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Farmer's Participation in Participatory Forest Management and Factors Affecting its Performance (The Case of Sodo Zuriya District, Wolaita Zone , Ethiopia)

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Authors' contributions
This study was carried out in collaboration between both authors. Author Girma Jatana designed the study, wrote the first draft of the paper, data collection and perform statistical analysis, Author Zegeye Paulos, supported the work especially econometric model part, result interpretation, edited and proof read the manuscript. Both authors read and approved the final manuscript.

Abstract
Community forest management seeks to initiate the process of eliminating the main causes of forest depletion through participation of local communities. The study attempted to analyze the participatory forest management in Sodo Zuriya District, Wolaita Zone, and SNNPR region with the objectives of investigating participatory forest management for sustainable livelihood, factors that determine the effects of economic, social and biophysical factors on participation. Primary data collected from 183 household respondents who were selected randomly, Secondary data were collected from published and unpublished sources. Descriptive statistical tools such as ratio, frequency, percentage, and mean value addressed to evaluate the contribution of different variables and logistic regression model was used to identify factors that affect community participation in forest management. The major findings from descriptive analysis result indicate that the performance of forest management has contributed to household income of 59%. 9% reported sustaining food security, 22% reported conserving soil and water and 10% mitigating climate change. The result of the logistic regression model revealed that out of 12 variables included in the model, 7 explanatory variables were found to be significant at 1%, 5% and 10% level. Accordingly, household head sex, household age, household size, annual household income, Land productivity, forest income and Land size were found to have positive association with Participatory forest management and statistically significant. The findings of the study reported that participatory forest management enhanced the livelihood, the natural resource and the social assets of the local communities. It was found that this forest management strategy could attain the sustainability of the forest and accelerate the standard of household's livelihood and finally based the study results appropriate recommendation was given.
Keywords: Forest, household, Logit Model, Participatory forest management, Sustainable Livelihood

1. Introduction

1.1. Background of the study

Participatory Forest Management is a new paradigm system of forest management which is adopted and implemented in order to fulfill the interest, respecting of traditional users, and bottom-up approach which encourage a sense of belongingness to the rural people in general landless rural youth in particular (Weinberg, 2010).

Forest resources and its management are increasingly observed to play a role in rural development, providing the resources necessary to drive local poor livelihoods improvement and poverty alleviation strategies (Islam & Sato, 2012a)

Participatory Forest Managements was introduced as one of the solutions to solve the problem of open access to forest resources and promote sustainable forest management in the country through community participation. Some experiences from around the world show that shifts from state-centered policies toward solutions at the local level, such as PFM, resulted in successful forest conservation and development (Fisher , Wily 2002 & Khanal 2007).

Since the mid-1970s, the management of forest resources in Ethiopia was mainly carried out as state and community forestry programmed. These non-participatory approaches failed to reduce tree felling and clearing, especially in Protected National Forest Priority Areas (FARM Africa, 2000). Further, this problem was beyond the control of the state; therefore, the ultimate solution for this severe problem will be encouraging of local people to manage and conserve their resources since they live with forests, and they are primary users of forest products (FAO, 2010).

According to Yemiru (2011), in Ethiopia there is a growing understanding that deforestation and land degradation will further exacerbate poverty, which brings natural resource conservation to the forefront of rural

development initiatives. Terefe (2003) on his side stated that community participation is very crucial to overcome the rate of deforestation.

Ethiopia is predominantly agrarian country. Agriculture, including forestry, accounts for 54% of the Gross Domestic Product (GDP), employs 85% of the population, accounts for about 90% of the export and supplies over 90% of the raw materials for the agro-industries (MoFED 2006). Ethiopia owns diverse vegetation resources that include high forests, woodlands, bush lands, plantations, and trees outside forests. Each of these vegetation resources variously contributes to the production, protection and conservation functions, and play significant role in the national and local economy.

According to United nation Department for Economic and Social Affairs (2015) Ethiopia has seen rapid population growth, from 18 million people in 1950 to 98 million today, with 80% in rural areas. The population explosion has further exacerbated deforestation, through increased demand for farm and grazing lands, settlement spaces, and wood for energy and construction. Yet millions still rely on the dwindling forests to fulfill part or their entire livelihood needs (Lemenih, 2012).

The PFM institutionalization process and its subsequent performance have proved controversial among scholars, policy-makers, practitioners and international development partners. Some claim that a major transformation has taken place consequent to PFM on the management of physical resources, institutional arrangements and livelihoods of resource-dependent communities. Proponents of PFM present performance indicators such as a decline in the deforestation rate and an increase in forest regeneration (Takahashi and Todo2012; Tsegaye et al. 2009).

1.2 Objectives of the study

The general objective of the study was to assess the status of farmers' participation in participatory forest management and factors affecting its performance in Sodo zuriya district, of Wolaita zone, Southern Ethiopia.

1.2.1. The specific objectives of the study:

1. To assess the performance of participatory forest management in the study area
2. To examine farming households willingness to invest in participatory forest management
3. To study the determinants of participatory forest management
4. To assess the contribution of participatory forest management to sustainable livelihood of the community.

2. METHODOLOGY

2.1. Description of the Study Area

The study was carried out in Sodo zuria district, Wolaita zone, South Ethiopia in three rural kebele Adminisertives of Marachare, DalboWogene and DamotWaja. It is one of the 15 woreda administrative, where the zone capital of Wolaita Zone is found. The District was situated relatively in south west of Addis Ababa at a distance of 378 kms which is the capital city of Ethiopia. There are 30 rural and 6 urban kebels administrative in the woreda. The total population of the study area is 209,149 of which male is 102,504 and female 106,645. Absolutely, it is located at 37°36'00"E - 37^0 53' 00"and $6^0$42'00"N-7°02'00"N with the elevation of 1600ma.s.l to 2958 ma.s.l (Wolaita Zone Berau of Agriculture,2015).

The land use comprises of cultivated land is 28384.05 hector, grazing land 6440.5 ha, forest land 3315.7 ha and others socially and rural settlement are 2710 ha. The total land coverage of the area estimated to 40850.25 ha. Agro-ecology of the study area degas 5% and woyna dega 95% with annual rain fall 900-1500 mm and the annual maximum and minimum temperature of 28 ^{0}c and 18 ^{0}c, respectively (Sodo zuria Woreda Agriculture office,2016)

The study area forest land coverage is 503 ha; from land use coverage 2.7 % is natural forest. However, the loss of forest cover has adverse effect on livelihoods of communities and as well as biodiversity. The biodiversity features of Forest types present in this eco-region range from wet to dry, giving the area high biodiversity values (ibid).

Agriculture is also the main income source for the respective community. The farming household is totally dependent on seasonal rain that is much irregular in its nature. Soil type of the area is clay loam and also there is not sufficient land available for free Grazing due to population density, the community uses stall feeding. Besides the fragmented land holding, the small land holding (on average less than 0.6ha per farmer) determines the economy. The rest of the community members (those who don't have farming land) are participating in daily labor work at nearby Sodo town, the Capital of Wolaita Zone. Some minor community groups are also involved in off-farm activities such as pottery, blacksmithing and making handcrafts. This shortage of land has forced the nearby community to encroach on the forest. Thus, crop production is practiced even at slopes of more than 80%. Over-grazing and increased settlements caused by increasing population pressure have also aggravated the situation.(Sodo zuriya Woreda Agriculture office 2016)

2.2 Sampling Technique

Sampling is a technique, which help us to understand the parameters or characteristics of the population by examining only small part of it. Therefore it is necessary that sampling technique be reliable. Appropriate sample size depends on various factors relating to the subject under investigation like the time, cost, degree of accuracy desired etc. But the sample size and sample selection process procedure should assure the representative of the population (Denial, 2008).

For this study, multistage sampling procedures was used .In the first stage, Sodo Zuriya District was selected purposively because it was one of the potential areas of the forest production in wolaita zone. In the second stage three kebels were selected from 30 kebels purposively. At the third stage, systematic random sampling was employed to select households frome sampled kebeles to ensure even sampling from the heterogeneous population in terms of forest production and management and utilization of farming households in the study area.

2.3. Sample Size determination

In this study the sample size was obtained using formula provided by (Yemane, 1967) with 93% confidence interval, and 7% precision level. The formula below illustrates how the 183 household sample size was determined.

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

$$n=\frac{1823}{1+1823(0.07)2} = \frac{1823}{1+8.9327} = \frac{1823}{9.9327} = 183$$

Where, N= Total no of household

n= sample size

e= margin of error at 7%

Table 1.Total number of Households and sample size

Kebele	Total HHs			Sample HHs		
	Participant	Non Participant	Total	Participant	Non Participant	Total
Dalbo Wogene	366	252	618	32	22	54
Kokate Mare Chare	447	358	805	50	40	90
Damot Waja	185	215	400	18	21	39
Total	1003	820	1823	100	83	183

Source: Sodo zuriya woreda agricultural office, 2016

2.4. Data Sources and Type

In this study, both primary and secondary data sources were used. Both qualitative and quantitative data type were employed in this study. Secondary data sources were obtained from both published and unpublished data sources, which include annual and semiannual activity reports of Woreda office of the agriculture, journals, books, working papers.

2.5. Method of Data analysis

This study employed descriptive statistics in the form of ratios, frequency, percentage and mean as well as binary logistic to address the study objectives .The statistical significance relationship of the independent variable with dependent variable was analyzed through SPSS version 20 and econometric model of logistic regression result by using STATA 11 version

2.6. Empirical model

To explain the observed variation in participation, logistic model in which the dependent variable participation is regressed as a function of the explanatory variables, economic, social, and biophysical was used. The response of the participants as to whether they participate in PFM can be outlined as a binary–choice model, with an outcome (decision of households) of participation or no participation. The decision of households whether or not to participate in PFM depends on economic, social and biophysical factors. Simply put, in the logistic model, Yi represents the dependent variable, participation, which equals to 1 if the respondent participates in PFM and 0 if not. The probability of household participation in PFM, Pr (Yi = 1), is a joint probability density function/ likelihood function evaluated at $Xi\beta$, where Xi is a host of explanatory variable and β is coefficient of the predictor variable explaining the change in the dependent variable as a result of a unit change in an explanatory variable.

The estimation form of logistic transformation of the probability of participants' opinions in Favor of participation in PFM *Pr* (*Yi*= 1**)** can be represented as:

$$\Pr(yi = 1) = \frac{exp(Xi\beta)}{1 + exp(Xi\beta)}$$

The above equation can be reduced to:
Pr(*Yi* = 1) = *B*0 + *B*1*X*1+ *B*2*X* 2 + ... + *BiXi*
Where:
P: Is the probability of presence of the characteristic of interest, participation.
β Is the coefficient of the predictor variables and are estimated from calibration data using maximum likelihood technique.
X Is a host of explanatory variables
The dependent variable: The outcome variable is participation of households in PFM, which is coded 1 to signify participation in PFM and 0 if not.
Independent variables: refers to a host of explanatory variables assumed to influence
Respondent's decision to participate in PFM.
The Model Equation
The model, which represents participation (coded 1 if the household has participated and 0 if not) and a host of explanatory variables, is given by:
P(P)=B0+B1(AI)+B2(IF)+B3(EX)+B4(CR)+B5(EU)+B6(HHS)+B7(G)+B8(DF)+B9(DM)+B10(A) + B11(L) + B12(LP)
Table-2 Where Description of the variables and their expected sign is as follows

Variable Code	Description of variable	Measurement	Expected sign
PFM	Participatory forest management	Dummy	Dependant Variable
TIF	Total income from forest sale	Continuous	+
AHI	Annual household income in birr from all activity	Continuous	+
DFF	Time taken to reach the forest in minutes	Continuous	-
DFM	Time taken in hours to sale forest products	Continuous	-
HHS	Number of people living in the household	Continuous	+
AOH	Age in Year of household	Continuous	-/+
SEX	1 if Male 0 if Female	Dummy	+
CRA	Credit access for purchasing inputs	Dummy	+
EXT	1 if he or she gets Ex service and 0 if not	Dummy	+
EDU	Households' Schooling year	Continuous	+
LDS	Land in Hectare	continuous	+/-
LPH	Land productivity per hectare	Continuous	+

3. Result and Discussion
3.1. Descriptive analysis
3.1.1 Income of the Sampled Households
Table 3 below shows the annual average income of sampled households per year. The annual average income per household was ranged from 107.2 ETB (from sale pea) to 3335.2 ETB (from sale of wheat). According to the report of respondents, they earned more income (3335.2 ETB) from sale of wheat followed by income from sale of livestock (2176.5 ETB).

In Ethiopia including the study area, natural grass and forests are among the major feed resources for livestock, that causing degradation of forest resources (Alemtsehay, 2010). There was significant difference between in total income in each kebele participants and non participants. This is due to they earn income from forest and forest product (bamboo tree, honey, carbon trade). The highest total income earned by participants in Damot Waja was 9777.8 *ETB* and the lowest income earned in non participant kokate, Mare chare was 5693.5 *ETB* and finally the average total income in the study area was 7198.7 *ETB*

Table-3 Annual mean average household income ETB earned from different sources per year

Types of income	Kebele						Overall Income
	Kokate Marachare(90)		Dalbo Wogene(54)		Damot Waja(39)		
	Participant(50)	Non-participant(40)	Participant(32)	Non-participant (22)	Participant(18)	Non-participant(21)	
Income from sale of wheat	4125.00	3196.00	2184.69	1428.57	4472.22	4605.00	3335.2
Income from sale of pea	120.00	0.00	84.38	66.67	372.22	-	107.2
Income from sale of LVK	1446.00	1377.50	3978.13	2200.00	2147.22	1910.00	2176.5
Income from sale of LVK products	960.00	700.00	255.38	690.48	888.89	205.00	616.6
Income from sale of wood for construction	-	-	158.44	-	1527.78	217.50	317.3
Income from off-farm activities	307.6	420.00	415.4	690.63	369.44	1672.22	645.9
Total income	6958.6	5693.5	7076.4	5076.4	9777.8	8609.7	7198.7

(N= 100 for participants and N= 83 for non-participants); LVK= livestock; ETB = Ethiopian birr; - = not available.
Source:- own survey result 2016

3.1.2 Participation and forest management conditions

3.1.2.3 Forest management

Respondent's level of participation; forest management status and willingness to invest participatory forest management are presented in table 16. About 68 % of the sampled households were participating in PFM activities highly, While, 32% of the respondents participation was low. According to the interview made with them, majority (89%) of the respondents manage forest resources strongly whereas, only few of them reported that their forest management status was weak. The high level of participation and strong management status of participants indicates their economic benefit from PFM and dependency on forest make them highly participation. Similarly, more than 83 % of the sampled households had willingness to invest participatory forest management. Although they had willing to invest, lack of financial capital couldn't allow them to invest in forest management (group discussion).

Table-4 Respondents level of participation, management status and willingness to invest participatory forest management

Description of variables	Kebele							
	Kokate marachare		Dalbo Wogene		Damot Waja		Overall	
Level of participation	N	%	N	%	N	%	N	%
High	33	66	22	68.80	13	72.20	68	68
Low	17	34	10	31.20	5	27.80	32	32
Forest management status								
Strong	46	92	28	87.5	15	83.30	89	89
Weak	4	8	4	12.5	3	16.70	11	11
Willingness to invest PFM								
Yes	42	84	26	81.20	15	83.30	83	83
No	8	16	6	18.80	3	16.70	17	17

(N= 50 for Kokate mara chare, N= 32 for Dalbo wogane and N= 18 for Damot waja); PFM= participatory forest management; N = number of respondents; %= percentage of respondents.
Source:- own survey result 2016

3.1.2.4 Perception of farmers participated in forest management activities

Table 5 below presents respondents' (who were participant of PFM) perception towards PFM approach improve the income of farmers, most of the participants respond as they agree(55%), strongly agree(20%),neutral(10%),disagree(5%) and strongly disagree(10%) .The effectiveness of PFM activities in retaining soil erosion and improving soil fertility condition in the study kebele most of the participants agreed (51%) ,strongly agreed (39 %),neutral(4%),disagree(5%) and strongly disagree(1%) in that PFM activities retained soil erosion and improved their livelihood status. This could be due to replanting (growth of new tree, shrub and grass species) of forest. As a result, forest cover was increased; soil erosion was reduced by increasing vegetative cover. Thus, most participants consider PFM as a vital activity for people and for the forests. The participant's response towards the enhancement of PFM to food security situation of household agrees (42%), strongly agree (38%), neutral (7%), disagree (5%) and strongly disagree (8%) and strongly disagree (5%) ,

Table-5 Farmers' perception towards participatory forest management approach to attain livelihood

NO	Statement	Frequency of respondents									
		Strongly agree(5)		Agree(4)		Neutral(3)		Disagree(2)		Strongly Disagree (1)	
		N	%	N	%	N	%	N	%	N	%
1	PFM approach improve the income of farmers	20	20	55	55	10	10	5	5	10	10
2	Farmers' PFM improve soil fertility condition	39	39	51	51	4	4	5	5	1	1
3	Farmers' PFM approach create good access for forage	15	15	42	42	9	9	22	22	12	12
4	PFM create access for fuel wood	4	4	14	14	5	5	33	33	44	44
5	PFM approach improve water holding capacity of the soil	28	28	55	55	6	6	10	10	1	1
6	PFM is potential home for wild life	21	21	65	65	1	1	10	10	3	3
7	PFM is potential success for timber	15	15	49	49	5	5	31	31	0	0
8	PFM enhance food security situation of household	38	38	42	42	7	7	8	8	5	5
9	Individual farmers forest management is more advantages than PFM	6	6	21	21	0	0	43	43	30	30
10	PFM contribute to create communal ownership	19	19	71	71	2	2	8	8	0	0

(N= 100); N = number of respondents; %= percentage of respondents.

Source:- own survey result 2016

3.2 The Econometric model Analysis

3.2.1 Logit Model result

Table-6 below presents the result of the logistic regression analysis for forest income, and land productivity were significant at (5%) level, where as annual income, household age, land size, and sex were significant at (1%) level and household size were at (10%) significant. Distance from forest was hypothesized to have negative effects on participation, however; the logistic estimation showed that distance from forest was insignificant in its power to influence household decision on participation. Similarly, distance from market was insignificant in its power to influence household decision on participation.

Table-6: Binary Logit Regression result

Dependant var	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
SEX	2.88	6.830149	2.367732	0.004***	2.189479 -	11.47082
AGE	.3462629	.0854372	-4.05	0.000***	.5137168 -	-.178809
EDU	.0665333	.1125583	0.59	0.554	.1540768 -	.2871435
HHS	.3672458	.2089493	1.76	0.079*	.0422873	.7767788
LS	12.12043	3.248004	3.73	0.000***	5.754456	18.4864
LPRO	2.403833	1.093432	2.20	0.028**	.2607459	4.546921
ANICOM	.0003793	.000115	3.30	0.001***	.0001539	.0006046
EXTN	.3688322	1.401223	0.26	0.792	-2.377514	3.115179
CRDTAC	1.048704	1.067001	0.98	0.326	-1.042579	3.139987
DISTFORST	-1.435849	.9146854	-1.57	0.116	-3.2286	.3569012
DISTMRKT	-1.189227	.860528	-1.38	0.167	-2.875831	.4973767
INCOMFOR	.0008263 -	.0003896	2.12	0.034**	.0000626	.0015899
constant	5.14794	1.642827	-3.13	0.002	-8.367821	-1.928059

****1 percent significant ** 5 percent significant and * 10 percent significant; Log likelihood = -32.942043 LR chi2 (12) = 179.77 Prob > chi2 = 0.0000; Pseudo R2 = 0.7318* Source: survey data using STATA, 2016.

3.2.2 . Marginal Effect for Logit Regression

Since the logit model I employed for regression analysis was not linear, the marginal effect of each independent variable on the dependant variable was not constant but it depends on the value of the independent variables. Thus, marginal effects can be a means for summarizing how change in a response was related to change in a covariate. For categorical variables, the effects of discrete changes were computed, i.e., the marginal effects for categorical variables showed how P(Y = 1) is predicted to change as Xk changes from 0 to 1 holding all other Xs equal.

For continuous independent variables, the marginal effect measures the instantaneous rate of change, i.e. I computed them for a variable while all other variables were held constant that means in this study change in the probability participatory forest management with a unit change in continuous independent variable (Greene, 1993).Thus, opposed to linear regression case, it is not possible to interpret the estimated parameters as the effect of the independent variable up on participatory forest management However, it is possible to compute the marginal effects at some interesting values of the significant explanatory variables.

Table 7: Marginal effect

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. mfx

Marginal effects after logit
      y  = Pr(dependantvar) (predict)
         =  .77553668
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variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
sex	1.188989	.42081	2.83	0.005	.364219	2.01376	.966292
age	-.0602773	.01534	-3.93	0.000	-.090352	-.030203	33.7978
landsize	2.109918	.51888	4.07	0.000	1.09294	3.1269	.367219
landpr~c	.4184582	.17763	2.36	0.018	.0703	.766616	1.11236
anuain~e	.000066	.00002	3.07	0.002	.000024	.000108	7075.74
extens~e	.0642061	.24676	0.26	0.795	-.419436	.547849	.910112
actcre~t	.1825579	.18985	0.96	0.336	-.189532	.554647	1.04494
distaf~e	-.249952	.15491	-1.61	0.107	-.553574	.053671	1.24719
distan~t	-.2070201	.1528	-1.35	0.175	-.506507	.092467	1.26404
forest~e	.0001438	.00007	2.09	0.037	8.8e-06	.000279	1164.75
educat~n	.0115821	.01887	0.61	0.539	-.025411	.048575	3.1236
hhsize	.06393	.03624	1.76	0.078	-.007103	.134963	6.46629

dy/dx = for discrete change of dummy variable from 0 to 1, Source: survey data computed using STATA, 2016.

Household Size

Household size was positive correlated with participation and statistically different from zero at 10 percent significance level. Holding all other variables constant at their mean values, it was expected that household family size increase by a unit, the probability of a household to participate in forest management increase by 6.39 %. This is attributed to that large family collect more fodder, fuel than small families

Age of Household Head

The result of this finding showed that age was significantly different from zero at 1% significance level and negatively related with probability of being participating in forest management. Therefore, the finding showed that as age increases by a unit, the probability of being participating in forest management decrease at 6.02 percent.

Land Size

Land holding is positively correlated with participating in forest management and statistically significant at 1% level. As it was expected the finding of this research showed that holding other variables on their mean values, land holding increase by a unit the probability participating in forest management increase by about 210.99 percent. During group discussion, the non-participant households reported that lack of land during establishment of PFM was the major bottleneck for participating as a membership.

Annual income

Annual income was positive relationship with participation and statistically significance at 1% level. Holding other variables on their mean value an increase in household's annual income by one unit increases the possibility of household participation by 6.6%. This is in line with the findings of Shahbaz and Ali (2000).

Forest income

Forest income was positively related and significant at the 5% level with Participation. The result of this variable can be interpreted to mean an increase in proportion of forest income to total income by 1% increases the possibility of household's participation by 1.4%. This is in line with findings of Behera and Engel (2006) from India, Argawal and Chhatre (2006) from the northern part of India and Gebremdhin (2008) from Ethiopia. The justification for this can be that, as a rational being, community has reason to preserve forests. Higher economic benefits from forests encourage the community to participate in the management of forest resources.

4.CONCLUSION AND RECOMMENDATION

4.1 Conclusions

This study assessed farmers' participation in participatory forest management activities in Kokate mare chare, Dalbo wogene and Damot waja kebels of Sodo zuria District. It has tried to look into the demographic, socio-economic, bio-physical, institutional and other related factors, which can affect participatory forest management activities and also assess the performance of participant households on the effectiveness of PFM activities in retaining soil erosion and improving their livelihoods .With 83 % of the sampled households had willingness to

invest participatory forest management. According to the FGD, the respondents had willing to invest but lack of financial capital couldn't allow them to invest in forest management 68 % of the sampled households were participating in PFM activities highly. While, 32% of the respondents were participating in PFM activities was low. The high level of participation was due to high dependency in forest and the economic benefit from forest and forest product

The survey result revealed that the respondent households measured the performance of forest management in their own perception. Accordingly, 59% of the respondents reported PFM increases household income, 9% reported sustaining food security, and 22% reported conserving soil and water and 10% mitigating climate change.

The result of the logistic regression analysis forest income, which indicated the overall subsistence benefits from forests to households, was positively related and significant at the 5% level with participation. The results for this variable can be interpreted to mean that when households assess their community forest to be more useful for livelihoods and their probability to participate in PFM increases. Total annual income has a significant positive relationship with participation at 1% significance level that the variable can be interpreted as households having better income can participate more and benefit more from forest management.

As the comparison made from survey data there was significant difference ($P<0.05$) in income sources between participants and non participants. Participants earned income from sale of grasses, honey, fruits, carbon trade, and bamboo trees in the study area where as non participants' lack these opportunities.

4.2 Recommendation

Based on the findings and conclusions of the study the following recommendations were made as policy implications:

- According to the result, forest and forest products play great role in contribution of increasing income for farming households and also forest management should sustainable if the local people participate in planning, implementing, monitoring and evolution and decision making. Therefore it is better to policy maker and other stakeholders give more attention for sustainable natural resources.
- Training in terms of sustainable natural resource management should be given to enhance local communities to scale up forest management practice. Therefore it is better government and other stockholders should give further attention.
- Providing required credit had better possibilities to invest in PFM and purchase agricultural technology. Credit user had better position to performing different participatory forest management activities. Thus the government Organizations in the woreda (Omo microfinance and Cooperative union) should give more attention.
- In study area farmers have willingness to invest in FPM. Carbon trade fund and other livelihood initiatives motivate the community to more protect the area and conserve natural resources besides help the community participate in different income generating activity to make the community more active, the fund should be released on time to do this the concerned body such as cooperatives and world vision should give more attention.
- Deforestation, poor agricultural practice and cultivation of sleepy slope were major Problem in the study area. Hence it should be better physical and biological conservation to increase soil fertility and erosion. Thus woreda agriculture and natural office and Environmental protection office should be give more emphasize to sustain natural resource. In addition, further research should be done through assessment of farmers' participation on Participatory forest management performance needs to be implemented.

Reference

Agrawal, A. (2001). Common Property Institution and Sustainable Governance of Resources.World Development Vol29, No. 10, PP.1649-1672.

Agrawal, A., and Chhatre, A. (2006).Explaining Success on the Commons: Community Forest Governance in the Indian Himalaya. World Development Vol. 34, No. 1, pp. 149–166.

Alemtsehay Jima, (2010). Determinating Factors for a Successful Establishment of Participatory Forest Management: A Comparative Study of Goba and Dello Districts, Ethiopia. An MSc thesis: University of Agder, Kristiansand, Norway. pp119

ANGELSON, A. and WUNDER, S. (2003). Exploring the forest-poverty link: key concepts, issues and research implications. CIFOR Occasional paper No. 40., Bogor, Indonesia.

Bryman, A. (2008) Social Research Methods, 3rd edition, Oxford University Press

Central statistical Agency (CSA). (2015). Ethiopian Statistical Abstract, Central Statistical Authority:Statistical bulletin 578. Addis Ababa, Ethiopia.

Conforti, P., eds. (2011). Looking ahead in world food and agriculture: perspectives to 2050. Rome, FAO

CSA (1998).Agricultural Sample Survey.1997/98.Bulletin 193, Vol. IV, CSA, Addis Ababa. pp. 561.
Daniel Tadesse(2008),Access and utilization of Agricultural information by settelers farming house heads. The case of Metema Woreda,North Gonder Haramaya University, Ethiopia
F.A.R.M. (2000). Assessment of timber Extraction Rate in the Chilimo Forest. FARM Africa, Addis Ababa, Ethiopia.
FAO & OECD. (2012). Building resilience for adaptation to climate change in the agriculture sector. Proceedings of a joint FAO & OECD workshop. Rome. (available athttp://www.fao.org/agriculture/crops/news-events-bulletins/detail/en/item/134976/.
FAO/UN (2010). Progress towards Sustainable Forest Management; Global Forest Resources Assessment main report FAO forestry paper -163.
Fikru, A., (2009).Assessment of Adoption Behavior Of Soil and Water Conservation Practices in the Koga Watershed, Highlands of Ethiopia. Msc thesis.
Fisher, R., Prabhu, R., and McDougall,C. (2007). Adaptive collaborative management of community forests in Asia, "Experience from Nepal, Indonesia and the Philippines",
Greene. (1993). Econometric Analysis, Fifth Edition. New York: Pearson Education, Inc., Upper Saddle River,New Jersey, 07458.
Garnett. T. (*2011).*Where are the best opportunities for reducing greenhouse gas emissions in the food system(including the food chain)? Food Policy, 36(1): S23–S32.
GOBEZE, M. BEKELE, M. LEMENIH and H. KASSA, (2009). Participatory forest management and its impacts on livelihoods and forest status: the case of Bonga forest in Ethiopia: *International Forestry Review Vol.11(3), 2009*
Gow, D. D. (1992) Poverty and natural resources:principles for environmental management and sustainable development. *Environmental Impact Assessement Review,* 12(49 – 65)
Gryseels, G. and F.M Anderson, (1983). Research on farm and livestock productivity in the central highlands: Initial results, 1977-1980. ILCA Research Report No. 4,ILCA, Addis Ababa, Ethiopia. 52p.
Islam KK, Sato N. 2012a. Participatory forestry in Bangladesh: has it helped to increase the livelihoods of Sal forests dependent people. South Forests: J Forest Sci. 74(2):89–101.
Islam KK, Sato N. 2012a. Participatory forestry in Bangladesh: has it helped to increase the livelihoods of Sal forests dependent people. South Forests: J Forest Sci. 74(2):89–101.
Lemenih, M. (2012) The role of forests in rural livelihoods and climate change adaptation.
Lemma G., (2002). Crude protein and mineral status of Forages grown on pelvic vertisol of Ginchi, central highlands of Ethiopia .PhD dissertation Presented to the University of the Free State, Bloemfontein.
Lepp, A. & Holland, S. (2006) A comparison of attitudes toward state-led conservation and community-based conservation in the village of Bigodi, Uganda. Society & Natural Resources, 19(7), 609-623.
Lobell, D., Schlenker, W. & Costa-Roberts, J.(2011). Climate trends and global crop production since 1980.Science.
Matta, J.R., and Alavalapati,J.R.R (2005) Perceptions of collective action and its success in
Mesfin Astatike (2005) Analysis of factors influencing adoption of TRITICAIE and impact. The case of Farta woreda .MSc thesis
Ministry of Finance and Economic Development (MOFED).(2006).*Ethiopia: Building on Progress. A Plan forAccelerated and Sustained Development to End Poverty (PASDEP) (2005/06-2009/10).*Volume I: Main Text. Addis Ababa, Ethiopia.
Mokonine,(2007) Assasement of factor influencing adoption of integrated striga management technologies of sorghum in Habro and Fedis Wereda ,Oromia region.M.sc.thesise submitted to School of Gradutes,Haramaya University.
Ostrom, E. (1990). Governing he commons: The evolution of institutions for collective action. Cambridge: Cambridge University Press
Padgham, J. (2009). Agricultural development under a changing climate: opportunities and challenges for adaptation. Washington D.C., The World Bank.
Plant Genetic Resources, pp. 237–247, (Engels, J.M.M., Brown, A.H.D. and Jackson, M.T.,
Rishi, P. (2007) Joint forest management in India: An attitudinal analysis of stakeholders. Resources Conservation and Recycling, 51(2), 345-354.
Salam, M.A, Noguchi,T., and Koike, M. (undated). Factors Influencing Farmers to Sustained Participation in Participatory Forestry: A Case Study in Central Sal Forest in Bangladesh
Sarker, D., and Das, N. (2006). A Study of Economic Outcome of Joint Forest Management Program me in West Bengal: The Strategic Decisions between Governments and Forest
SCHMITT, J. (2003). The contribution of community forest management to the rural household economy: a case study from Bale mountains, Ethiopia. I-TOO working paper No. 11, Freiburg, Germany, 73 pp.
Shrestha, R. K. & Alavalapati, J. R. R. (2006) Linking conservation and development: An analysis of local

people's attitude towards Koshi Tappu Wildlife Reserve, Nepal. Environment Development and Sustainability, 8(1), 69-84.

Sodo Zuriya Woreda Agriculture & Natural resource office(2016): Annual report, Sodo

Solomon, D., Fritzsche, F., Tekalign, M., Lehmann, J. & Zech, W. (2002) Soil organicmatter composition in the subhumid Ethiopian highlands as influenced by deforestation and agricultural management. *Soil Science Society of America Journal,* 66(1)**,** 68-82.

Sonneveld, B. &Keyzer, M. A. (2003) Land under pressure: Soil conservation concerns and opportunities for Ethiopia. *Land Degradation & Development,* 14(1)**,** 5-23.

Takahashi, R., and Y. Todo. (2012). "Impact of Community-Based Forest Management on Forest Protection: Evidence from an Aid-Funded Project in Ethiopia." Environmental Management 50: 396–404.

Terefe,D. (2003). Factors Affecting People's Participation in Participatory Forest Management: The case of IFMP Adaba Dodola in Bale zone of Oromia Region; MA Thesis Addis Ababa University School of Graduate studies Regional and Local Development Studies (RLDS)

The role of farmers' perceptions and attitudes. Agroforestry Systems, 66(3), 217-229.

Tsegaye, G., B. Melaku, L. Mulugeta, and K. Habtemariam. (2009). "Participatory Forest Management and Its Impacts on Livelihoods and Forest Status: The Case of Bonga Forest in Ethiopia."International Forestry Review 11 (3): 346–358. doi:10.1505/ifor.11.3.346

UN Department for Economic and Social Affairs (2015) World Population Prospects, the 2012 Revision. [online] Available at: http://esa.un.org/wpp/unpp/panel_population.htm [Accessed 30 Jun. 2015]..

WILY, L.A. (2002).*Participatory Forest Management in Africa.An Overview of Progress and Issues.*Community Based Natural Forest Management Network (CBNM).

Winberg, E. (2010).Participatory Forest Management in Ethiopia, Practices and Experiences. Addis Ababa: Food and Agriculture Organization, Sub-regional office for Eastern Africa(SFE).http://www.fao.org/forestry/24514043adbe564e803444b40d3e18987b434d.pdf.

Wondatir Z., Mekasha Y. and Bram W., (2011). Assessment of productive performance of dairy cattle nexus with feed availability in selected peri-urban areas of Ethiopia. PP.313

World Bank (1996).The World Bank participation source book.

Yemiru, T. (2011). Participatory Forest Management for Sustainable Livelihoods in the Bale Mountains, Southern Ethiopia Faculty of Forestry Department of Forest Products Uppsala Doctoral Thesis Swedish University of Agricultural Sciences