Drivers Of Deforestation Andtheirimpact On Farmers Livelihood In Selectedvillages Ofachefer Liben Woreda, West Gojam Zone,

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Abstract: Ethiopia has been subjected to extensive deforestation. This phenomenon is seriously affecting the livelihood of people in various ways. According to the reports of North AcheferLibenWoreda Agriculture and Rural development office (2015), the causes and consequences of deforestation is not well known among the local communities of AcheferLibenworeda. The purpose of this study was to assess the drivers of deforestation and their impact on farmers residing around Won Beria Mountain. To determine sample from population, Yamane (1967) formula was used. Sample size among four villages was determined using proportionality principle. Then, 246 sample households were selected using simple random sampling technique. Primary data were gathered from household survey, through Questionnaires, interview and FGD. Secondary data were also gathered from Land sat image, legal documents, reports, articles, journals, magazines, library books and different web sites that are related to under the study. Thedatafromhousehold headswere organized and then analyzed usingdescriptiveand inferential statisticaltechniques by the help of SPSS 20 software. Moreover, data were also analyzed through image processing, post classification of Land sat image, with the implementation of Arc GIS. Based on this the following findings were investigated; the status of forest is decreasing from time to time. The basic reasons for such extensive deforestation were; agricultural expansion, wood extraction, and producing forest for income generation..As a domestic fuel, totally seven sources of fuel has been used for cooking and non-cooking activities. The predominant energy source that were consumed by almost all household respondents was fuel wood. Due to the prevalence of deforestation, households were additionally spending an average of 2hours and fourteen minute for one round fuel wood collection than they were spending before ten years ago. Due to the prevalence of deforestation, productivity of the land was found to be decreasing from time to time. As the consequence of these, respondents were forced to use commercial fertilizers for improving their production and hence posing a challenge to cover the costs of chemical fertilizers each year. Furthermore, change in chemical properties of soil was also found to be another negative effect of applying chemical fertilizers. Moreover, both indigenous trees species and animals were becoming extinct in the study area. The overall results show that; providing job opportunity, alternative cook stove technology; creating awareness about the long term impacts of deforestation to rural people, require the attention of government institutions and NGOs.

Keywords: Deforestation, Drivers, Land Sat Image, Livelihood.

1. INTRODUCTION

Deforestation is the conversion of forest to an alternative permanent non-forested land use such as agriculture, grazing or urban development [18]. Deforestation is also an alarming challenge in the Amhara region where the loss of approximately 2 to 4 billion tonnes of soil annually leaving between 20,000 to 30,000 hectares of land unproductive **[17].**The cause for environmental degradation, coupled with the effects of a long history of settlement, prevailing farming methods and increasing population pressure which forces people to cultivate even steeper slopes have exacerbated the devastating land and resource degradation in the region **[3].** One of the major challenges is environmental degradation emanating from population pressure, land use (insecure land tenure, small land size, and land fragmentation), weak agricultural research and extension services, and lack of infrastructure, weak institutions, and a low level of technology use and inadequate input supply and marketing systems [16]. And also another factor is firewood collection, conservation to farm land, overgrazing and use of forest for building materials particularly in the highlands of the country [**6].**It is estimated that between 2000 and 2008, 80% of new agricultural land was converted from forests, woodlands or shrub lands. Fuel wood is also largely free access and a major source for household energy in Ethiopia. It is estimated that 90% of the country's total energy for household cooking is derived from biomass fuels, of which 78% come from fire wood **[4].** Ethiopia's government has been largely ineffective at regulating around the use of common property which in turn continues to put pressure on forests, resulting in the severe degradation of land resources **[7], [15].**Wonberiya mountain forest, which is found in North Achefer Woreda, covers an area of about 107 hectares. The forest is surrounded by four peasant association (Pas) or village namelyMenigesech, Shemakicha, Kashanikurit and Buahetwith total population of 640 according to North Acheferliben-Woreda agriculture office. According to the annual report of North AcheferlibenWoreda agriculture and development office **[12]** the forest is by now cleared by the society living around it. To reduce this destruction, according to the data collected from AcheferLibenWoreda Agriculture and Rural Development Office, indicated that government tried to reduce deforestation in the study area by establishing participatory forest management. However, According to the annual

report of **[12]** there is a continued destruction of this forest by the society living around it. Thus, this study area forest cover change for the past 34 years to the present and it will address important issues relation to the driver of deforestation as well as its implication of rural livelihood. Besides, the drivers of deforestation and its consequences were not well known by the rural people in the study area. So, the researcher aim was to asses drivers of deforestation and its implication on rural livelihood in order to reduce the existing gaps and to find a solution for a more viable and sustainable forest management in the study area.

2. METHODOLOGY AND METHODS

2.1. Description of the Study Area

Astronomical and Relative location:-The study area is astronomically located between $11^0$15'00''N -$11^0$55'00''N and $36^0$30'00''E-$37^0$15'00''E and relatively Acheferworeda is located North of DanglaWoreda, North west of MerawiWoreda, West of Bahir Dar South west of Lake Tana, South & SouthEast of Alefa Woreda.

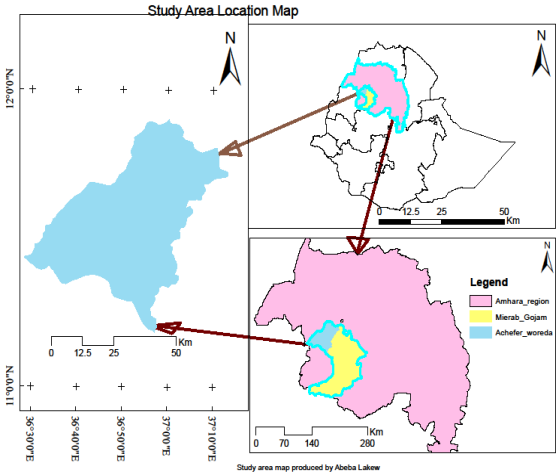

Figure 1: *Map of Ethiopia, Amhara regional State and Study area*

2.2. The Research Design

This research employed a mixed approach of both quantitative and qualitative methods to assess the drivers of deforestation and its implication on rural livelihood in AcheferLibenWoreda. Therefore, quantitative as well as qualitative data collected in the form of close ended, open question, semi-structured interviews, and focus group discussion. For this reason, it was necessary to use a mixed method approach by coding data in two ways: quantitative and qualitative.

2.3. Sampling Techniques

Multi stage sampling technique was used to this study. In the first stage; purposive sampling was used to select North AcheferLiben Woreda among 10 rural Woredas and 1 City administration that were found in West Gojam Zone because of two reasons. The first one is the existence of forest resource coverage along with deep problem of deforestation as compared to other kebele in the Woreda (NALWADO, 2015) and the second one was the researcher's deep work experience in the study area. In the second stage, for the selection of sample Kebeles among 28 kebeles that exist in the study area, purposive sampling was also used based on the potential of these selected kebele for crop production along with the problem of degradation. To do so, representative sample were taken from the selected population. Moreover, this method enables the researcher to examine drivers of deforestation as well as the impacts of deforestation on rural livelihood.

2.4. Sampling method

The sampling frame was included all the households in these four village. The total number of the households in these four villages was 640 and the sample size was determined using Yamane (1967) formula as follows:

$$n = \frac{N}{1+N(e)^2}$$

This formula was employed to calculate the sample sizes at 95% confidence level and P =0.5. Where n is the sample size, N is the population size, and e is the level of precision. When this formula is applied to the above sample, we get

n =640/(1+640(0.0025)) =246

Therefore, the researcher believed that a total of 246-sample size was a representative of the population. The sample size for each village was determined using the proportionality principle P=n/N*y=x

2.5. Methods of Data Analysis

After collecting the questionnaires necessary data from each selection household and manual editing completed, the survey generated both qualitative and quantitative data was summarized, categorized and coded some qualitative responses into numeric values and then entered in to Statistical Program for Social Science (SPSS) version 20. Once the process of data entry and cleaning completed, it was analyzed by descriptive statistics techniques. Information obtained from unstructured interviews in the study area was narrative and qualitative in nature and used to support the coded qualitative and quantitative data. Descriptive statistics; sum, mean, standard deviation, percentages, graphs were used to enable easy interpretation. In general, depending on the responses of respondents, satellite image analysis result and literatures the implication of deforestation on forest in the study area was described quantitatively as well as qualitatively.

2.5.1 Satellite image processing and analysis

The satellite image was processed by ERDAS 9.1 &Arc Map 10 soft ware's starting form:Image pre-processing (geometric & radiometric correction). Image enhancement by using linear contrast stretch. Image classification by using supervised classification. After classification and producing maps, the next task will be developing table showing the forest area the degree of forest cover change during the past twenty eight years. The image analyses of land use and land cover classification statistics will be presented in the form of figures.

3. RESULT AND DISCUSSIONS

Land cover changes over 34 years (1984-2016) were investigated and rate of change for each LULC classes was computed.

3.1 Detection Changes in Land Use land cover since 1984

Data collected from field and topographic map and satellite images were used in the analysis of LULC change. Land cover map of the three periods of images was evaluated depending on land use land cover change LU/LC classes. Land Cover changes over 32 years (1984-2016) were investigated and rate of change for each LULC classes was computed from which change in forest cover was estimated. Field survey and satellite images were used to detect the status of forest coverage in the study area between1984-2016. Four land use classes were restructured which include forest cover, agricultural land, Wood and shrub land and grazing land were mixed together covered the area.

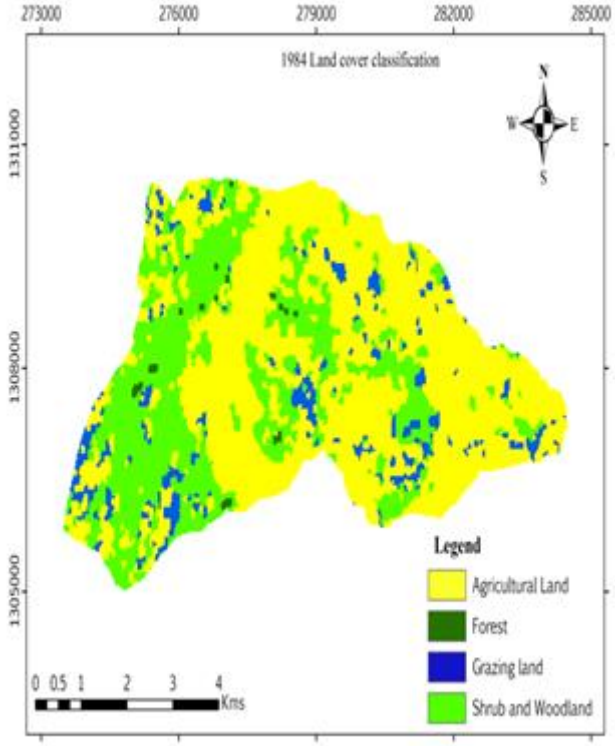

Figure2: *Land SAT image of 1984*

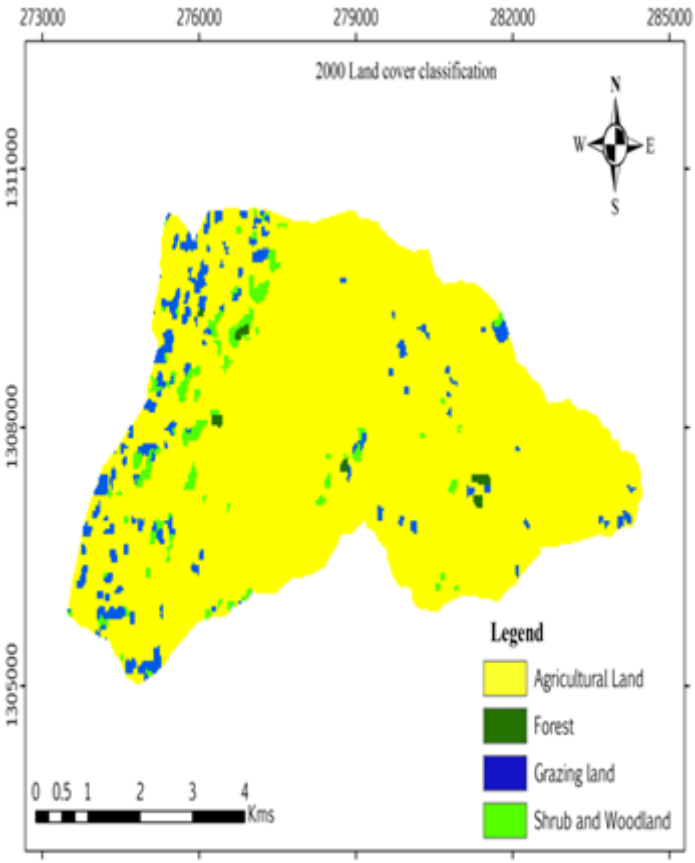

Figure3: *Land SAT image of 2000*

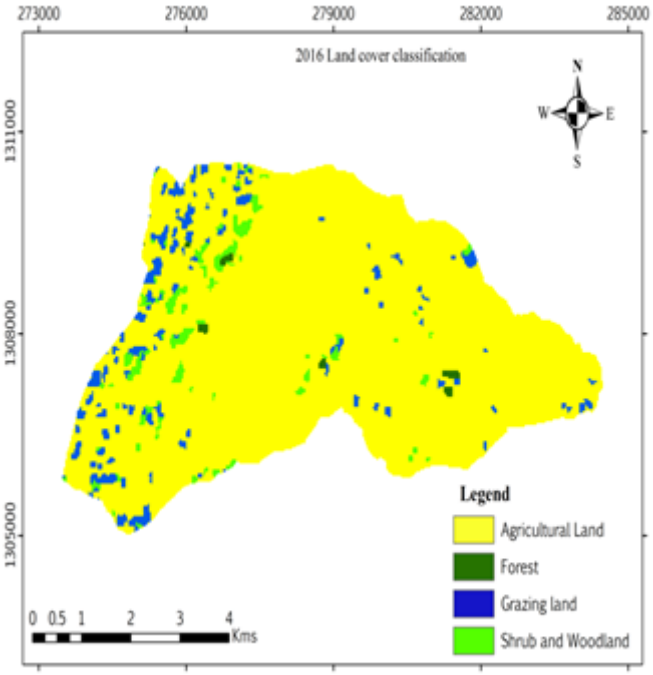

Figure 4: *Land SAT image of 2016*

Table1:*Land use and land cover change from 1984 to 2016 in Achefer Libenworeda*

Land cover type	Area in ha1984	% of land cover in1984 -	Area in hain 2000	% of land cover in (2000)I	Area in ha in 2016	% of land cover in (2016)	Change between					
							1984-2000		2000-2016		1984-2016	
							Ha	%	(ha)	%	(ha)	%
Forest land	285	8	217	6.13	168	4.74	-68	-1.92	-49	-1	-117	-3.3
Shrub and wood land	1086	30.7	201	5.7	95	2.7	-885	-25	-106	3	-991	-28
Agricultural land	2152	60.74	3055	86.2	3175	89.6	903	25.5	120	3.4	1023	28.9
Grazing land	20	0.56	70	1.98	105	2.96	50	1.41	35	1	85	2.4
Total	3543	100	3543	100	3543	100						

Source land sat image analysis.

3.1.1 Change in Agricultural land

Agricultural land in Achefer Liben woreda showed significant increase in area. As land use classification of 1984 revealed that agricultural land increased from 2152ha (60.74) in 1984 to 3055(86.23%) in 2000 and 3175(89.6 %) in 2016.Between 1984 to 2016 about 1023ha (28.87%) of cropland was added to agricultural land at the expense of forest, woodland and shrubs. The change on agricultural land between 1984 and 2000 was larger than as it was between 2000 and 2016and increased by 25.49% and 3.37 % respectively at the expense of forest, woodland and shrubs. It indicates that the conversion of forest land to other forms of land is decreasing because of the completion of potential forests in the study area. Interview revealed market price for agricultural products, agricultural policy on the use of agrochemicals (pesticide, herbicides, round up and mechanized farming system prompted agricultural expansion in study area due to the expansion of modern agricultural technologies.The result of the study is similar with the finding in Dembecha area of East Gojam, study confirmed that agricultural land is expanding from 1957 to 1982[2].

3.1.2. Change in Forest land

Forest in the study area reduced from 285 to 168hectares between 1984 and 2016. Indiscriminate cutting and setting fire for extra cropland, overgrazing fuel wood extraction were reported as factors for change of forest the area.Along WonberiaMountain were changed to cropland and grazing land. Similarly forest coverage area was decreased by 68hectares between 2000 and 2016. In the same year agricultural land expansion driven by population pressure was reported as the major factor for forest destruction in the study area.

3.1.3 Change in Wood and Shrub land

Woodland and shrubs accounted to cover an area of 1086 hectares (30.7%) and shrunk to 201hectares (5.7%) of the total study area in between 1986 and 2000 respectively the change is continuing to reduce from 201 to 95 hectares but comparatively the change that occur in in between 1986-2000 885ha (25%) of the total study area which is higher than that of the change occurred in between 2000-2016 which accounts 106ha (3%) of the total area (Table 1). Actually 991ha (27.97%) of the shrub and wood lands are leaving their site to agricultural and grazing lands from 1986-2016. FGD revealed the reason behind the change was cutting of tree for local domestic use like timber, firewood and charcoal. Indiscriminate cutting and setting fire for extra cropland was reported as another reason behind the change **[15].**

3.2 Annual deforestation rate from 1984-2016 in Achefer Liben woreda

As it can be observed from table 2 the annual speed of forest area dynamics was -0.98 % which was high compared with global level ,Africa and Ethiopian which is -0.13% and -0.49% and -0,93% respectively[5]-[7]. On the other hand, annual deforestation or annual forest change was -34.625 ha/year, i.e. about 34.625 ha of forest areas have been added to agricultural land each year on average between 1984 and 2016.

Table 2 *Annual rate deforestation*

1984 A1 in ha (forest, wood and shrub land area)	2016 A2 in ha (forest, wood and shrub land area	Δt in year (t_2+t_1)	Annual rate of Deforestation (r %)
1371	263	32	-0.98%

Source *from land-sat image of 1984-2016.*

3. Accuracy Assessment

The diagonal matrix from the table indicates sample point classes which are correctly classified; while off diagonal

elements represent either of commission or omission errors. From confusion matrix in Table 3, the overall accuracy estimated from the total 200 sample point selected is 83.33% (50/60*100). Based on this sample point study estimation, 83.33% of Landsat derived map for the study area was correctly classified as the same in the high resolution Google Earth Image (GEI). Per class cross referenced user accuracy ranges from 80 % (for Shrubs and woodland & agricultural land class) to 87 % (forest and grazing land class). This user's accuracy indicates the probability that a sample from both classes, most importantly from agricultural land, and shrubs and wood lands cover map actually matches the real world observation from reference dataset. As an example, a user's accuracy of agricultural land category in Landsat imagery would indicate that 80 % probability of correctly detecting and classifying agricultural land areas from the total category of sample points assigned to this class. The remaining percentage (20 %) indicate inclusion of agricultural land areas to the category which it does not truly belong. For illustration, out of 60 samples classified to forest loss in Landsat dataset, 13 % and % are indeed turned out to be stable shrubs and woodland. This might cause overestimation of the area of agricultural land for the study site. On the other hand, the producer's accuracy estimated 80 % both Agricultural land andshrub and wood land followed by forest and grazing land accounting 87% producer accuracy. There was omission of about 20 % in the first two classes and 13%, in forest & grazing land classes respectively. This cause underestimation of the categories due to the actually exist in reference of the GEI. From this estimated producer's accuracy, relatively there was low producer accuracy in agriculture and Shrubs and woodland indicating more omission and underestimation of this class.

Table 3: Confusion matrix of estimated Landsat imagery; corresponding to the reference data from Google earth imagery.

Land sat Imagery	Google earth Imagery (Reference data)				Row Total	User Accuracy (%)
	Agricultural Land	Forest	Grazing land	Shrub and wood land		
Agricultural Land	12	0	1	2	15	80
Forest	0	13	1	1	15	87
Grazing land	1	1	13	0	15	87
Shrub and wood land	2	1	0	12	15	80
Column Tot	15	15	15	15	60	
Producer Acc. %	80	87	87	80		

Over all accuracy is 50/60*100= 83.33 %

4. Causes of Deforestation in the Study Area

4.1. Direct Causes of Deforestation

4.1.1. Domestic Energy Consumption

The result of survey revealed that totally seven sources of fuel has been used for cooking and non-cooking activities. These were fire wood, plant residue, charcoal, animal dung, biogas, kerosene and electricity. It also indicated that the first two sources were by far the most dominant sources of energy used for cooking and non-cooking activities such as boiling, space heating and lighting in the study area. (Own household survey) The study found out that among a total of 246 respondents, 136(55.28%) of respondents mentioned that they were using fuel wood as a principal fuel for cooking activities, while the remaining 16(6.51%), 49(19.92%), 44(17.89%) and 1(0.40%) were using charcoal, plant residue and cow dung for the same activity, respectively. For boiling activities fuels such as wood, charcoal and biogas were mentioned by 236(96.31%), 9(3.46%) and 1(0.34%) of respondents as a principal fuel used in the household, respectively. For lightning activity fuels such as wood, plant residue, kerosene, biogas and electricity were mentioned by 205(83.33%), 14(5.69%), 15(6.01%), 1 (0.4%) and 11(4.47%) of respondents as a principal fuel used in the household, respectively. Accordingly, for space heating activities fuels such as wood, charcoal and cow dung were mentioned by 128(52.03%), 98(39.84%) and 20 (8.13%) of respondents as a principal fuel used in the household. Therefore, the predominant energy source that were consumed by almost all household respondents for cooking (baking), boiling, lighting and space heating was biomass energy of which the large part was contributed by fuel wood. This might be because wood is the cheapest alternative when compared to other available and commercial fuels and hence this indicated that it will continue to be the most preferred cooking fuel for some time in the future. The finding of this study on the fuel use pattern was in line with the study conducted in Harari region by [11]- [19] on the fuel use pattern revealed that the majority of the households used firewood for domestic cooking and baking. It also was similar to the study conducted in satellite rural villages, which were located about 10 to 15 kilometers outside to Bonga; Yirgalem and Hossana towns by **[13]**found fuel wood contributed a lion's share of the fuel consumption (79%) next to charcoal (19%).

5.1.1.1 Sources of household fuel and its obtaining patter

The primary interest in thisanalysis is how and from where households were obtaining their fuel wood, which is assumed to affect their livelihood and forest resources. In the areas in which data were collected, there were a number of different places where fuel wood could be gathered or collected. The survey result showed that majority, 223(90.65%) of household respondents were obtaining fuel wood by collecting while, the remaining 23(9.35%) were satisfying their fuel demand from the market by purchasing. The finding of this study indicated that majority of the respondents in the study area were meeting their fuel demand by gathering the fuel wood from forest resources. This unreliable way of meeting the energy demand especially in rural area is a catastrophe to the environment as treeplantation to replace them is not so common and hence such pattern might cause deforestation and degradation in the study area. Fuel wood gathering was considered to be the main cause of deforestation and forest degradation in El Salvador [15].

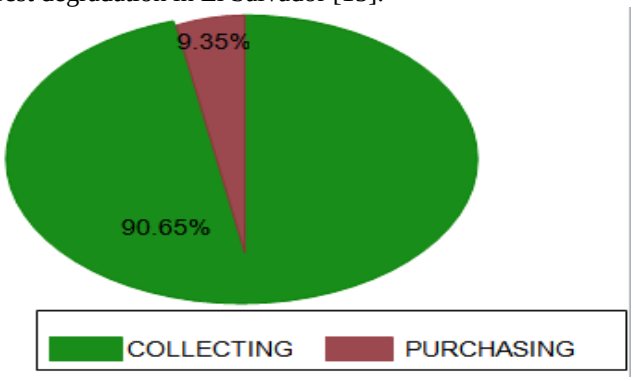

Figure 5: *Household Respondent's Fuel wood obtaining patterns*

In terms of the choice of fuel wood collecting sources, the majority 190(77.24 %) were mostly collecting fuel wood from government forests, whereas 50(20.33 %) and 6(2.44%) were collecting fuel wood from community forests and own land, respectively (Figure 5). According to the information obtained from the FGD, majority of them preferred government forest as a major source of fuel wood collecting area because, they could obtain large amount of fuel wood, this can easily be collected due to an availability of abundant forest resource in government forest area than both private and community forests.(Source: Researcher's survey, 2015).

4.2. Underlying or Indirect Causes of deforestation

Next to the direct drivers of deforestation, one can also observe more indirectly related global drivers affecting the pressure levels on the direct drivers. The indirect drivers of deforestations are a complex interplay of many economic, institutional/governance, technological and demographic/cultural factors [9].

Table 4: *Level of Agreements on human induced indirect drivers of deforestation*

Socio Economic Drivers	Level of agreement								
	Strongly Agree	Agree	Strongly Agree + Agree	% of Strongly Agree & Agree	Undecided	Disagree	Strongly Disagree	Disagree + Strongly Disagree	%of Disagree+ Strongly Disagree
Pop growth	88	122	200	81.30	7	20	19	39	15.85
Lack of alternative economy	93	85	178	72.36	0	32	36	68	27.64
Market accesses	55	69	124	50.41	3	52	67	119	48.37
Lack of awareness	68	72	140	56.91	6	61	39	100	40.65
Rural Dev't policy	42	28	70	28.46	24	82	67	149	60.57
Resource competition	78	69	147	59.756	7	36	56	92	37.40

Source: *own survey data, 2015*

In economic models of land use change, demand and supply functions are the driving forces of land use change. There has been little adjustment of family size since children are considered an asset in the struggle for survival, as well as a

security in old age. As indicated on table 4 out of the total respondents 200(81.30%) of them agreed that population growth as main cause of deforestation and occupied the leading position being followed by 178(72.36%) of the respondents mentioned lack of alternative economy as a main cause of deforestation. Accordingly, the remaining alternatives such as resource competition, lack of awareness, market access, carelessness, natural dynamics and rural development policy were agreed by 147(59.76), 140(56.91%), 124(50.41%) and 70(28.46%) as indirect causes of deforestation, respectively. The finding of this study indicated that population growth was found to be the leading indirect cause for deforestation to be occurred in the study area. In line up with this; the study conducted by [2] reveled that population growth was certainly the greatest driving force in the observed land use/land cover dynamics because of the demand of land for cultivation and settlement, forests for fuel, and construction purposes was greater. Moreover FGD exposes that one of the culprits of environmental damage in the study area is population number with the relation to land fragmentation. As indicated on table above the average numbers of the family size is 6 with minimum of 2 and maximum of 12 family numbers per house to the contrary of this numbers the land holding of the households reveals that an average of 0.75ha with the minimum of 0.15ha and maximum of 8ha. Which clearly show that the presence of land fragmentation that leads to the growing need of additional agricultural lands in order to feed those rapidly growing number of family; this land expansion could be forest land which leads to deforestation.

4.3. Effects of deforestation on Local livelihood

The third research specific objective sought to identify the implication of deforestation on local livelihood. A general observation is that locally, the negative effects of deforestation manifest in several ways include vegetation becomes increasingly scarce, water courses dry up and degraded, soil degradation (soils become thin and stony); loss of biodiversity. All of these manifestations have potentially severe impacts on the environment, for land users and for people who rely for their living on the products from a healthy landscape [1]. However, deforestation produces a mixture of benefits and negative effects for the development of livelihoods for the poor as well support of trees and other forest resources. Therefore, both benefits and negative impacts of deforestation were investigated in this section.

4.3.1. Negative implications

5.3.1.1 Respondents facing difficulty in fuel wood obtaining

The null hypothesis for this test states that there is no mean difference in the fuel wood collecting time before ten years ago and now. Paired t-test was used to examine individual difference and paired measurements and it is also appropriate for pre-post situation analysis. Moreover, using the paired t-test, it is possible to compare the change in outcomes before and after a treatment is applied [19]. Therefore, the researcher had used this test to investigate the effects of deforestation in such a way that whether households additionally incur time or not.From paired sample T-test, the average time spent for fuel wood collection by households before ten years ago (N=246, M= 1.70, SD= 0.97), reported significantly different from the time which is being spending now (N=246, M= 3.97, SD=1.28), t (245) = 21.539, d= 2.27, p value ≤ 0.1per one round collection. From the test result, it was concluded that there is strong evidence that the mean fuel collection time was significantly different. This indicated that households were additionally spending an average of 2hours and fourteen minute for one round fuel wood collection than they were spending before ten years ago. This additional time which is wasted for collection of firewood due to the increasing effects of deforestation, should have been spent on other productive works to improve the livelihood of rural households. From focus group discussion the time wasted for collection of firewood should had been used to meet domestic activities, recreation (coffee time with neighbors and friends), childcare, education, agriculture related work, socializing and vocational work or income generation. In addition, parents could have given additional time to their children and help them in their studies. Moreover, children had more time for education, reading a book, and schoolwork, which can result in social benefits in the longer-term. In that discussion, discussants were of the opinion that their children's school attendance had decreased because of their long time expenditure for fuel wood collection.

5.3.1.2. Land degradation

These major impacts of deforestation were discussed in this section as follows:- Land degradation is a temporary or permanent decline in the productive capacity of the land, or its potential for environmental management [14]. It includes soil degradation, vegetation degradation and degraded lands. Because of the broad nature of land degradation, this paper gives particular emphasis to soil erosion and nutrient depletion.

5.3.1.3. Productivity decline

Major livelihood activities related to respondents were identified by expanding the question "how do you make your living?" based on this, 39(15.85%), 203(82.52%) and 4(1.63%) of respondents replied that by crop production alone, livestock raring alone and combination of the two activities, respectively.

Table 5: *Major livelihood activities*

Major livelihood activity	Frequency	Percentage	Cum
Only crop production	39	15.85	15.85
Only animal raring	4	82.52	98.37
Combination of the two	203	1.63	100
Total	246	100	

Source: *Owen survey data, 2015*

This indicated that majority of the respondents leading their livelihood by crop production as well as livestock rearing. Since majority of respondents' livelihood depends on both crop production and animal rearing, the researcher wanted to investigate in depth about the impacts of deforestation on land productivity. To this end, respondents in the study area were requested to elaborate how they perceive their land productivity from time to time. In this regard, 196(79.67%)

of respondents in the study area acknowledge declining of production from year to year and account this problem to continuous cultivation of farmlands, fragmentation, loss of soil fertility and soil erosion while 35(14.23%) of the respondents acknowledge the increasing of production. The remaining 15(6.1%) have not observed any changes.

Table 6: *Respondents perception about their yearproduction*

Perception on production	Frequency	Percentage	Cum
Decreasing	196	79.67	79.67
Increasing	35	14.23	93.9
No change	15	6.1	100
Total	246	100	

Source: *Owen survey data, 2015*

The study area is one of the longest settled areas in the country and it is expected that soil fertility declines would occur even though farmers may also develop means of combating the fertility decline. While the resulting effects from soildegradation may vary between the two communities, a general observation of the views expressed indicates that it has reduced the resilience of the soil in terms of its fertility and structure. The loss of these attributes of the soil has highly affected agriculture because 79.67% of the household respondents as well as the key informants argued that crop production has been declining. Moreover, discussants stated that because of reduced soil fertility the average yield of main food crops cultivated in the areas have not been remarkably high and even a crop such as maize has experienced continuous decline in production over the years. As a result of continuous low crop yields, the total product of most farming families is not sufficient to cover their annual consumptions.

5.3.1.2 Due to productivity declining respondents were facing shortage of food

It was reported that majority of the respondents 227 (92.28%) used commercial fertilizer for soil fertility improvement, which is an indication that soil fertility is declining. Whereas only 19 (7.72%) reported that they were not using commercial fertilizer for soil fertility improvement. This indicates that majority of the respondents were forced to use commercial fertilizers for improving their production and hence posing a challenge to cover the costs of chemical fertilizers each year. Moreover, change in chemical properties of soil is another negative effect of applying chemical fertilizers. This might be a clear indicator that the level of soil fertility has been deteriorating over time and farmers have had to make additional investment in the same plot of land that they have been cultivating over centuries. The highest average rates of soil loss are from currently unproductive but formerly cultivated lands with less vegetative cover [10]. Excessive land degradation, along with other climatic factors such unreliability and high intensity of rainfall could lead to reduced average crop yields per unit area [6].

5.4. Conclusion

The status of forest is decreasing from time to time. The study found out that since 1984, about 1023ha (28.87%) of cropland was added to agricultural land at the expense of forest, woodland and shrubs. The rate of deforestation is 1.68%, 0.27%, 0.98% in between 1984-2000, 2000-2016 and 1984-2016 year intervals, respectively. The prominent causes of deforestation investigated in this study were: agricultural expansion, wood extraction and land grazing. The found out that the average land holding of the respondents was found to be 0.75 hectare, which was reported as insufficient for their agricultural production and hence they were coping up this problem by clearing the forest as a means of expanding their agricultural land. The predominant energy source that were consumed by almost all household respondents for cooking or baking, boiling, lighting and space heating was biomass energy of which the large part was contributed by fuel wood. The study indicated that majority of the respondents were used to produce forest products for their income generating purpose and hence they were generating an average annual of 2636.34Birr from production of forest, which is more than 26 % of total annual income investigated in this study. Major fraction of this was came from sell of timber followed by sell of charcoal and fuel wood. Another, major drivers such as Population growth, lack of alternative income generating opportunities, access to market, lack of awareness about the long term consequences of deforestations and rural development policy were found to be the indirect causes of deforestation. Regarding the implications of deforestation, now due to the depletion of forests respondents are facing challenges in gathering fuel wood. Due to fear of such a challenge they are forced to purchase it; and hence incur additional cost that they did not face before. Moreover, households were additionally spending an average of 2hours and fourteen minute for one round fuel wood collection than they were spending before ten years ago. The study also investigated that majorities' productivity of the land was found to be decreasing from year to year. As the result of these local peoples livelihoods were seriously affected in covering their annual consumption. To cope up with this situation, they employed strategies which include the worst scenarios such as reducing numbers of daily meals, reducing quantity of food per meal, withdrawal of children from school and marginal land cultivation had been adopted. Moreover, they also were forced to use commercial fertilizers for improving their production and hence posing a challenge to cover the costs of chemical fertilizers each year.

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