native trees and decrease in over all quantity and quality of natural forest. Also existence of gullies, reduction in soil capacity to grow crops, drought and prevalence of barren land in the study area. These were indicators for the destruction of biodiversity.

The main land use land cover changes are expected to lead for declines in terrestrial biodiversity. Native tree species such as *Juniperus procera*, *Podocarpus falcatus*, *Hagenia abyssinica*, and *Olea africana* were heavily exploited because of its high economic demands. According to land use land cover change analysis; there was no increase in the density of native trees in the forest. But there were recent introduced plantations of eucalyptus (*Eucalyptus globulus*) and Cedar (*Cupressus lusitanica*) in the peripheral areas and at deforested places. Also further intensification of coffee, fruits, Khat (*Catha edulis*) and other plantations introduced. These developments were

improving vegetation cover and supporting the productivity of the region, but they were highly replacing the former species rich and endemic fauna and flora by single exotic Eucalyptus trees.

Goro Gutu highland facing strong land use land covers change which intensified and has been considerably transformed over the last three decades. This has endangered and threatening the high diversity of endemic plants. The speed of the ongoing processes clearly shows that need for immediate action and intervention.

- Land use/ land cover change from forest and shrub land to farm land, settlement and bare land have profound impacts on ecosystems. In addition to agricultural expansion, there were intensive deforestation, habitat simplification and narrowing of certain cover types.
- The farmers' low education level, low income level, small land size, ways of land hold, large family size, institutional and policy factors resulted in LULC changes which cause forest land degradation. Also demand, participation and awareness, limited equipments, skilled manpower particularly in the areas of policy analysis and planning, administration and management, resources assessment, monitoring and evaluation of real environmental condition were major problems facing forest conservation.
- The over exploitation of natural forest does not match the ever low afforestation/ reforestation and environmental rehabilitation.

4.2 Recommendations

- ▶ Educating farmers to understand about degradation of native tree species. Training is important to implement newly introduced forest conservation methods.
- ▶ Community-based forest area and specifically native tree species should be rehabilitate, protect and manage properly.

- ▶ Alternative sources of energy, constructional materials and control grazing in line with awareness creation should be considered and information disseminated at grass roots level to protect native tree species in the isolated remaining forests.
- ▶ Minimizing population pressure on the resources, technological improvements in agriculture, institution, policy and fair resource distribution should be improved. Forest area demarcation, protection, expansion of indigenous silvi culture at nursery and forest product traffic should be improved. Also development of other economic sectors and involvement of the local people in decision making areas are important. Effective implementation and service of family planning recommended for optimum population growth.
- ▶ The degradation and depletion of forest affects the livelihood of the community. The community must participate in conservation of forest ecosystem. This may also include the involvement of individuals, the community and inter village cooperation and government should share equal load and benefit.
- ▶ The strong land use/ land cover change is much intensified and has been considerably transformed over the last three decades. This has endangered and threatening the high diversity of native plants from the forest. The speed of the ongoing processes clearly shows that there is a need for immediate action and intervention of biodiversity preservation.
- ▶ To sum up, the significance of forest and over exploitation of forest in the study area and other places have some similarities. The problems of forest degradation have to be given emphasis and to be taken seriously and genuinely solutions. To this end, it is important to give adequate consideration for those points discussed above. The aspects emphasized and the recommendations forwarded could contribute substantially towards the sustainability of forest resources conservation.

References

- Codjoe, S.N.A., 2007. Integrating Remote Sensing, GIS, Census, and Socioeconomic Data in Studying the Population–Land Use/Cover Nexus in Ghana: A Literature Update. *Africa Development*, Vol. XXXII, No. 2, pp. 197–212.
- Creswell, J.W and Plano. 2007. *Designing and Conducting Mixed Methods Research*. Thousand Oaks CA SAGE Publications, London.
- CSA (Central Statistical Agency) .2007. *Population and Housing Census Report*. Addis Ababa, Ethiopia.
- Eshetu Yirdaw .2002. *Restoration of the native woody - species diversity, using plantation species as foster trees in the degraded highlands of Ethiopia*. Academic dissertation, Helsinki, 61 pp. *Procedures for Soil and Plant analysis*. Addis Ababa, Ethiopia, 238pp.
- FAO (Food and Agriculture Organization). 2007. *Trees outside forests: Towards rural and urban integrated resources management*. Rome, Italy (Internet: <ftp://ftp.fao.org/docrep/fao/005/y1785e00.pdf>). (Accessed on September 15, 2015).
- FAO (Food and Agriculture Organization). 2010. *Global Forest Resources Assessment 2010 Country Report Ethiopia*. Rome, Italy (www.fao.org/forestry/fra/fra2010/en/). (Accessed on May 15, 2015).
- GGWARDO (Goro Gutu woreda agricultural and rural development office) .2015. *Annual Wereda Reports on Natural Resources, Karamile*.
- Israel, D. 2012. *Determination of Sample Size*. Fladolfia. USA.
- Jentsch, A., Beierkuhnlein, C., and White, P. S. (2002). Scale, the dynamic stability of forest ecosystems, and the persistence of biodiversity. *Silva Fennica*, 36(1), 393–400.
- Kittessa Hundera and Kflay Gebrehiwot. (2014). Species composition, Plant Community structure and Natural regeneration status of Belete Moist Evergreen Montane Forest, Oromia Regional state, Southwestern Ethiopia. *Momona Ethiopian Journal of Science (MEJS)*, V6(1):97-101, 2014.
- Lambin, E. F., Geist H. J., and Lepers, E. (2003). Dynamics of land-use and land cover change in tropical regions, *annual review of environmental resources*, 28:205–41.
- Landsat 4 Thematic Mapper (TM). (1984, 2000). *Earth Explorer*. United States Geological Survey (USGS) Website: <http://earthexplorer.usgs.gov/>(Accessed on March 26, 2017).
- Landsat 8 Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS). 2016. *Earth Explorer*. United States Geological Survey (USGS). <http://earthexplorer.usgs.gov/>. (Accessed on March 26, 2017).

- Mulugeta Lemenih and Demel Teketay. 2006. Changes in soil seed bank composition and density following deforestation and subsequent cultivation of a tropical dry Afromontane forest in Ethiopia. *Tropical Ecology*, 47: 1-12.
- Quentin F. B., Jim, C., Julia, C., Carole, H., and Andrew, S. (2006). Drivers of land use change, Final report: Matching opportunities to motivations, ESAI project 05116, Department of Sustainability and Environment and primary industries, Royal Melbourne Institute of Technology. Australia.
- Solomon Tekalign Demissie. (1998). Soil and soil management practices in Ilibabor highland, Ethiopia. M.A Thesis submitted to the department of Geography, SGS, Addis Ababa University, Ethiopia
- Teor Garavito N, Newton A. C., Golicher D., Oldfield S. (2015). The Relative Impact of Climate Change on the Extinction Risk of Tree Species in the Montane Tropical Andes. *PLoS ONE* 10(7): e0131388. doi:10.1371/journal.pone.0131388.
- Vivero, J. L., Ensermu Kalbessa and Sebsebe, D. (2005). Progress on the red list of plants of Ethiopia and Eritrea: conservation and biogeography of endemic flowering taxa. Addis Ababa University, Ethiopia.
- WB (World Bank). (2010). Resources and Development. Coordination with Food and Agriculture Organization of the United Nations, Annual reports. Rome, Italy.
- Zubair, A. O., 2006. Change detection in land use and Land cover using remote sensing data and GIS (A case study of Ilorin and its environs in Kwara State), MSc Thesis, University of Ibadan, Nigeria.

Major types of native trees, shrubs and herbs

No.	Species name	Local name (Afaan Oromoo)	Types	Use/demands
1	Acacia abyssinica	Laaftoo	T	
2	Bersema abyssinica	Lolchiisaa	T	
3	Cordial Africana	Waddeessa	T	
4	Croton macrostachyus	Bakkanniisa	T	
5	Domboya torrid	Daannisaa	T	
6	Ekebegia capensis	Somboo	T	
7	Erythrina bruceischweinf	Waleensuu	T	
8	Ficus sycomorus	Harbuu	T	
9	Ficus vasta	Qilxuu	T	
10	Hagenia abyssinica	Heexoo	T	
11	Juniperus procera	Gaattiraa	T	
12	Pittosporum viridiflorum	Soolee	T	
13	Podocarpus falcatus	Birbirsaa	T	
14	Pouteria adolfi	Qararoo	T	
15	Oliva Africana	Ejersa	T	
16	Asparagus africanus	Sariitii	S	
17	Calpurina aurea	Ceekaa	S	
18	Clausenia anisata	Ulmaayii	S	
19	Coffee Arabica	Buna	S	
20	Embellia schimperio	Hidda hanquu	S	
21	Euphorbia abyssinica	Adaamii	S	
22	Justicia schimperiana	Dhummuugaa	S	
23	Kotschya Africana	Heenna	S	
24	Lippie adoensis	Kusaayee	S	
25	Maesa lanceolata	Abbayyii	S	
26	Maytenus arbutiolia	Kombolcha	S	
27	Myrsina Africana	Qacama	S	
28	Ocimum lamifolium	Damaakasee	S	
29	Nicotina glauca	Timbatimbo	S	
30	Ocimum grattissimum	Hancabbii	S	
31	Phoenix reclinata	Meexxii	S	
32	Phytolacca dodecandra	Handoodee	S	
33	Prema schimperi	Qoraasuma	S	
34	Rhamnus prinooides	Geeshoo	S	
35	Solanium incanum	Hiddii	S	
36	Bidens biternata	Maxxannee	H	
37	Brassica sp	Raafuu Simbiraa	H	
38	Canna indica	Qoccoo Seyixanaa	H	
39	Cirsium dender	Baala Waraantii	H	
40	Commelina Kotschyi	Kalaalaa	H	
41	Cyperus bulbosus	Qunnii	H	
42	Discorea bulbifera	Kottee Harree	H	
43	Guizotia scabra	Hidda	H	
44	Kalonche quartinia	Bosoqqee	H	
45	Snowdenia palystachya	Muujjaa	H	
46	Urtica simensis	Doobbii	H	

T=Tree S = Shrub H = Herb

Households' Willingness to Pay for Improved Solid Waste Management: The Case of Dire Dawa City

Tariku Birhanu¹

Abstract

This paper analyzed households' willingness to pay (WTP) for improved solid waste management (SWM). The study employed Contingent valuation method (CVM), and 384 households' were selected based on two-stage sampling technique from nine kebeles in Dire Dawa City. The selected sample households were asked a contingent valuation question using a double bounded elicitation with open ended follow up question. To examine the WTP and to compute the mean WTP for the improve SWM, probit and bivariate probit model were used.

The probit model result shows that age, education, perception and Case of Disease in the Household head has positive and significant effect at 10% level of significant and household income, marital status, number of children has positive and significant effect at 1% level of significant in affect the probability of the households' WTP for the improved SWM. From the bivariate probit model, the computed mean WTP for the improved SWM, using double bounded elicitation (DBE) is 15.03 birr. The computed open ended elicitation mean WTP value is 9.82 birr. Likewise, the total WTP for improved SWM from the DBE method is 765,568.08 birr. The total WTP for the improved SWM from open ended elicitation is 500,191.52 birr. The mean value obtained from the open ended elicitation is lower than the values from the double bounded elicitation. Thus, policy makers should be careful on the selection of the elicitation technique to elicit the households WTP and households should be educated on effective solid waste disposal through regular sensitization programmes by a collaborative effort of key stakeholders in the solid waste management such as local government, the private sector, NGOs and residents is important.

Keywords: probit analysis, willingness to pay, solid waste.

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1. Introduction

Rapid population growth and urbanization in general have led to serious solid waste generation in most cities worldwide. Daily global generation of municipal solid waste in 2006 was reported as 2.02 billion tones' (UNEP, 2009).As a consequence, the environment undergoes degradation as reported in various parts of the world, particularly in developing and under-developed countries (Rahji and Oloruntoba, 2009).

According to Gebreegziabher *et al*, (2012) many Ethiopia towns lack the financial resources and institutional capacity to provide the most basic municipal infrastructures and services including solid waste management. Ethiopia has experienced rapid urbanization and increasing urban population in the last few years due to more rural-urban migration and rising per capita incomes. Presumably, increased demand for infrastructure and public services accompanies this growth.

Poor solid waste handling is threatening the lives of Dire Dawa residents. Waste materials that are generated from residential households are mostly organic but if not controlled and just dumped anywhere, it can harm people and constitute a major environmental and health hazard providing fly breeding, black roads, cause flood disaster when dumped into rivers and attract animals which may cause zoonotic infections. The problem is usually inadequate budget, unable to meet the cost in managing the ever increasing volumes of waste (DDASBA, 2014).In the city the provision of solid waste management services had for long been from administration which had focused on the technical aspects of collecting and disposal of solid waste.

Currently, the volume of solid waste generated in Dire Dawa city was raise. Results from many contributing factors, among these factors unplanned settlement, rural migration from east Harerge and Somali regain to the city and rapid urbanization are the major ones. Problems related to inadequate collection and disposal services facility, inability of the government to find efficient ways to manage and finance environment needs of the people are also observed (Dire Dawa Administration Sanitation and Beautification Agency, 2014).

According to DDASBA (2014) the city generated about 159 tone solid wastes every day. Generation of solid waste in the city has increased significantly in the past three years. Between 2013 and 2015, solid waste generation in the city increased from 46,866 tons/year to more than 11,169 tons/year. Due to the inadequate transport capacity and deficient workforce, collection efficiency in the city has been 63%. Uncollected waste mostly comprises of organic substance and in some cases human and animal excreta. It may also contain hazardous waste like industrial and medical waste (Haile, 2013). The uncollected garbage is often dumped indiscriminately resulting in clogged drains and sewerage that serves as a breeding ground for rodent's vectors and insects leading to spread of diseases (DDASBA, 2014).

The government has a role to protect public health and the environment. In order to accomplish this, there is a need to improve environmental amenities and provide clean environment at household level. For any attempt aimed at environmental quality improvement to be successful and sustainable, it has to make use of demand side information. Inline with this, this study will provide the required information as to what value households give to any effort the government makes to ensure better environmental quality, specifically household's capacity or willingness to pay for improved SWM and the factors that influence their WTP for improved SWM can be an input in the design of sustainable and effective SWM.

To the researcher's knowledge only few studies in the area of solid waste management are done in Dire Dawa city. Haile (2013) and Dire Dawa Administration Sanitation and Beautification Agency (2014) studies mainly focused on the supply side of solid waste management with little or no reference to the demand side.

Those previous works focus on the theoretical and empirical review of analyzing the quality of service in collection and disposal of solid waste and preference of solid waste management, but did not estimate the households' WTP improve solid waste management which is a gap to be filled by this study.

However, studies undertaken regarding SWM on the demand side like Amiga (2002), Gebreegziabher, *et al*, (2012) and Asrat (2014) employed contingent valuation eliciting single-bounded dichotomous choice format. Single bounded dichotomous choice approach yield inefficient welfare measurement due to limited information obtained from each respondent. Double dichotomous choice format has the gain in efficiency over the single bounded elicitation format by asking respondents a second follow up binary question based on the response of the first offer these makes clear bounds on unobservable true WTP. Asrat's (2014) study was undertaken in Dire Dawa too. But beside its use of single bounded dichotomous approach, there has been observed a significant change in population, an increase in quantity of solid waste, and major changes in solid waste management since then. This paper also intended to fill this methodology gap.

The general objective of this study was generation of demand side information from households who are the primary producers/generators of significant proportion of solid waste and perhaps main victim of the effect of improper handling of solid waste.

Specific Objectives:-In line with the general objective, the study specific objectives were to;

1. Study the current level of public participation and awareness for SWM in Dire Dawa city.
2. Identify the determinants of households willingness to pay for improved solid waste management service;
3. Elicit the mean households' willingness to pay for the improved SWM using contingent valuation method (double bounded dichotomous choice format); and
4. Identify the aggregate benefits (demand) for SWM in Dire Dawa city.

The outcome of the study has a significant contribution to the existing literature, and can be used as an input for informed policy making and further studies in relation to solid waste managements. It will also shed some light on the problems of management and sustainability of solid waste management in the study areas and it also serves as a benchmark to see the households' WTP characteristics over time.

The rest of the paper is organized as follows Chapter two reviews the related theoretical and empirical literature. Chapter three consists of the methodology part that introduces the study areas, data type, source and method data collection, sample size determination, sampling techniques, method of data analysis, and empirical model specifications. Chapter four contains the descriptive and the econometric analysis of households' willingness to pay for improved solid waste management. Finally, chapter five deals with the conclusion and recommendations based on the empirical findings.

2. Theoretical Literature: Municipal Solid Waste Management

In Dire Dawa city, the city administration gives most of the solid waste collection service and the entire transportation and disposal service. The majority of the households get the service of solid waste collection service and disposal without any direct charge. Only those households disposed there solid waste by street sweepers and adult labourers to drains and sewerage, on an open space or on the street and the nearby river non-fixed payment mechanisms.

Dire Dawa Sanitation and Beautification Agency introduce service charges (sanitation fee) to households in the city that paid added to water bill depend on amount of water they consume. Based on DDASBA, (2014) a review of the available sanitation fee proposals for solid waste generator in Dire Dawa city are summarized as follows:

The Agency establish sanitation fee by principle “all generators shall pay“ by assuming all people are consume water so they pay according to their consumption of water by added to water bill.

Table 1: Sanitation fee proposals

Amount of Water they consume by m ³	Type of customer and service payment		Additional payment “Bono Wiha”
	Households	Trade sector & institution	
0—10	14.40 Birr	100 Birr	5%
11—20	17 Birr	300 Birr	
Above 20	20 Birr	500 Birr	

Source DDASBA, 2014

The proposal has been taken by the principle of “all generators shall pay”. In the cities there is some improvement in solid waste management, however, the provision of this service should not entirely depend on the ability of the household to pay for this service since there are externalities involved in this service. Almost half of total household's Dire Dawa pay for this service because of only 21,780 households on water Meter (DDASBA, 2014). Even in some season because of desert characteristic the city households consume more water due to these they should have to pay more. On the rivers if one household doesn't have water Meter or live in rental house does not pay sanitation fee or little contribute. The proposal doesn't consider all the people because of this the government has lose revenue from the left household that cover the cost this service, House-to-house collection of waste is not fully covered in the cities, Even if, households how are paying sanitation fee doesn't get the service. Those households will have an incentive to dispose of the waste on the street since the private cost of doing that is lower than the social cost. From this illegal disposal, it is all the individuals including those who are paying and getting the service that get hurt. Therefore, to improve solid waste management in Dire Dawa city, the first step should be the generation of demand side information for solid waste management. That consider for all people and fees charged should be low enough.

Deposit-Refund Systems are playing a very important role in waste minimization. However, DRSs in Dire Dawa city are used only for soft drink, beer in which people pay a surcharge and are re-funded when they return the empties.

The administration should work hand in hand with firms that have possibilities in creating solid wastes at the end of their product usage to create means of DRS. Though this process it would also be possible to create jobs for unions to work in the area of DRS

The three R's (Reduce, Reuse and Recycle) should always be part of a well-designed solid waste management. The three R's are almost non-existent in Dire Dawa city. Collection of refuse poses another problem as household waste is thrown indiscriminately in the open area. Absence of segregation at the source makes it very hard to recycle the collected waste and gain value

from it. According to DDASBA 2014, 60-70% solid waste are organic waste it can reuse but simply without segregation of waste it dispose, only two corporative are decompose organic waste and some people collect 'atela' (residual from a local drink 'tela') to be used as feed for cattle. There are also some people who collect and/or buy broken objects made of clay for recycling purpose.

To improve solid waste management the city administration together with all stakeholders has to put maximum effort on encourage and advocate the three R's (Reduce, Reuse and Recycle) .

2.1 Definition of willingness to pay and valuation of economic resources

The concept of willingness to pay or reservation price is defined as the maximum price that a given consumer accepts to pay for a given quantity of goods and service while remaining on his/her indifference curve. The concept first appeared in economic literature more than a century ago by Davenport in 1902. WTP and its methods were designed to determine prices for pure public goods and services. It is still used for subjects as varied as the value of human life or minimization of risks threatening human life, public financing of the arts, solid waste management, sanitation services, and water quality improvement

Economic value is a measure of what the maximum amount an individual is willing to forego in other goods and services in order to obtain some particular goods, service or state of the world. Such a measure of welfare is formally explained by the concept called WTP. WTP is about measuring the use and non use value of resource and there are generally two recognized methods of estimating WTP of economic agents for economic resources. These are the revealed preference technique which is based on indirect observations of behavior and the direct technique which is based upon stated preference (Hales, 2013).

2.1.1 Revealed Preference Technique

The indirect (inferential) approach (or revealed preference method) rely on observable behavior in order to deduce how much something is worth to individuals even though it is not traded in markets. These methods produce value estimates that are conceptually identical to market values, but they must be measured more creatively since market data are not available. Revealed preference measure only the use value of the good in question. The technique includes travel cost models and the hedonic pricing method (Hales, 2013).

1. Travel Cost Method

The travel cost method is popular for describing the demand for the natural resource service and environmental attributes of specific recreational sites. People usually visit recreational and scenic sites from different points of origin at diverse distances. This observed travel behavior is then used to evaluate the WTP of the agents to visit the site. This technique assumes that visitors to a particular site incur time and travel expenses and such economic expenditures indirectly reflect the minimum amount that a visitor is willing to pay for the use of the site (Assefa, 2012).

2. Hedonic Pricing Method

The hedonic pricing method provided an inferential measure of people's WTP for the amenity under study. This method is mostly used to estimate willingness of the economic agents for variations in property values due to the presence/absence of specific environmental attributes like air quality, noise and scenic views. By comparing the specific environmental attributes of two properties over time, it is possible to determine the implicit price of the amenity. This is done by correcting for other factors that might influence the value of the subject property and hence economists able to isolate the implicit price of some or bundle of amenities which have changed over time (Freeman, 2003).

2.1.2 Stated Preference Technique

The direct approach (or stated or expressed preference method) refers to the direct expression of individuals' willingness to pay or willingness to accept in

compensation for any change in quantities, qualities, or both of the goods in question. The method involves direct estimation of values based on the hypothetical valuation questions which presented to individuals, and hence it does not depend on market information (Freeman, 2003). The stated preference technique could potentially apply in almost any valuation context (Mattia *et al.*, 2010). The technique includes the contingent valuation method.

1. Contingent Valuation method

CVM is a survey or questionnaire based stated preference method that provides respondents the opportunity to make an economic decision about the market and non-market good. This method has been in use for over 30 years of estimating a wide variety of use and non-use values. It measure non-market values by asking people directly using questionnaires how much they would be willing to pay for the resource, avoid any damages that might be sustained by the resource or compensation for damages (Mattia *et al.*, 2010).

This paper employs the Contingent Valuation Method (CVM) to determine the willingness to pay for improved solid waste management in Dire Dawa city. The CVM utilizes an appropriately designed questionnaire (or experiment) to elicit the valuations or bids of households about a decrease or increase in the amount of an environmental good, and how much they are willing to pay or to accept compensation in order to avoid an environmental damage.

2.1.3 Derivation of welfare measures for improved solid waste management

Change in environmental goods (solid waste management) can affect individual's welfare through changes in prices they pay for private inputs and goods in the market, and changes in the quantities of non-marketed environmental goods like solid waste management. This welfare changes can be measured using ordinary consumer's surplus, which holds income constant but not the level of utility. According to Hicks (1943) the welfare changes can also be measured using compensating surplus, compensating variation, equivalent variation and equivalent surplus. Compensating variation and compensating surplus measure the gains or loss from environmental goods and services, and hold utility constant at the initial level. However, equivalent

variation and equivalent surplus measure welfare change and hold utility constant at some specified alternative level. Generally, these four welfare measures involve either payment or compensation to maintain utility at the specified level (Randall and Stall (1980), cited in Mitchell and Carson 1989). If the proposed change is welfare increasing through changes in the quantity of environmental goods, which is the focus of this study (solid waste management), the appropriate welfare measure is the compensating surplus. This measure can be interpreted as the consumer's WTP in order to gain the quantity increase and still maintain their initial utility level (Mitchell and Carson 1989).

In Hicksian demand curve, the demand function for the public good requires accurate market data. But it is very difficult to obtain accurate market data and therefore, we can use a contingent valuation method, which requires the creation of hypothetical market scenario that is similar to actual market situation for solid waste management. From this method we can generate the WTP data, which will be used to conduct valuation process of the solid waste management without having to estimate the actual demand curve. This concept can be further emphasized from the relationship between the expenditure function and Hicksian compensated surplus measure. According to Haaband McConnell (2002), the expenditure function that provides the theoretical structure for welfare estimation is specified as:

$$M = e(p, q, u) = \min_x \left\{ p \cdot \frac{x}{u(x, u)} \geq u \right\} \dots\dots\dots 1$$

Where: M is the minimum amount of income needed to maintain utility level given the price and the good vectors; q= is the vector of environmental goods; p= is a vector of prices; u= is level of utility when u=V (p, q, y), x= is the vector of private goods and y= income. Let p₀, q₀, u₀, m₀ represent some initial level of those respective arguments and p₁, q₁, u₁, m₁ represent some succeeding levels. We can represent the compensation surplus by

$$WTP = CS = [e(p_0, q_0, u_0)] = m_0 - [e(p_0, q_1, u_0)] = m_1] \dots\dots\dots 2$$

q1 is preferred q0 for proposed new project brings welfare gain. In this case, the compensated surplus (CS) measure tells us the consumers' WTP for welfare gain. Contingent valuation is capable of obtaining the appropriate Hicksian measure for a proposed change in the public good (Mitchell and Carson 1989). It can be viewed as a way of estimating the change in the expenditure function (Haab and McConnell 2002). Coming to the case of this study we could determine the value of solid waste management using household WTP.

2.2 Empirical Literature

The contingent valuation method has been a technique used to elicit respondents' willingness to pay for improved solid waste disposal services in both developed and developing countries reliable results have been found. In Ethiopia, too, some researches undertaken using this method have shown CVM to be an important instrument.

Walelegne (2003) conducted a CVM survey on valuation of improved solid waste management in Addis Ababa. He selected a sample of 500 households using two stage stratified sampling followed by a random sampling applied on each stratum to ensure representativeness. The information on different characteristics of households obtained from the survey was used to test the model that explains WTP for improved solid waste services as a function of income age, sex, education, and number of children, wealth, interest in environmental issues, service provider dummies and starting bids. The results using Ordinary Least Square (OLS) and the result showed that income, education, wealth, and types of service (private versus public) were significant while the remaining repressors were found insignificant in influencing households' WTP for improved solid waste management service.

In a related study, Gebreegziabher, *et al* (2012) estimated households' willingness to pay for improved urban waste management in Mekelle City, Ethiopia, using a cross-sectional survey of 226 randomly selected households. Their study employed Tobit and Probit models in the empirical analysis to determine the factors that influence households WTP for improved Solid Waste management. The mean WTP from their analysis based on their

dichotomous choice questions was ETB 11.89 which is less than US\$ 1. The results of their study revealed that, respondents' WTP for improved solid waste management was significantly related to income and awareness of environmental quality, among other factors.

Asrat (2014) used CVM, based on closed ended with a follow-up format, to estimate households' willingness to pay for improved urban waste management in Dire Dawa City, drawing 300 households at random. The model used in the study, the Tobit model, showed that educational attainment, family size, number of children, income, household work, payment, and housing arrangement had a positive and significant effect on WTP. These literatures have helped for this research to identify the potential socioeconomic, demographic and factors related to the good under consideration that could help to explain willingness to pay.

3. Methodology

The study was conducted in Dire Dawa city. The city was founded in 1902 when the railroad from Djibouti reached the area, and its growth has resulted largely from trade brought by the railroad. Dire Dawa city is city commercial and industrial center located on the Addis Abeba –Djibouti railroad and it is also the second largest urban center in the country (DDGCAB, 2015).

The total population of Dire Dawa Administration is estimated to be 341,834 out of which 68% (233,224) live in urban while the rest 32% (108,610) live in rural areas (CSA, 2007). Average family size in urban households is 4.2 while it is 4.9 in rural households with annual population growth rate of 4.65 percent. The total area of the city is about 681 square miles and it is situated between 9.36 degrees north latitude and 41.867 degrees east longitude (Dire Dawa Government communication Affairs Bureau, 2015).

3.1 Method of Data Collection

This research mainly used a primary data which was collected from the study sites. To obtain information on the socio economic condition of the

households in the city the data is collected through questionnaires having a close ended elicitation format with open ended follow up questions. The CVM questionnaires were posted to the heads of the households with face to face interviews. The questionnaire includes the following socioeconomic aspects. Demographic characteristics (sex and age distribution, marital status, and family size), social situation, economic situation, education, and WTP questions Data from the primary sources was also supplemented by secondary data obtained from Dire Dawa Administration sanitation and beautification, CSA and other sources.

A pilot survey was conducted in all income group areas (low, middle and high) to check its wording, ordering, and timing. Interviewers were supervised by the researcher. In the pilot survey, an open-ended elicitation format was employed to determine the starting bids for improved SWM. Households were asked to state a price they would be willing to pay for improved SWM. This is strategically done to reduce the effect of start-up bias which is normally encountered while using double-bounded dichotomous choice approaches. Based on the pilot results, three starting point prices were introduced.

3.2 Sampling Technique

Once the total sample size is determined, the next step is to decide on how the sampled household is selected. In this study, two stage sampling technique was employed. In the first stage households in each 9 Kebeles were stratified by income groups (based on the CSA data and kebele administrations' information.). This step is very important, because willingness to pay for improved solid waste management involves demand estimation, and its main determinant is expected to be income. Therefore, to have a more reliable estimate of total willingness to pay, we need to stratify households into income groups. In the second stage, households were selected from each of the income group in 9 Kebeles by randomly picking the starting house from the household number lists obtained from the respective 9 kebeles offices. Finally 384 sample households were interviewed from Selection of households from each of the income group in 9 Kebeles is in proportion to the number of households in each Keble (i.e probability proportionate to sample size (PPS)).

3.3 Method of Data Analysis and Respective Empirical Models

To achieve the objectives of the present study, different methods of data analysis were used. The study uses both descriptive and econometric analysis. More specifically, to answer the first and fourth specific objective, a descriptive method of data analysis was used. The descriptive analysis uses percentages, graphs and tabulations to explain and characterize the households' willingness to pay for improve SWM. The second and third specific objectives are answered via empirical models as presented in the next sub-sections. The econometric analysis includes the use of empirical probit and bivariate probit models to examine factors affecting households' WTP for the improve SWM and to analyze the mean values of WTP respectively.

Probit model

Given the binary nature of the data a probit model was used to analyze the factors affecting households' WTP for the improved SWM. The Probit model is among the most widely used members of the family of generalized linear models in the case of binary dependent variables. The analysis employed data that resulted from CVM. Willingness to pay was conceptualized as a consumer choice problem.

Hanemann (1991) developed the basic model to analyze dichotomous responses based on the random utility theory. The key idea of this hypothesis is that although an individual knows his/her utility certainly, it has some parts which are unobservable from the perspective of the researcher. As a consequence, the researcher can only make probability statements about respondent's "yes" or "no" answers to the suggested scenario. Furthermore, following Haab and McConnell (2002), this model specified by indirect utility function for each respondent assuming that the representative household gains utility from the improved SWM in relation to the status quo. Suppose $u_{ij} = u_i(y_i, x_i, \varepsilon_{ij})$ is indirect utility function for i^{th} respondent.

Where, $Y_j = j^{\text{th}}$ respondent's income; $i = 1$ denotes the final state and $i = 0$ the status quo (or the initial state); $X_j =$ vector of household characteristics and attributes of a given choice and $\varepsilon_{ij} =$ random component of the given indirect utility

If a payment, the initial bid, p_i^* is introduced due to changes in a measurable attribute (like in quality or quantity), the consumer accepts the proposed bid only if

$$U_{1j}(y_i - p_i^*, x_i, \varepsilon_{1j}) > U_{0j}(y_i - p_i^*, x_i, \varepsilon_{0j}) \quad (3)$$

For the researcher, however, the random components of preferences cannot be known and he/she can only make probability statement of “yes” or “no” responses. Thus, the probability that the respondent says “yes” is the probability that he/she thinks that he/she is better off in the proposed program.

For individual i, the probability is given by;

$$P(\text{yes}) = P[U_{1j}(y_i - p_i^*, x_i, \varepsilon_{1j}) > U_{0j}(y_i - p_i^*, x_i, \varepsilon_{0j})] \quad (4)$$

By assuming the utility function is additively separable in deterministic and stochastic preferences, we have:

$$U_{ij} = U_i(y_i, x_i) + \varepsilon_{ij}$$

The probability statement for respondent j having the additive specification of the utility function becomes:

$$P(\text{yes}) = P[U_{1j}(y_i - p_i^*, x_i) + \varepsilon_{1j} > U_{0j}(y_i - p_i^*, x_i) + \varepsilon_{0j}] \quad (5)$$

This probability statement provides an intuitive basis to analyze binary responses to initial bid, p_i^* . Therefore, the probability that an individual is willing to pay for the improved SWM can be identified using a probit model given the assumption of normality and Y_i follows standardized normal CDF.

$$P_i = P(Y = 1|X) = P(Y_i^* \leq Y_i) = P(Z_i \leq \beta'_{ix_i}) = F(\beta'_{ix_j}) \quad (6)$$

Where $P(Y=1|X)$ means the probability that an event occurs given the values of the X, or explanatory variables and where Z_i is the standard normal

variable, i.e., $Z \sim N(0, \sigma^2)$. F is the standard normal CDF, which written explicitly as:

$$F(Y_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Y_i} e^{-\frac{z^2}{2}} dz = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\beta_1 + \beta_2 X_i} e^{-\frac{z^2}{2}} dz \quad (7)$$

Since, P represents the probability of households' WTP; it is measured by the area of the standard normal curve from $-\infty$ to Y_i . We take the inverse of equation #16 to obtain the probit model as follows;

$$Y_i = F^{-1}(Y_i) = F^{-1}(P_i) \\ Y_i = \beta_1 + \beta_2 X_i$$

Therefore, the probit model can be specified as:

$$Y_i = \beta'_{iX_j} + \varepsilon_i \quad (8)$$

Where β' is vector of parameters of the model β, X_i is vector of explanatory variables,

ε_i unobservable random component distributed $N(0, \delta^2)$

Y_i = unobservable households' actual WTP for the provision of SWM.

Y_i^* is simply a latent variable but what we do observe is a dummy variable WTP_i , which is defined as:

$$Y_i = WTP_i = 1 \text{ if } Y_i^* \geq p_i^* \\ Y_i = WTP_i = 0 \text{ if } Y_i^* < p_i^* \quad (9)$$

Therefore, the probit model for the determinants of households' WTP for the improved SMW in line with the recommendation made by Amiga 2002; Gebreegziabher *et al*, 2012; Genzago and Guillermo 2013 is specified as:

$$WTP_i = \beta_0 + \beta_1 GDR + \beta_2 AGE + \beta_3 EDU + \beta_4 INCOME + \beta_5 MSR \\ + \beta_6 NCHH + \beta_7 QW + \beta_8 CDH + \beta_9 HA + \beta_{10} BIDV \\ + \beta_{11} RPSW + \beta_{12} LoA \dots \dots + \varepsilon_i$$

Where (GDR) Gender of the household head, (AGE) Age of the household head, (EDU) Education Level of Respondent, (IHH) Monthly Income of the

Household, (MSR) Marital status, (NCHH) Number of children in the household, (QW) Quantity of waste generated, (HA) Housing arrangement, (BIDV) The Initial Bid Values, (LoA) Level of awareness, (CDH) Case of Diseases in the Household, (RPSW) Respondents' perception of current SWM.

Bivariate Probit Model

The main objective of estimating econometric model in WTP survey is to calculate mean WTP and to allow inclusion of respondents' socioeconomic factors into WTP functions. The double bounded (or bivariate) CVM was first proposed by Hanemann (1985) and applied by Hanemann, Loomis and Kanninen (1991) with the main aim to show how the statistical efficiency of single-bounded dichotomous choice pioneered by Bishop and Heberlein can be improved by asking respondents further questions with a higher or lower bid based on the responses to the initial bids (Bane, 2005).

The model used to estimate the mean WTP from the double bounded dichotomous elicitation method with an assumption of the estimated correlation coefficient of the error terms follow normal distributions with zero mean and constant variance distinguishable from zero. According to Greene (2003, p.710), a bivariate probit model is specified as:

$$\begin{aligned}
 Y_1^* &= x_1' \beta_1 + \varepsilon_1 \\
 Y_2^* &= x_2' \beta_2 + \varepsilon_2 \\
 E(\varepsilon_1 / X_1, X_2) &= E(\varepsilon_2 / X_1, X_2) = 0 \\
 Var(\varepsilon_1 / X_1, X_2) &= Var(\varepsilon_2 / X_1, X_2) = 1 \\
 Cov(\varepsilon_1, \varepsilon_2 / x_1, x_2) &= \rho
 \end{aligned}
 \tag{10}$$

Where: y^*_1 = i_{th} respondent unobservable true WTP at the time of the first bid offered. $WTP = 1$ if $y^*_1 \geq \rho i^*$ (the initial bid) 0, otherwise

y^*_2 = i_{th} respondent implicit underlying point estimate at the time of the second bid offered.

x_1 and x_2 = The first and second bids offered to the respondents (from household and SWM related vector, x'_1 , and x'_2) respectively.

ε_1 , & ε_2 , and β_1 & β_2 are error terms & coefficients for the first and second equations of equation #10

In the double-bounded CV format, the respondent is presented with two bids where the level of the second bid is contingent upon the response to the first bid. If the individual responds “no” to the first bid (denoted by ρ_i^*), the second bid is a lower amount $\rho_i < \rho_i^*$, while if he/she responds “yes,” it is some higher amount $\rho_i > \rho_i^*$. Thus, there are four possible outcomes: (a) both answers are “yes,” i.e., (Yes, Yes); (b) a “yes” followed by a “no,” i.e. (Yes, No); (c) a “no” followed by a “yes,” i.e., (No, Yes); and (d) both answers are “no,” i.e., (No, No). Following Hanemann, Loomis, and Kanninen (1991), the probabilities of these response outcomes can be expressed as:

$$\begin{aligned}
 Pr \{yes/yes\} &\equiv p(\rho_u \leq y_i) = G(\rho_u; \theta), \\
 Pr \{yes/No\} &\equiv p(\rho_i^* \leq y_i < \rho_u) = G(\rho_u; \theta) - G(\rho_i; \theta), \\
 Pr \{No / yes\} &\equiv p(\rho_i \leq y_i < \rho_i^*) = G(\rho_i^*; \theta) - G(\rho_i; \theta), \\
 Pr \{No / No\} &\equiv p(\rho_i > y_i) = 1 - G(\rho_i; \theta)
 \end{aligned} \tag{11}$$

Where, $G(\rho_i^*; \theta)$ denotes the cumulative probability distribution (e.g., normal or logistic) of the bid with the parameter vector θ .

The respondents know their own maximum WTP, y_i^* but to the researcher it is a random variable with a given cumulative distribution function (CDF) denoted by $G(y_i^*; \theta)$ where θ represents the parameters of this distribution, which are to be estimated on the basis of the responses to the CV survey. In the double bound elicitation method given a sample of N respondents, the log-likelihood function for the responses to a CV survey is specified as:

$$\ln L^{DB}(\theta) = \sum_{i=1}^n \{ d_i^{YY} \ln G(\rho_u; \theta) + d_i^{YN} \ln [G(\rho_u; \theta) - G(\rho_i^*; \theta)] + d_i^{NY} \ln [G(\rho_i^*; \theta) - G(\rho_i; \theta)] + d_i^{NN} \ln [1 - G(\rho_i; \theta)] \} \tag{12}$$

Where: $d_i^{YY} = 1$ if the i_{th} response is (Yes, Yes) and 0 otherwise; $d_i^{YN} = 1$ if the i_{th} response is (Yes, No) and 0 otherwise; $d_i^{NY} = 1$ if the i_{th} response is (No, Yes) and 0 otherwise; $d_i^{NN} = 1$ if the i_{th} response is (No, No) and 0 otherwise.

The maximum-likelihood (ML) estimator for the double-bounded model is the solution to the first-order condition,

$$\frac{\partial \ln LDB(\theta)}{\partial \theta} = 0 \quad (13)$$

According to Haab and McConnell (2002), for the double bounded CV, the mean WTP for the improved SWM (μ) is given by;

$$\mu = \frac{-\beta_0 + \sum_{i=1}^m \beta_i \mu_i}{\beta} \quad (14)$$

Where β_i are the coefficient of the i^{th} explanatory variable μ_i - Are the mean of the i^{th} explanatory variable for the improved SWM. β_0 is the intercept (constant) term and β is the coefficient of the bid proposed to the respondent. Bivariate probit model estimation deliver two parameter estimates from the two rounds of bidding game. However, parameter estimates from the first equation (β_0) are generally used in the computation of mean WTP. This is due to the fact that the second equation parameters are likely to contain more noise in terms of anchoring bias where the respondents is assumed to take the cue from the first bid while forming his response for the second question. Other explanatory variables such as socioeconomic variables are omitted from double-bounded model as most of them are statistically insignificant in the second equation (Palanisami, Ranganathan, Udaya, 2014). Therefore, the mean WTP for the improved SWM is,

$$\mu = \frac{\beta_0}{\beta_1} \quad (15)$$

For the open ended contingent valuation survey responses the maximum willingness to pay figures reported by the respondents can be simply be averaged to produce an estimate of mean willingness to pay:

$$\text{Min WTP} = \sum_{i=1}^n (y_i/n) \quad (16)$$

Where n is the sample size and each y is reported willingness to pay amount by surveyed households for the improved SWM (Haab and McConnell, 2002).

4. Results and Discussions

4.1 Level of Public Awareness and Participation in Solid Waste Management

From the total surveyed households, about 37% of the households were aware of the waste disposal practices undertaken by Dire Dawa Administration, while 63% of the respondents surveyed had no idea

Table 2: Distribution of respondents on the level of awareness about waste disposal practices undertaken by Dire Dawa administration

Particulars	Number of Households	Willing	Not willing	Difference <i>t/x2 test</i>
		No=329 Percent	N =55 Percent	
Aware about the current waste disposal practices undertaken by the Dire Dawa Administration	36.98%	0.39	0.25	0.14
Having no idea regarding waste disposal practices undertaken by the Dire Dawa Administration	63.02%	0.61	0.74	-0.13

Source: own survey, 2016

The below figures represent the distribution of respondents on the basis of their knowledge and practice of waste segregation. Segregation means simply the process of separating waste into bio-degradable and non-bio degradable. Questions regarding segregation were made in order to understand the awareness of people about the basic tools of waste management like segregation. According to Dire Dawa Administration Sanitation and Butiefcation Agency waste segregation at source would solve almost 60-70 % of the waste management problem which the Dire Dawa city was facing. Segregation would automatically reduce waste generation as the organic waste could be composted and the dry inorganic waste could be given up for recycling.

On conducting the survey it was found that 24.74% of the surveyed respondents knew the meaning of segregation, while 75.26 % of the respondents had no idea or had never heard about segregation before.

Almost 2.6 % of the total interviewed respondents practiced segregation at their houses whereas around 97.4% did not. It was found that even respondents who knew the concept of household waste segregation did not practice it. Out of 24.74% who knew about segregation only 10.53 % practiced it

Figure 1: Distribution of respondents on the basis of their knowledge and practice of segregation

Figure 1.a

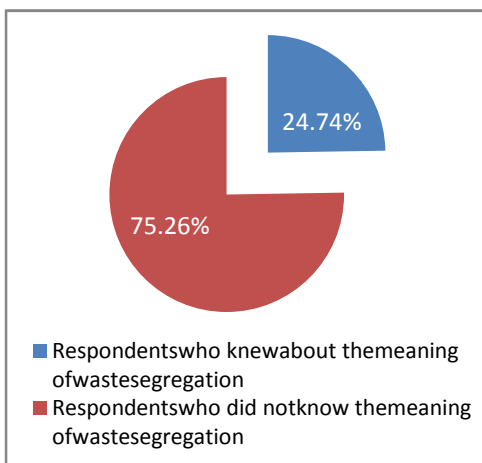
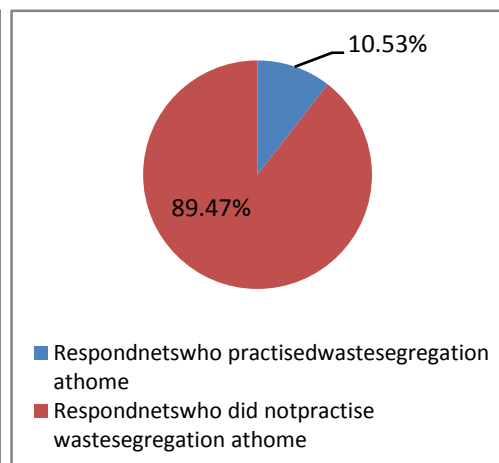


Figure 1.b



Source: Own survey, 2016

4.2 Probit Model Estimation Result

The study tested the joint significance of explanatory variables by using Wald test. The Wald test which takes a chi-squared (χ^2) distribution with 12 degrees of freedom is about 65.89 with a p-value ($\text{Prob} > \chi^2$) 0.0000 tells us the Probit model as a whole is statistically significant, as compared to the model with no predictors. From χ^2 distribution Table with 12 DF the critical value is 5.23 at 1% level of significance. The null hypothesis that all the coefficients of the independent variables are simultaneously equal to zero is rejected at 1%

level of significance. Another method of goodness of fit is pseudo R2, which measures how well the model fits the data and it is 0.5465 for this study showing the good model fit.

Table 3: The probit model estimation (with robust standard error)

Dependent variable is discrete response (yes=1/no=0) to willingness to pay						
9.5	Coefficient	Std.err	z-value	p>z	(95% confidence interval)	
GDR ^a	-0.1115257	0.2394626	-0.46	0.645	-0.5797643	0.3589117
AGE	0.0168935	0.0098581	1.68	0.092*	-0.0027348	0.0359081
MARSTS ^a	0.7039727	0.2238465	3.14	0.002***	0.2652415	1.142704
NOCHLD	0.8896827	0.2190152	4.06	0.000***	0.4604207	1.318945
EDUC	0.3703505	0.1906385	1.94	0.052*	-0.003294	0.743995
INCOME	0.0007515	0.0002378	3.16	0.002***	0.0002856	0.0012178
HSOWN ^a	-0.2486337	0.2363326	-1.05	0.293	-0.7118371	0.2145698
WGQUN	0.2440653	0.2598271	0.94	0.348	-0.2651864	0.753317
PERC ^a	0.8350766	0.2255765	3.7	0.000***	0.3929548	1.277198
AWER ^a	0.1336059	0.2590465	0.52	0.606	-0.374116	0.6413278
DISCASE ^a	1.300097	0.3786785	3.43	0.001***	0.5579005	2.042293
BIDV	0.0132579	0.058028	0.23	0.819	-0.1004748	0.1269907
Con	-2.833425	0.6769714	-4.19	0.000	-4.160264	-1.506585
Number of obs	384					
Log pseudolikelihood	-71.532713					
Wald chi2(12)	65.89					
Pseudo R2	0.5486					
Prob> chi2	0.0000					

*significance at 10%, ** significance at 5%, ***significance at 1%,

Source: Stata output, 2016

The probit model estimation result shows that among the variables included in the model six variables have the expected sign and more than half of them were found to be significant in affecting WTP decision. These include age of the household head, marital status, number of children, education, household income, perception and Case of Disease in the Household. All significant variable age of the household head, marital status, number of children, education, household income, perception and Case of Disease in the Household affect WTP decision positively.

In the probit model estimation, only the sign of the variable are important since the magnitude does not show the effect of each independent variable on the probability of households' WTP for the improved solid waste management. In order to analyze the effects of each explanatory variable on the probability those respondents willing or not willing to pay for the improved solid waste management, the partial derivatives of explanatory variables with respect to discrete responses must be taken (Greene, 1993). i.e., we need to estimate the marginal effects.

Table 4: Marginal effect estimates of the probit model (with robust standard error)

Variables	Dependent variable is discrete response (yes=1/no=0) to willingness to pay						
	dF/dx	Std. Err.	Z	P>z	x-bar	(95% confidence interval)	
SEX ^a	-0.0008268	0.0021295	-0.46	0.645	0.372396	-0.00623	0.004159
AGE	0.0001189	0.0001392	1.69	0.092*	43.5781	-0.000171	0.000472
MARSTS ^a	0.0079239	0.0092365	3.23	0.002***	0.666667	-0.011088	0.030996
NCHLD	0.0063783	0.0063242	4.05	0.000***	1.09115	-0.006268	0.021868
EDUC	0.0026551	0.0028185	1.68	0.052*	1.08073	-0.005568	0.015397
INCOME	5.39E-06	5.59E-06	3.21	0.002***	2560.93	-5.10E-06	0.00002
HSOWN ^a	-0.0017788	0.0027114	-1.29	0.293	0.528646	-0.009489	0.004217
WGQUN	0.0017498	0.0028308	0.92	0.348	1.30508	-0.00421	0.008447
PERC ^a	0.0068677	0.0073506	3.63	0.000***	0.476563	-0.007654	0.02384
AWER ^a	0.0009165	0.0021645	0.69	0.606	0.369792	-0.004037	0.007061
DISCASE ^a	0.0084287	0.0078026	3.43	0.001***	0.346354	-0.006893	0.028151
BIDV	0.000095	0.0004177	0.37	0.819	10.6979	-0.000871	0.001262
Number of obs		384					
Log pseudolikelihood		-71.532713					
Wald chi2(12)		65.89					
Pseudo R2		0.5486					
Prob> chi2		0.0000					

*significance at 10%, ** significance at 5%, ***significance at 1%,

(^a) dF/dx is for discrete change of dummy variable from 0 to 1

Source: Stata output, 2016

Unlike to the prior expectation, age of the household has a positive and statistically significant effect at 10% level of significance on the households' decision to pay for the improved solid waste management. The marginal effect shows that, other things remain constant a one year increase in the age of the household head increases the probability of willingness to pay by 0.011% indicating that older citizens have more willingness to pay for the SWM. This suggests as people get older; they tend to understand the need to keep a clean environment. In addition, they may also know that access to funds by waste management organization can improve their services. This result is consistent with findings of Afroz *et al* (2009) but contradicts the findings of Aggrey & Douglason (2010).

Asrat, (2014) found that age of the household head have effect on willingness to pay but that affect was insignificant in his study, this shows that then positive and significant effect of age of the household head is sound in this study.

Education has positive and statistically significant effect on willingness to pay at 10% level of significance. The marginal effect of education shows that holding other things remain constant, a unit increases in the year of education increases the probability of willingness to pay by about 0.26%. This result seems straightforward and reasonable since year of education could be related to a better understanding of the problem of solid waste. As individuals receive higher education, they tend to understand the need for waste management better. This result is consistent with the findings of Afroz *et al* (2009) & Ahmad *et al* (2009).

Households' income has a positive and statistically significant effect at 1% level of significance on willingness to pay which is consistent with economic theory. The marginal effects shows that keeping the influences of other factors constant at their mean value, a one birr increase in income of the respondent increases the probability of willingness to pay by about 0.001%. This implies that a household with a higher income is willing to pay more for the improved solid waste management. This is consistent with economic theory that indicates that income is positively related with demand in general and the

same with environmental demand. Therefore, as we expected, income has a significant effect on willingness to pay.

Respondents perception of current solid waste management was found to have a positive impact on willingness to pay for improved solid waste management and significant at 1%. The positive relationship indicates that households who are not satisfied the current SWM system will be more willing to pay than households who satisfied with the current solid waste management system. The marginal effect of respondents' perception of current SWM shows that keeping other variable constant, changing the perception dummy from 0 to 1 will increase the probability of willing to pay by about 0.68%.

Marital status has a positive and statistically significant effect at 1% level of significance on willingness to pay. The marginal effect of marital status shows that keeping other variable constant, changing Marital status dummy from 0 to 1 will increase the probability of willing to pay by about 0.79%. This implies that married households are more responsible and have higher WTP than the unmarried ones.

Number of Children in the household has a positive and statistically significant effect at 1% level of significance on willingness to pay. Holding other things remain constant, a unit increases in the Number of Children in the household increases the probability of willing to pay by about 0.63%. This implies that more children one has, the more could be the probability of being a victim of mishandling solid waste and hence the household willing to pay more. This suggests that positive relationship can also be the result of bequest value. The more children one has, the more bequest value he/she would expect, and hence the more the willingness to pay to make the city cleaner for the future generation.

Case of disease in the household has a positive and statistically significant effect at 1% level of significance on willingness to pay. This suggests that those household members who are affected by disease in the past are more willing to pay for the improved solid waste management than those who were not affected. This may be the reason for their concerns about their family's health; they may not have the enough time to properly manage their waste.

The marginal effect shows that, when the health dummy changes from 0 to 1, the probability of the household willing to pay for the improved solid waste management increase by 0.84%.

4.3 Bivariate Probit Model Estimation Results

The bivariate probit model estimation is a first step in the estimation of households' mean willingness to pay for the improved solid waste management. These bivariate probit models (or the double-bounded probit models) are estimated using households' responses to the first and the second bids.

Table 5: Bivariate estimates for the Improved SWM

Variables	Coefficient	Std.err	z-value	p>z	(95%confidence interval)	
<i>Dependent variable (yes/no1=1 if yes to the initial bid, 0 otherwise)</i>						
Initial bid	-.0592728	.011145	-5.32	0.000	-.0811166	-.0374289
Constant	.8911981	.1369723	6.51	0.000	.6227372	1.159659
<i>Dependent variable (yes2=1 if yes to the second bid, 0 otherwise)</i>						
Second bid	-.0238091	.012039	-1.98	0.048	-.0474052	-.0002131
Constant	-.2366343	.1405291	-1.68	0.092	-.5120663	.0387976
Athrho	3.400349	22.5229	0.15	0.880	-40.74373	47.54443
Rho (ρ)	.9977765	.100049			-1	1
Wald chi2(2) =	30.46					
Prob> chi2 =	0.0000					
Log likelihood =	-402.90202					
Likelihood-ratio test of rho=0: chi2(1) = 155.219 Prob> chi2 = 0.0000						
<i>Source: Stata output, 2016</i>						

Table 5 shows the bivariate probit model result for which the initial bids and the second bids have the expected signs and statistically significant at most at 5% level of significance. Implying that higher initial bids and second bids lead to lower probability of accepting the bids. Therefore, the initial bids and the follow up bids of the improved solid waste management have a negative and significant effect in determining households' amount of WTP.

The correlation coefficient of the error terms of the double-bounded model, Rho (ρ) which shows the relationship between the random components of the

responses to the initial bids and the second bids are positive and statistically significant at 1% level of significance. Less than unity value for Rho (ρ) implies that the correlation between the random components of the responses to the initial bids and the second bids are not perfect. The result is consistent with economic theory and the empirical works of Falola *et al*, (2013), and Mezgebo *et al*, (2013).

Based on the pilot survey results three starting point bid values were identified and introduced to the households based on income category. The first question the respondent asked is their willingness to pay for the improved solid waste management at the initial bid. The households who accepted the first bid, were given a second bid, which is higher than the first bid. On the other hand, if the interviewee say ‘no’ to the initial bid, they would be asked a follow up question which is lower than the initial bid values.

Table 6 summarizes the bids and responses to the double-bounded questions. For each bid offered for the improved SWM, there are two possible responses. The first row summarizes the “yes” responses to the initial bid and the “yes-yes and yes-no” response to the second bid for the improved SWM. Likewise, the second row summarizes the “no” response to the first bid and the “no-yes and no-no” response to the second bid for the improved SWM.

For the initial bid values of Improved SWM, 69.91% respond “yes” and 30.09% respond “no” (i.e. 69.91% of the households were willing to pay at the initial bid value and 30.09% rejected the proposed bid). Of the 69.91% “yes” responses to the initial bid for Improved SWM, the follow-up bid results in 52.17% “yes” responses and 47.83% “no” responses. Of the 30.09% “no” responses to the initial bid for Improved SWM, the follow-up bid results in 30.09% “yes” responses and 0% “no” responses.

(i.e. 52.17% of the household who were willing to pay the initial bid value again says yes for the next increased bid price, indicated by “yes-yes” (YY) response. The rest 47.83% of the households say no to the next increased bid price (YN) though they were willing to pay for the initial bid value. The rest of the cells of the table interpreted in a same fashion.

Table 6: Summary of the Improved SWM bid responses to the double-bounded questions

Unwilling household 14.32%	
Willing household 85.68%	
Initial bid	Second bid
	52.17% (YY)
69.91% (Y)	47.83% (YN)
	30.09% (NY)
30.09% (N)	0 (NN)

Source: own survey, 2016

From Table 6 we can understand that, households are more willing to pay for the initial bid value of Improved SWM. In this cases, the ‘yes’ response to the second bid is lower than the initial bid values. This is in line with the economic theory, the higher the bid value ends up with the lower the WTP (yes response to the follow up bid).

From the total sample of respondents, 85.68% households were found to be willing to pay for the proposed bid for the improved SWM. The remaining 14.32% are not willing to pay Improve SWM.

In this study based on Boyle (2003) criteria, about 47.3% and 52.7% of the unwilling sampled households were categorized as genuine zero and protest zero bidders respectively. Inclusion of protest zero bidders’ in the estimation of mean and aggregate WTP results in biased aggregate demand values. Though, there are a number of arguments on how to treat, the protest zero bidders, exclusion of the protest bidders from the estimation is the most common and results in more robust value. Therefore, this study exclude household with zero bid responses in the estimation of the aggregate demand for the improved SWM.

Estimation of mean WTP, total WTP and aggregate demand for the improved SWM

Estimation of mean WTP, total WTP and aggregate demand for the improved SWM are computed using bivariate probit model estimated coefficients of the bid values. The next table summarizes the mean and total WTP of the households' from the open ended and double bounded responses to the bid values.

Table 7: Summary of households' mean and total WTP for the open ended & double bounded question

SWM	Total Household	Double Bounded		Open Ended		
		Mean WTP1	Mean WTP2	Total WTP	Mean WTP1	Total WTP
Improved SWM	50,936	15.03	9.94	765,568.08	9.82	500,191.52

Mean WTP1 and WTP2 are mean WTP for the improved SWM computed using initial and follow up bid. Source: own survey, 2016

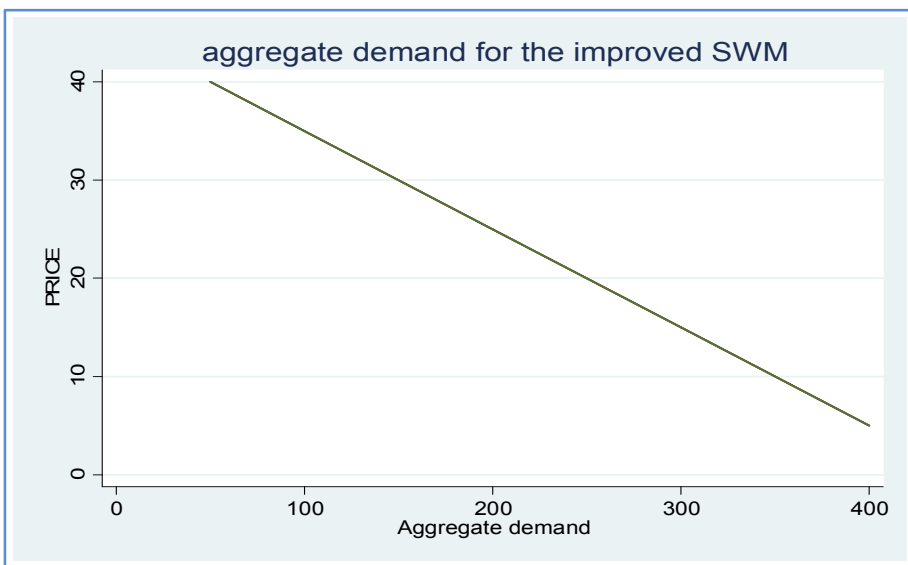
Based on the double-bounded model estimates, the mean WTP varies from 15.03 birr to 9.94 birr for the improved SWM. The mean WTP of the households from the open ended elicitation is 9.82 birr. This shows that, the mean WTP from the open-ended elicitation is clearly lower than the double bound elicitation mean WTP (mean WTP1 which calculated at the initial bid value) in all cases.

The aggregate demand for the improved SWM is also lower for the open ended elicitation than the double bounded method. Possible explanation for this lower mean WTP from the open ended response may be that, households' want to benefit from the free riding or free service provision by the government.

The total economic benefits that can be obtained from the improvement SWM are considered as a total WTP (aggregate benefit). However, Mitchell and Carson (1989) indicates that, before computing total WTP, we should be careful on population choice bias, sampling frame, sample non response bias, and sample selection biases to have valid aggregation of benefits. Using of random sampling method in selection of the final household, using in person interview, exclusion of protest zero bidders, using of mean WTP for

measuring aggregate value minimize the occurrence of such biases and hence valid estimation of aggregate demand (Mezgebo *et al*, 2013).

Total WTP for the improved SWM computed by multiplying the mean WTP (from both open-ended and double bounded responses) by the total number of households (Mezgebo *et al*, 2013). Following this, the total WTP for the improved SWM from the double bounded response is 765,568.08 birr .Using the open ended elicitation, the total WTP for the improved SWM is 500,191.32 birr.



The negatively sloped aggregate demand curves for the solid waste management: it is in line with the economic theory of demand. This implies an increase in the price of the improved solid waste management decreases the quantity demand for the improved solid waste management, other things remain constant.

5. Conclusions and Recommendation

In Dire Dawa city, solid waste management service is mainly provided by the municipality and it has been measured and evaluated based on the role and performance of the service provider (supplier of the service). This in turn, has

put limit to achieve sustainable solid waste management in the city. Therefore, the service beneficiary needs to pay for the improved SWM service. Yet, to improve the service, demand side information including WTP is necessary. Hence, the main objective of the study is to assess whether or not households demand an improved SWM service to solve the problem that they face and to identify factors that determine their WTP decision and the WTP amount for the suggested improved SWM service.

This study analyzes the households' willingness to pay. The study used 384 sample household heads. To elicit households' WTP for improve SWM, the study used double bounded elicitation method with an open ended elicitation format of the contingent valuation method.

The descriptive analysis shows that in the study areas 86% of the households are willing to pay for the improved solid waste management.

The Probit model which used a data from the CV survey shows that, households where not satisfied by the current SWM system (perception) have positive and significant effect at 1% level of significant in affecting the probability of households' WTP for improved SWM. Age of the household head have positive and significant effect at 10% level of significant, marital status have positive and significant effect at 1% level of significant, number of children have positive and significant effect at 1% level of significant, education have positive and significant effect at 10% level of significant, household income have positive and significant effect at 1% level of significant, and Case of Disease in the households have positive and significant effect at 1% level of significant in affecting the probability of households' WTP for improved SWM. The implication is that, households where affected by a disease caused by inappropriate solid waste management, have more children member, married households, high income earner, educated households, relatively aged households are more likely to be willing to pay for improved SWM. Thus, age of the household head, marital status, number of children in the household, education, household income and Case of Disease in the Household are enhance the need for solid waste management.

The mean and total WTP which is calculated from the bivariate probit model shows that, the mean WTP for the improve SWM is 15.03 birr and 9.82 birr using open ended elicitation method. This shows that the mean WTP computed from the open ended elicitation is lower than the mean values from the double bounded elicitation.

The total benefit (aggregate demand) for the improve SWM calculated from the double bounded elicitation is 765,568.08 birr. The total WTP for the improve SWM using the open ended elicitation method is 500,191.52 birr. This also shows that the total WTP computed from the open ended elicitation is lower than the total WTP computed from the double bounded elicitation. The implication may be households want to benefit from free riding and a discount rate provision of SWM. Finally, the study concludes that there is a room for improving SWM service system at household level in Dire Dawa city.

Following the results from descriptive and econometric analysis, the following policy implications are forwarded as alternatives for the improved solid waste management.

It has been noted that households are willing to pay for improved SWM and to boost such level of households WTP for improve SWM further and households should be educated on effective solid waste disposal through regular sensitization programmes by a collaborative effort of key stakeholders in the solid waste management such as local government, the private sector, NGOs and residents is important. Designing a way to increase the income of the household, government should create more employment opportunities so that people can earn regular income. In addition government and various stakeholders should make efforts towards improving residents' income as willingness to pay relates positively to income.

The strong positive relationship between the marital status, Case of disease, number of children, and perception of current SWM and their willingness to pay for the improved SWM. Policy makers should consider these variables in designing improved SWM services in Dire Dawa city.

The lower households' mean WTP values of the open ended elicitation comparing to the double bounded elicitation may indicate that households want to benefit from the discount rate provision of SWM by the government and hence it is advisable for the policy makers to carefully select the target elicitation technique to question households' WTP.

Generally, this study examined the demand side of the SWM. To have a complete picture of the economic values of SWM. Furthermore, we had seen that household's value improve SWM even more than what the current market price, efficient and better solid waste management service can be provided in the city.

References

- Afroz, R., Hanaki, K. & Hasegawa-Kurusu, K. (2009). Willingness to pay for waste management improvement in Daka city, Bangladesh. *Journal of Environment Management* 90 (2009) 492-502
- Aggrey, N. & Douglasson, G. O. (2010). Determinants of willingness to pay for solid waste management in Kampala City. *Current Research Journal of Economic Theory*, 2(3), 119- 122.
- Ahmad, I., Khan, J., & Naeem Ur Rehman, K. (2009). An Analysis of Willingness to Pay for Better Solid Waste Management Services in Urban Areas of District Peshawar. *Sarhad Journal of Agriculture*, 25 (3), 529-535.
- Ahtiainen, H. (2007). The Willingness to pay for reducing the harm from future oil spills in the Gulf of Finland- n application of the contingent valuation method. Discussion Papers n:o 18, Department of Economics and Management, University of Helsinki.
- Alebel, B., Weldeeslassie, C., Frör, O., Boelee, E., & Dabbert, S. (2009). The economic value of improved wastewater irrigation: a contingent valuation study in Addis Ababa, Ethiopia. *Journal of Agricultural and Resource Economics*, 428-449.
- Amiga, A. (2002). *Households Willingness to Pay for Improved Solid Waste Management: The Case of Addis Ababa*. Retrieved August 12, 2014, from [http:// etd. aau. edu.et/dspace /bitstream/1 23456789/762/1/ AKLILU%20AMIGA.pdf](http://etd.aau.edu.et/dspace/bitstream/123456789/762/1/AKLILU%20AMIGA.pdf).
- Asrat, P. (2014). Households' willingness to pay for improved solid waste management: the case of Dire Dawa. Dire Dawa, Ethiopia.
- Bane, J. (2005). Valuing non-agricultural uses of irrigation water: empirical evidences from the Abbay River-Basin of the Amhara Regional State, Ethiopia.
- Bartone, C. and Bernstein, J. (1993). Improving Municipal Solid Waste Management in Third World Countries". *Resources, Conservation and Recycling*; 8; 43-45.
- Carson, R (2000). Contingent Valuation: A Users Guide. *Environment. Environ. Sci. Technol*, 34 (14), 13-1418.
- Carson, R (2012). *Contingent Valuation: A Comprehensive Bibliography and History*. Edward Elgar Publishing.
- Carson, R. T., & Hanemann, W. M. (2005). *Handbook of Environmental Economics*, Vol. 2. (K. G. Vincent., Ed.) Elsevier B.V.
- Crooper, M., & Oates, W. (1992). Environmental Economics. *A survey Journal of Economic Literature*, 30 (2), 675-740.

- Dire Dawa Sanitation and Beautification Agency (2014). House–House collection and estimate sanitation fee proposal. Dire Dawa, Ethiopia.
- Falola, A., Ayinde, O., & Agboola, B. (2013). Willingness to take agricultural insurance by cocoa farmers in Nigeria. *International Journal of Food & Agricultural Economics*, 1(1), 97-107.
- Freeman, A. M. (2003). The measurement of environmental and resource values: theory and methods. Resources for the Future.
- Gebreegiabher, Z., Hagos, D., & Mekonnen, A. (2012). Households' Willingness to Pay for Improved Urban Waste Management in Mekelle City, Ethiopia. Environment for Development, Discussion Paper Series.
- Genzago, L., & Guillermo, L. (2013). Who should shoulder the cost on Solid Waste Management: The case of Urbanizing Municipality Solid Waste Management Schemes. . *51st Annual Philippine Economic Society Meeting*.
- Greene, W.H. (2003). *Econometric analysis* (5th ed.). Pearson education, Inc., Upper Saddle River, New Jersey, 07458
- Gujarati, D.N. (2004). *Basic econometrics* (4rd Ed.). McGraw-Hill, Inc.
- Gundimeda, H. (2012). *Forests, sustainability and poverty in India. Environment and Development Economics*, Cambridge University Press. 17(03), 373-378.
- Haab, T.C. and McConnell, K. E. (2002). Valuing Environmental and Natural Resources: The Econometrics of Non-Market Valuation, New Horizons in Environmental Economics Series. Edward Elgar Publishing.
- Haile, C. (2013). Evaluation of solid waste management in Dire Dawa city. Dire Dawa, Ethiopia.
- Hales, A. (2013). Fundamentals of Environmental Economics. New Delhi: Random Exports.
- Hanemann, W. M. (1991). Willingness to Pay and Willingness to Accept: How Much Can They Differ? *The American Economic Review*, Vol. 81, No. 3, 635-647
- Hastings, V., Tolley G., & Rudzitis, G. (1978). Economics of Municipal Solid Waste Management: The Chicago Case. Cincinnati: United States Environmental Protection Agency.
- Mezgebo, A., Tessema, W., & Asfaw, Z. (2013). Economic Values of Irrigation Water in Wondo Genet District, Ethiopia: An Application of Contingent Valuation method. *Journal of Economics and Sustainable Development*, 4(2), 23-36.
- Niringiye, A., & Omortor, G. (2010). Determinants of Willingness to pay for Solid Waste Management in Kampala City. *Current Research Journal of Economic Theory*, 2 (3), 119-122.
- Rahji, M. A. Y. & Oloruntoba, O. (2009). Determinants of households' willingness-to-pay for private solid waste management services in Ibadan, Nigeria. *Waste Manage Res* December. 27 (3), 961-965, 2009.

- Rahman, M., Salequzzaman, M., Bahar, M., Uddin, N., Islam, A. & Al Hrun, A. Y. (2005). People's perception of the existing solid waste management of Khulna City Corporation (KCC) Area.
- United Nations Environment Program (UNEP). 2004. The Use of Economic Instruments in Davis, Mackenzie L, and David A. Cornwell (1998). Introduction to Environmental Engineering. pp. 630-690. Boston: McGraw-Hill, 1998.
- United Nations Environment Program (UNEP). (2009). Developing Integrated Solid Waste Management Plan. Assessment of Current Waste Management System and Gaps therein.
- Walelegne, D. (2003). Public Valuation for Improved Solid Waste management in Addis Ababa: Affordability and Willingness to Pay Analysis, Addis Ababa, Ethiopia.