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Assessment of Knowledge, Attitude and Practice of the Local Community on Watershed Management at Kindo Koysha Woreda of Wolayta Zone, Southern Ethiopia

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The aim of this study is assessment of farmers' participation in watershed development in case of Kindo Koyisha Woreda since there was no thorough study conducted so far on farmers' knowledge, Attitude and practice of the watershed management. The study also deals with, identifying factors influencing watershed development in the study area. A purposive sampling procedure was applied to select two kebeles and 120 sample respondents. Data were collected from both primary and secondary sources. The methods of data collection employed include sample survey by administering an interview schedule and focus group discussions. Participation index, descriptive statistics and ordered logit model were used to analyses the collected data. The result descriptive statistics also showed that 27, 52 and 41 respondents were with low, medium and high levels of participation. The estimation of the ordered logit model revealed that out of 17 variables included in the model, 9 variables were found significant at different probability levels. Age, education level of respondents, sex, family size, farm size, extension service and training were positively and significant related to farmers' knowledge, Attitude and practice of the local community on watershed development. Results of this research and other observations revealed that watershed development activities could only be successful with active participation of the community. For this, raising the awareness and enabling of the community at large and specifically farmers' at woreda level providing short and long term training and education are required until they reach sustainability and to develop sense of ownership in the development practices. Thus, comprehending the driving factors of farmers' knowledge, Attitude and practice on watershed development is crucial to improve the response mechanisms related to sustainable management of natural resource in the study area.

Key Words: community perception, conservation, resource management, climate change, Wolayta zone, Ethiopia

Introduction

Agriculture is one of major economic activities in the study area. However the production of agricultural output is constrained by several factors including traditional farming system, natural resource degradation, erratic rainfall distribution, and limited use of modern agricultural technologies. Rapid growth of population has resulted in fragmentation and reduction of farm size which contributed much on the production and productivity of food crops.

Community participation in the development process is of paramount importance for supporting government budgets part since participation could be in various ways that is from idea up to material contribution. Moreover, development process that doesn't involve willful community participation may not be sustainable. Soil degradation on large tracts of cultivated land is seriously undermining millions of people livelihoods. Attempts to overcome this problem have been made through large investment in watershed management through Asia, Africa and Latin American (Lal, 2000). As many evidence indicates, in the study area the level of farmers' participation on watershed development is no well developed. This study therefore aims to assess the level of farmers' participation in watershed development; and identify the determinants that influence farmers' participation in watershed development in the study area.

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Literature Review

Watershed degradation in many developing countries threatens the livelihood of millions of people and constrains the ability of countries to develop a healthy agricultural and natural resource base. Increasing populations of the people and livestock, particularly in the steep, mountainous watersheds, are rapidly depleting the existing natural resource base because the soil and vegetation systems cannot support present levels of use. In a sense, the carrying capacity of these lands is being exceeded. As population continue to raise, the pressures on forests, rangelands, and marginal agricultural land to inappropriate cultivation practices, forest removal, and grazing intensities that, in the extreme case, leave a barren land that yields unwanted sediment and damaging floods to downstream communities. Recognizing the importance of upland areas conservation, especially in most of the developing countries where the economy is depending predominately on agriculture, watershed management has received over the last few decades an increasing scientific attention from countries themselves as well as from concerned international and regional organization (FAO, 2004).

Sustainable natural resources management has become the main concern of the Ethiopian rural development strategy. Underdevelopment, rapid population increase, land degradation, low productivity level, climate uncertainty and water scarcity are the major bottlenecks to achieving higher agricultural production and improved rural livelihoods in developing countries like Ethiopia (Singh et al. 2011).

A watershed approach can be a coordinating framework for management that attempts to focus public and private, community and individual efforts toward addressing high priority land and water-related issue within the hydrological-defined geographic area. Watersheds are being considered as a unit of management for many natural resource related issues including land degradation, water conservation, non-point source pollution, etc (FAO.2004)

Arable land is overcrowded, over cultivated, and under maintained. Eighty percent of the population lives in the highlands, which cover only 45 percent of the country and stuffier from widespread erosion, deforestation and loss of nutrients, further reducing the per capita share of arable land (Teketay et al., 2003).

The study area

Wolaita Zone is one of the 14 Zones in the Southern Nation Nationalities and Regional State. It is roughly located 6.4^0 -7^0 N and 37.4^0 - 38.2^0 E. the boundary areas are KambataTambaro in the north, Sidama Zone in the East, GamoGofa Zone in the South, Dawro Zone in the West. The Zone has total population of 1,691,867 (CSA,2000). Area of the Zone is 451170 hectare or 4511.7 km^2. The zone has 12 rural districts and three town administrations.

The study was conducted in Kindo koyisha is one of the 12 woredas in Wolayta Zone, which is situated in SNNPR. It is about 410 kilometers from Addis Ababa to the south and about 36 kilometers from wolayta Soddo to the west. The woreda is bounded by Boloso sore and Boloso Bombe woredas in the North, Damot Sore and Soddo Zuria woredas in the East, River Omo and Dawro Zone in the West, and Kindo Didaye and Ofa woredas in South.

Research Method

For the purpose of this study, both qualitative and quantitative data were collected from primary and secondary sources.

Data Collection Methods

The interview schedule was developed based on the context of the specific objectives of the research and information was gathered by using survey method.
Exploratory survey was conducted first to generate relevant information for the actual survey. This was also supplemented with Focus Group Discussions. Key Informants Interview and Personal Observations to generate primary data.

Enumerators who were employed of Agricultural and Rural Development Office and familiar to the area and language was recruited from the study area and trained on the objectives, methods of data collection and interviewing techniques to assist the researcher in collecting the desired data. These enumerators were also familiar to the culture of the farming community and they had been experienced in watershed development. Before effecting the data collection by using personal interview technique, pretesting of the interview schedule was carried out with the enumerators to assess whether the questions are clear and relevant and to know whether the enumerators can administer the Interview Schedule without difficulties. Necessary modifications were made in the Interview Schedule after pre testing.

Sample Size

To determine sample size the mathematical formula used. Taro Yamane, 1970 has suggested the following mathematical formula for determining sample size.

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

Where, N is the total number of farmer participate in watershed development at household level are 1239 , confidence level of 95% . Based on this, the error term would equal to 5%. Using the total population of 1239 and the level of precision of 8.7%, the sample size was calculated as follows.

$$n = \frac{1239}{1 + 1239(0.087)^2} = 119.5$$

Hence, out of the total population of 1239 farmer in watershed development at in two kebeles , a sample size of 120 was taken. Accordingly, among the 23 rural kebeles of the woreda, 2 kebeles were purposively selected and the criteria used for their selection were the existence farmers' attitude in the development practice in the area. To identify the 120 participants a systematic random sampling technique was used.

Data Analysis

Descriptive statistics were used to have clear picture of the characteristics of sample units. By applying descriptive statistics one can compare and contrast different categories of sample units (farmer's respondents) with respect to the desired characteristics. In this study, descriptive statistics such as mean, standard deviation, percentages and frequency of occurrence were used with F-test for continuous variables and χ^2-test for dummy/discrete variables to see the existing relationship between explanatory variables and farmers' participation level.

The ordered logit model was employed due to the ordered nature of the dependent variable. Use of appropriate model is usually determined by the nature of the dependent variable or variables. In this study dependent variable has categorical or ordered nature.Then ordinary linear regression is not appropriate because of the non-interval nature of the variable and the spacing of the outcome choices cannot be uniform. Although the outcome is discrete, the multinomial logit or probit models would fail to account for the ordinal nature of the dependent variable (Greene, 2008). The ordered probit and logit models have come in to fairly wide use as a frame work for analyzing such responses (Zavoina and MacElvey, 1975). Hence, the Ordered Logit Model was used to assess the determinant of the farmer Participation having three distinct categories. That is low, medium and high participation categories.

By following Green (2008) and Liao (1994) the functional from of ordinal logit model is specified as follows:

$$y^* = \sum_{k=1}^{k} \beta_k \quad + \varepsilon. \qquad (1)$$

y*= is unobserved and thus can be thought of as the underlying tendency of an observed phenomenon
$\varepsilon =$ it is assumed it follows a certain symmetric distribution with zero means such as normal or logistic distribution. What it is observed is

$$\begin{aligned} &y=1 \text{ if } y^* \leq \mu_1 \\ &y=2 \text{ if } \mu_1 < y^* \leq \mu_2 \\ &y=3 \text{ if } \mu_2 < y^* \leq \mu_3 \qquad (2) \\ &y=j \text{ if } \mu_{j-1} < y^* \end{aligned}$$

Where y is observed in j number of ordered categories, μ_s are unknown threshold parameters separating the adjacent categories to be estimated with β_s
The general form of the probability that the observed y falls into category j and $\mu_s$and the β_s are to be estimated with an ordinal logit model is

$$Prob\,(y = j) = 1 - L\left(\mu_{1-1} - \sum_{k-1}^{k} \beta_k\, x_k\right) \qquad (3)$$

Where L(.) represents cumulative logistic distribution
Odds ratio on each participation status is calculated by

$$\frac{\delta\, prob(Y=j)}{\delta\, X_k} = \left[f\left(\mu_{1-1} - \sum_{k-1}^{k} \beta_k\, x_k\right) - f\left(\mu_{1-1} - \sum_{k-1}^{k} \beta_k\, x_k\right)\right]\beta_k \quad (4)$$

Where f(.) represents the probability density function.

Result and Discussions

Socio-Demographic variables

Age is one of the characteristics considered as important in this study. It was expected to be a great source of experience in every day to day activities of the human beings so that increase farmers' participation in the watershed development. The age of the respondents ranged from 19 to 87 years. As Table 1 shows, the total mean age of the sample respondents was 51.3 years. The mean age of Low, Medium, and High levels of participation categories were found to be 57.5, 48.75, and 42.84 years respectively. But the result obtained from this study is completely different from the expectation. This is because those member respondents who are under the low participation categories have large mean age value than those from respondents in the high categories.

Table 1: Age, family size, years of membership, and education level of respondents

Variables	Participation Categories			Total	F – value
	Low	Medium	High		
	Mean	Mean	Mean		
Age	57.5	48.75	42.82	51.3	4.87**
Family size	7.93	7.42	6.93	7.37	0.47(NS)
Dependence ratio	0.37	0.36	0.35	0.36	0.33(NS)
Education level	3.62	2.38	2.86	2.9	0.530**
	Low	Medium	High	Total	χ^2 – value
Sex					0.043***
Male	21	44	40	105	
Female	2	5	8	15	

The result of mean test using one way ANOVA also indicates there is statistically significant mean difference (F=4.872 and P=.091) among the respondents with 10% probability

The results displayed in Table 2 below confirmed significant mean differences among the three participation categories. The result indicated that 27(22.5%), 52(43.3%), and 41(34.2%) of the respondents were in the order of low, medium, and high participation categories respectively. The categories were tested for significance using one-way ANOVA.

Table 2. Distribution of respondents by participation categories

Participation categories	N	%	Participation score range	Mean	Std. Dev.	F	P
Low	27	22.5	1-4	2.5	1.08	368.409***	.000
Medium	52	43.3	5-7	6.6	1.23		
High	41	34.2	8-9	9	0.0		
Total	120	100	1-9				

*** significant at 1% probability level

Participation and demographic variables

It was expected to be a great source of experience in every day to day activities of the human beings so that increase farmers' participation in the watershed development. The age of the respondents ranged from 19 to 87 years. As Table 3 shows, the total mean age of the sample respondents was 51.3 years. The mean age of Low, Medium, and High levels of participation categories were found to be 57.5, 48.75, and 42.84 years respectively. But the result obtained from this study is completely different from the expectation. This is because those member respondents who are under the low participation categories have large mean age value than those from respondents in the high categories. The result of mean test using one way ANOVA also indicates there is statistically significant mean difference (F=4.872 and P=.091) among the respondents with 10% probability .

Table 3. Age, family size, years of membership, and education level of respondents

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Family size	7.93	7.42	6.93	7.37	0.47(NS)
Dependence ratio	0.37	0.36	0.35	0.36	0.33(NS)
Education level	3.62	2.38	2.86	2.9	0.530**
	Low	Medium	High	Total	χ^2 – value
Sex					0.043***
Male	21	44	40	105	
Female	2	5	8	15	

The family size of the respondents ranged from 1 to 15. The mean family size of the sample respondents in the study area was found to be 7.37 (Table 3). The respective average family size for low, medium, and high participation categories was 7.93, 7.42, and 7.15 respectively. The results of one way ANOVA (F=0.47 and P=0.36) show that there is no significant mean difference of family size among the different participation groups.

Dependency ratio: This indicates the proportion of dependent household members (the number of children under age 15 and old age of above 65 years) to that of economically active age groups (15-65).The mean dependency ratio of the sample respondents in the study area was found to be 0.36 (Table 3). The respective average for dependency ratio low, medium, and high participation categories was 0.37, 0.36, and 0.35 respectively. The results of one way ANOVA (F=0.33 and P=.48) show that there is no significant mean difference of dependence ration among the different participation groups. From this dependence ration and level of farmers' participation in watershed development is not related.

Participation and economic variables

Land is an important means of agricultural production in rural areas. It plays a central role in producing crops and rearing livestock. In this study having large size of land is associated with producing and supplying more farm produce for the market. The size of land holding of the sample respondents ranged from 0.35 to 5 hectares. The average land holding size of low, medium and high participation categories were 1.12, 1.08, and 1.14 respectively. The result of one way ANOVA (F=.533 and P=.4810) revealed that there is no significant mean difference among the participation categories (Table 4). From this, it is possible to conclude that members participation categories and their farm size are not related.

Table 4. Participation category with respect to economic Variables

Variables	Participation Categories				F – value
	Low	Medium	High	Total	
	Mean	Mean	Mean	Mean	
Size of land	1.12	1.08	1.14	1.11	0.533(NS)
Total livestock holding	4.48	5.2	6.81	8.40	5.177***
Farm income	4,150	7,900	11,600	8000	0.901(NS)
Farm distance to WSC site	1.0	1.2	1.4	1.2	1.03(NS)
					χ^2 – value
	Low	Medium	High		
Adoption of new technology					0.01400**
Yes	12	40	28		
No	15	12	13		

Psychological Variables

Perception of farmers' is measured by Likert scale. Farmer's perception and response to soil erosion and deforestation problems had a positive and significant association with their contact with conservation agents (Abiy, 2002). The average perception farmers' to Watershed for low, medium, and high participation categories were 1.5, 3.4 and 3.9 respectively. The one way ANOVA (F=50.024 and P=0.00) shows there is a significant mean difference among the participation.

Table 5 Perception and farmer to farmer knowledge sharing

Variables	Participation Categories				χ^2 – value
	Low	Medium	High	Total	
Perception	1.5	3.4	3.9	2.85	50.024***
	Low	Medium	High		
Farmer to farmer knowledge sharing					0.007***
Yes	17	36	38	91	
No	10	16	3	29	

Farmer to farmer knowledge sharing is interpersonal communication with other farmers and neighbors' improve farmers innovativeness' and motivates them adopt new watershed technology. Out of the total sampled respondents 75.83% were sharing their knowledge to other farmer. The corresponding figures for low, medium, and high level of participation categories were 62.96%, 69.23%, and 92.68% respectively (Table 5).

The significant χ^2 test indicates that more of the sample farmers categorised under high participation group were sharing their knowledge to other farmers'.

Perception of farmer in watershed development

This section presents the result and discussion on farmer's perception as measured by the Likert Scale. Accordingly, different perception statements were presented to the sampled farmer.

It was examined in the samples. These items in the scale were watershed development reduces runoff, it conserves soil, it conserves moisture, it helps to get better yield of crops, it improves vegetation cover, it helps to get fodder availability, it increases livestock rearing, it creates income generating possibility, it helps to get fuel availability, it improves ground water level and it improves availability of water.

The scores for the statements were assigned as 5,4,3,2, and 1 for strongly agree, agree, neutral, disagree and strongly disagree respectively. Finally the mean score for a statement is obtained by dividing the total value by the number of respondents and ranked based on mean score value.

Table 6. Farmers perception to watershed management

No	*Activities*	*Mean*	*Std*	*Var*	*Rank*
1	WSD reduces runoff	4.83	0.37	0.14	1
2	WSD conserve soil	4.8	0.4	0.16	2
3	WSD improves vegetation covers	4.75	0.42	0.18	3
4	WSD conserves moister	4.51	0.54	0.3	4
5	WSD help to better yield crop availability	4.16	0.737	0.535	5
6	WSD improves ground water	3.95	1.04	1.08	6
7	WSD help to fuel availability	3.91	0.731	0.543	7
8	WSD help to fodder availability	3.83	0.71	0.51	8
9	WSD create income generation possibilities	3.8	0.67	0.49	9
10	WSD increase livestock rearing	3.62	0.48	0.23	10

The result of ANOVA on the perception of the participant farmer on these items of impact of watershed development showed that they are perceived good. This difference may be resulted from the difference in direct involvement of farmer in the activities by the participated farmer.

Soil and water conservation measures adopted in the watershed development projects were helpful in augmenting water storage capacity and improving local water resources by reducing the rate of runoff, and increasing the ground water recharge. (Butterworth et.al, 2001).

Watershed development in the study area have started before 15 years by different projects like Action aid, SOS project and safety net programs in order to fill the food gap of the farmers by reducing land degradation problem of the area. These development activities were undertaken by paying in kind or in cash for the activities implemented. The programs have their own impact creating awareness about reducing land degradation problem and fulfilling the food gap but it creates a sense of dependency on the community to perform the activities in a participatory way.

Table 7. Determinants of Farmers' Participation

Variables	Coefficient	P-value	Marginal effect		
			Low	Medium	High
AGE	-0.0196***	0.060	-0.012	0.0071	0.0058
EDULEVEL	1.9279***	0.062	-0.0782	-0.0195	0.0977
SEX	1.1484***	0.050	-0.164	-0.087	0.251
FAMSIZE	-0.3368***	0.002	-0.0203	0.0112	0.0091
DEPDRATIO	1.3088***	0.069	0.01848	-0.0985	-0.02833
TLU	-0.0399	0.578	0.0024	-0.0013	-0.0011
FARMSIZE	0.7719***	0.002	-0.0465	0.0256	0.0208
FARMIN	0.00002	0.357	-1.14e-06	6.28e-07	5.11e-07
DISFWSS	-0.8732***	0.041	0.0526	-0.0290	-0.0236
TRAINING	1.3194***	0.055	-0.0556	-0.0019	0.0575
EXTESERVICE	1.7816***	0.056	-0.03906	0.0953	0.0304
CREDIT	-0.8442	0.116	0.0598	-0.0398	-0.0199
USEINFO	0.2542	0.564	0.0151	-0.0088	-0.0063
YEARMEM	0.308	0.210	-0.0186	0.0102	0 .0083
PERCEPTION	1.579	0.149	-0.0816	0.0230	0.0585
ADONWTECHN	-0.4337	0.445	-0.0264	0.0147	0.0117
FARTOFARKSH	0.4680	0.548	-0.0242	0.0091	0.0151

Log likelihood = -69.695318 Prob>chi^2 = 0.0000
LR chi^2(20) = 167.98 Psudo R^2 = 0.5465
***, **, and * are significant at 1%, 5%, and 10% probability level respectively

A total of seventeen explanatory variables which were hypothesised to have a significant impact on the dependent variable were put in to the ordered logit regression model. Out of which nine explanatory variables were found to be significantly influencing the participation of farmers in different activities of watershed development. These are Age of respondents (AGE), Education level (EDULEVEL),Sex (SEX), Dependence ratio (DEPRATIO), Family size (FAMSIZE), Size of farm (FARMSIZE), Distance from the watershed (DISFRWSD), Training (TRAINING) and Extension (EXTSERV).

Age of the respondents (AGE): This variable was statistically significant at 10% probability level, influencing the farmers' participation positively. According to the model output, as the age of the respondent increases by one year, the probability of farmers' participation in watershed development for low participation category decreases by 1.29% while the participation by medium and high categories increases by 0.71% and 0.58% respectively. The result is consistent with the finding of Amsalu & De Graaff (2007).

Education level (EDULEVEL): This variable was statistically significant at 10% probability level, influencing the farmers' participation positively. According to the model output,as the education level of the respondent would decrease the participation level of low and medium categories by 7.82% and 1.95% respectively, but it increases the participation level of high category by 9.77%. The positive estimated coefficient of to farmers' participation in watershed development reveals that farmers in high education level have higher probability of being participate on watershed developmenr than those farmers with lower education level.The result is consistent with results of (e.g. Tegegne, 1999; Ervin and Ervin, 1982; Noris and Batie, 1987; Pender and Kerr, 1996; Asrat et al., 2004).

Sex of the respondents (AGE): Sex of the respondent was hypothesized negative to have impact on farmers' participation in different affairs of watershed development. But the result of the ordered logit model indicates positive relationship between farmers' participation level and their sex at 5% probability level. The probable reason for this could be both male and female farmers might have more participation in higher categories. According to the model output, as the a sex of the respondent would decrease the probability of farmers' participation to the low and medium categories by 1.64% and 8.7% respectively, but it increases the probability of farmers' participation for high participation category by 2.65%. The result is consistent with the findings of (ibid).

Family size (FAMSIZE): This variable was statistically significant at 1% probability level, influencing the members' participation positively. This result depicts that as the family size increases by one adult equivalent, the probability of farmers' participation in watershed for low participation category decrease by

2.03% while the participation by medium and high categories increases by 1.12% and 0.91% respectively.as family size increase level of family participation in watershed development increase. The result is in contrary to the finding of (Shiferaw & Holden, 1998; Bekele & Drake, 2003; Tadesse & Belay, 2004) which states household with large family size seems to accept less risk in using new technologies. But the result is consistent with the finding of (Tadesse & Belay, 2004).

Dependency ratio (DEPRATIO): The result from the ordered logit model reveals that the dependency ratio significantly influence members' participation at 10% probability level negatively. The presence of more dependents in households may reduce time investing in developemnt practice and occupied by household duties the probability of farmers' participation on watershed development for low participation category increase by 1.84% but it reduces the participation level for medium and high categories by 9.8% and 2.83% respectively. The result is consistent with the findings of Shiferaw & Holden, 1998.

Size of farm (FARMSIZE): The result from the ordered logit model reveals the significant and positive relationship between members' participation and the size of the land respondents have at 1% probability level. The implication is that farmers with large farm size actively participate in watershed development since they need to buy large farm inputs and have a potential to produce and sell agricultural product. If other variables remain constant, a unit increase in hectare of farm size decreases the probability of farmers' participation for low category by 4.65%. The same increase in the hectare of farm size increases the probability of members' participation for medium and high categories by 2.56% and 2.08% respectively. The result is consistent with the findings of (Shiferaw & Holden, 1998; Bekel & Drake, 2003; Tadesse & Belay, 2004; Amsalu & De Graaff, 2007; Kassa et al., 2013).

Distance from the watershed site (DISFWSS): The result from the ordered logit model reveals that the distance from the watershed development significantly influence members' participation at 5% probability level negatively. Farmers who are relatively nearer to the watershed site participate more. This is because the proximity allows members to participate easily since it requires less time and cost in travelling. In addition, it helps farmers to know more about the benefits of watershed. An increase in the distance of the farmers from the watershed site by an hour increases the probability of members' participation for low participation category by 5.26% but it reduces the participation level for medium and high categories by 2.9% and 2.36% respectively. The result is consistent with the findings of Shiferaw and Holden (1998), Bekele and Drake (2003) and Regasa (2005)

*Extension service (EXTNSRV):*This explanatory variable is correlated with the probability of farmers' participation positive and significantly at 10% probability level. As the respondents believed that access to extension service have good perception to watershed development, the probability of farmers' participation for low participation category decreased by 7.06%, while the probability to medium and high categories increased by 4.53% and 2.54% respectively. The result is consistent with the findings of (Shiferaw & Holden, 1998; 2004; Rgasa, 2005).

Training (TRAINING): The result from the ordered logit model shows that training undergone in different aspects of development practices and farmers' participation in watershed development had a positive significant relationship. The coefficient of this variable is statistically significant at 10% probability level. From the marginal effects, one can understand that for one unit increase in training (i.e., going from 0 to 1), the probability of farmers participation for low and medium participation categories decreases by 5.56% and 0.19% respectively while the probability for high participation category increases by 5.75%, given that all of the variables in the model are held constant. The result is consistent with the findings of (Shiferaw & Holden, 1998; Sidibe, 2004).

Conclusion

Farmers' are the most affected section of the community by the degradation of the natural resource since they rely on it to fulfill their different needs. The main focus of this study is to assess farmers' participation on watershed development.Soil erosion and loss of soil fertility on cultivated lands, increase of the number of mouths to be fed due to excessive high population growth, low productivity level and an alarming rate of land degradation and environmental imbalances due to poor management of natural resource are a very problematic issue in the study area. The result show that high level farmers' participation under medium 43.3% and high 34.2% categorie believed that only active participation of farmers' on watershed development can solve the problem. But their actions and capacity was constrained by various socio demographic, economic, institutional and psychological factors. Basic influencing factors were age,education, sex, dependence ratio, farm size, distance to watershed site, contacts with extension agents and training of the household head.

Results of Order Logit model showed that age, education level of respondents, sex, family size, farm size, extension service and training were positively

and significant related to farmers' participation. On the other hand, distance to watershed and dependence ratio were negative and significant related to farmers' participation on watershed development at different probability levels.

The most important conclusion that can be drawn from this research is that there has been voluntary participation of farmers' in watershed development in the three phases of participation, attention needs to be paid to the factors influence the target groups, and the need for designing and implementing appropriate policies and programs that will influence farmers' participation on watershed development in their agricultural practices.

Results of this research and other observations revealed that watershed development activities could only be successful with active participation of the community. Finial it is important to note that, Ethiopia is diversified in agro-ecology, socio-economy, cultural, and institutional environment, and the study being location specific in nature, its results could not be generalized to zonal or regional level. However, recommendation and policy implication of the study can be used for other areas of similar context and as a basis for further studies.

Recommendations

Based on the findings of the study the following recommendations were forwarded:

- *Sex:* Government and other concerned body should design necessary strategies to empower women to participate equitably with man in watershed development. Strengthening the capacity of females through formal and informal education (like literacy) should be also an integral part of the whole development process.
- *Education:* The strong relationship of education with participation on watershed development suggests government and other concerned parties to give due attention for promoting farmers' education through strengthening and establishing both formal and informal type of education, developing farmers' training centers, promoting literacy campaign, expanding technical and vocational schools.
- *Age:* The positive and significant influence of age on participation of watershed development as the result of having more labor accounts to build capacity of laborer in order to enhance their skill especially in the area of watershed development activities. Indigenous skills associated with watershed development activities should be given prior attention in the study area.
- *Farm size*: The significant influence of farm size on participation of watershed development considers giving due attention by concerned bodies. Strategies should be designed and implemented that would have effect on maintaining the existing land size and promoting intensive agriculture production for those devoid the opportunities. Measures such as appropriate land use and proper extension services should be in place to raise land productivity.
- In order to curb the negative significant effect of *distance from watershed* providing training to farmers' about overall improtance of watershed development is needed.
- *As extension service* is significant for members' participation in the affairs of watershed development, expanding extension service opportunities' through ICT such as mass media, web site, TV and etc.

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