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Determinants of Rural Women Participation in Agriculture Activities in Gurage Zone, Ethiopia

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***Abstract* – This study examined the determinants of rural women participation in agriculture activities in Gurage zone, Ethiopia. A total of 389 sample women were from four districts of Gurage zone were included in the study. A multi-stage sampling technique was employed to select 389 sample women. Both primary and secondary data were used. The semi-structured questionnaire used as the data gathering instruments and focus group discussion and key informants were interviewed to collect necessary data on major activities performed by rural women in the study area and determinant factors. Descriptive statistical tools such as frequency, percentage, mean and standard deviation were employed to identify the characteristics of the respondents. In addition, ordered probit regression model was used to examine the determinant factors that influenced the determinants of women participation in agriculture activities. The results of the study showed that sowing, weeding, harvesting, manuring, transportation, and planting, were the main agriculture activities accomplished by women in the study area. In addition, findings of the study revealed that 27% of the sample women were belong to the low level of participation, 54% of the women were categorized in medium level of participation and the remaining 19% of the women were found to be in high level of participation. The results of the ordered probit model stated that farm income, education level, and contacts with development agents were found to be positively affected the women participation in agriculture activities while age and access to market were negatively influenced women participation in agriculture activities. Recommendations coming from the study findings are to identify the determinants of participation of rural women in agriculture activities not only to perform agriculture activities. With this regard, this study recommended that stake holders and concerned bodies who focus on promotion, encouragement and expansion of rural women participation in agriculture activities is needed to enhance educational level of women, provide aids and subsidized inputs to improve agriculture production which in turn increases income, develop rural infrastructure to create opportunity for agricultural inputs and extension agents should make readjustment of serves program for contacting rural women and government and non-governmental organization provide income generating activity for rural women.**

***Keywords* – Determinants, Ordered Probit Model, Participation, Women.**

I. INTRODUCTION

Rural women play vital roles in agricultural production in all parts of the world. Around the world, there are at least 1.6 billion women who live in rural areas and depend on agriculture for their livelihoods. In the world estimated that women grow half of the world: food, but they rarely own land, and one-third of the world's paid labor force but are generally found in the lowest, paying job. The feminization of poverty has become a global phenomenon. Despite social norms regarding the support and protections, many widows around the world receive little concrete support from extended networks (UN, 2002). Women farmer produce more than half of all the food that is grown in the world, specifically, up to 80 percent in Africa. Women constitute about 60-80% of the labor used for farming activities like planting, weeding, transportation, processing, marketing and storage of agricultural products in Africa. Women comprise, on average, up to 50 percent of the agricultural labor force in Sub-Saharan Africa (Akinyinzioki, 2007).

Ethiopia is one of the developing countries in Sub-Saharan Africa having vast and varied rural sector and primarily agrarian socio-economic setup. Agriculture sector has been the main of its economy as it contributes about *(*46%*)* towards the gross domestic product followed by service and industry sector each taking (39%) and (15%) share respectively (MoFED, 2012). Rural farmers in the country operate at the small scale farming in an extensive agricultural system; despite this the country's food security and agricultural development depend on them. Evidently, development, food security and poverty alleviation will not be truly achieved without rapid agricultural growth (Ogunlelaand Mukhtar, 2009). Women account more than half of the work force by participating in different activities, either directly or indirectly. Particularly striking is the fact that rural women, take the lead role in agricultural activities, making up more than half of the labor force. It is ironical that their contributions to agricultural development are seldom noticed due to different socio-economic and institutional factors (Etenesh, 2005).

The division of labor force for women varies from one society and culture to another, and within each culture external circumstances affect their participation in agriculture activity (Nigist, 2004). In the nine countries observed by Ogunlela (2009) women's low participation in agricultural activities suggested that these issues of most concern to women have been neglected in the design and implementation of agricultural development which ignores the impact of women's participation in agricultural production can at best achieve 'false growth. Broadly, increase in agricultural productivity is central to growth, rural women plays pivotal and crucial roles to the overall success of efforts directed at agricultural development in rural areas. The role played by women in meeting the challenges of agricultural production development are important. Their relevance and significance, therefore, cannot be trivialized (MoARD, 2009). This study was tried examine the determinants of rural women participation in agriculture activities in Guragezone, Ethiopia. It would enable the development practitioners and policy makers to prepare plans, which would address women's concerns and develop projects where the hidden potential could be utilized fully for the development of the agriculture in particular and economy in general.

II. RESEARCH METHODOLOGY

2.1. *Description of Study Area*

The present study was conducted in Geta, Gumeri, Merako and Sodo districts of the Gurage zone, Southern Ethiopia. Geta district is located in Gurage zone and is 98 km away Wolkite. It consists 14 rural kebeles where its altitude ranges from 2,400 to 3,200m and its agro-ecological zone is divided to dega (90%) and woinadega (10%) with an average minimum and maximum annual rainfall of from the 1001 mm to 1400 mm and the mean annual minimum and maximum temperature from 7.5% to 20%. The district is bordered to the south by Endegan woreda, to the east Gumer woreda and Silte zone, to the north by Geta woreda, and to the west by Enamuri woreda. The district has red and brown soil types, with a total land of 16580.32ha. The main economic activity of the woreda is agriculture. The dominant crops grown in the district are barley, wheat, bean, pean, maize and, enset (GWAO, 2018).

Gumeri district encompasses 18 rural kebele administrations which are found in dega agro-ecological zone. The district is located about 65 km from Wolkite. The total land area is 23,555 ha. It is bordered to the south by Geta, to the east by Silte zone, to the north by Ejaworeda and to the west by Cheha woreda (GWFEDO, 2018). The altitude of the district range from 2700 to 3178 m. It has clay loam 85% and 15% red types of soil.

Agriculture is the main economic activity in the district. The dominant crops grown in the area are barley, bean, wheat, pean, potato, and enset (GWAO, 2018).

Merako consists of 25 rural kebele administrations which are found in dry woina dega agro-ecological zone. The woreda is located about 136 km from the zonal capital, Wolkite. The woreda is bordered in the south by the Silte zone in the east and north by the Oromia region, and in the west by the Meskan woreda (MWFEDO, 2018). The altitude of the district ranges between 1800 to 2076msea level. The district has sand lame, silty, green and blue soils. The main economic activity in the district is agriculture. The dominant crops grown in the district are maize, wheat, pepper, sorghum, haricot bean, pean and barley (MWAO, 2018).

Sodo district includes 54 rural kebeles administrations which are found in two different agro-ecological zones viz., dega and woinadega. The district is located about 168 km from the zonal capital, Wolkite. The district is bordered to the south by Meskan woreda, to the east by Mareko woreda, to the north and west by Oromiya region (SWFEDO, 2018). The administrative center of the woreda is Buhi. The topography of the district is characterized by flat and hill lands. The altitude of the district ranges between 1790 to 3600 meters above sea level. The district has three types of soil, comprising of red 60%, brown 28%, black 12%. The total land holding area under different land uses is estimated to be about 103834.26ha. The main economic activity in the district is agriculture. The dominant crops grown in the district are maize, wheat, tef, maize, and sorghum (SWAO, 2018).

2.2. *Sample Size Determination*

To determine appropriate sample size simplified Yemane (1967) formula was used.

$$n = \frac{N}{1 + N(e2)}$$

Where, n = required sample size; d = degree of accuracy expressed as a proportion of (0.05); and N = total population. The required sample size was computed from the population of 15042 women present in the study area. Finally, 389 from sample women were selected using the sample size determination formula.

2.3. *Sampling Technique*

A multi-stage sampling technique was employed to select representative sample of the study. In the first stage, Geta, Gumer, Mareko and Sodo districts were selected purposively because they had the large number of women involved in agriculture activities. In the second stage, two sample kebele administrations were selected from each of the sample district through purposive sampling technique because for the reason where the women participation practice was high in comparison to the other districts of the targeted zone. From these Kebele administrations, sample size was determined using simplified formula provided by Yamane (1967) and sample women were determined by employing 95 percent confident interval and 5 percent margin errors. In the fourth stage, the list of sample women who have participated in agriculture activities were recorded from sample kebele administrations. A total of 389 sample women were selected from the sample kebele administrations using proportional to sample size. Simple random sampling technique was employed to select sample women by taking their lists from each kebele administration office.

2.4. *Methods of Data Collection*

Both primary and secondary data were collected from primary and secondary data sources. Primary data whi-

-ch includes both qualitative and quantitative data were gathered through a survey of sample respondents. Primary data such as socio-economic, demographic and agriculture activities data were collected through sample women interview using a semi-structured interview schedule. Prior actual data collection, pilot-tests were employed by allotting interview schedule to ten percent sample women to assess whether the instruments were suitable or appropriate to the study at hand. Crucial corrections were employed based on the comments obtained from pre-test responses from women to ensure reliability and validity. Data collectors were trained with respect to the survey techniques and ethical issues. In addition, qualitative data were gathered through focus group discussions, key informant interviews and observation. Secondary data were obtained from each woreda farm and natural resource development office, women and youth affair office, kebele administration office, reports, journals, documents, internet, various books and other relevant materials.

2.5. *Methods of Data Analysis*

2.5.1. *Descriptive Analysis*

Data were analyzed through descriptive statistics and ordered probit regression model. Descriptive statistical tools such as percentage, frequency, mean and standard devetation were generated general information of the sample respondents. Chi-square test was applied to analyze categorical data, correlation and cross tabulation was employed to identify inter-dependence among various factors influencing the level of women participation in agriculture activities. T-test was applied to analyze continuous data to compare the mean differences among level of women participation in the agriculture activities. Data analysis was employed with help of statistical package for social sciences (SPSS) version 24 software.

2.5.2. *Econometric Analysis*

The level of women participation in agriculture activities was measured by setting the indicator activities with their score value of number activities starting from women participated in one agriculture activity to participate in five activities. The indicators of activities used for this analysis include women participation of different agriculture activities. With this regard, the respondents were asked to what level they were participating in those activities. These were based on their intervention as one, two, three, four and five activities. Point was awarded for each response with sufficient scoring values as 1, 2, 3, 4 and 5 respectively. The number of women participated activities was noted to set the participation index of the each activity. The participation index for each activity was figured by using the following formula; WPI = (X1Z1) + (X2Z2) + (X3Z3) + (X4Z4). Where: WPI = women participation index for different agriculture activities, X1 = Number of women who participate in one activity X2 = Number of women who participate in two activities X3 = Number of women who participate in three activities X4 = Number of women who participate in four agriculture activities. Women participation index refers to the level they are involved in each activity in the area. But in order to examine the level of their participation in agriculture activities as a general, the scores of these activities were calculated for each respondent and categorized them as from low to high participation *(Abebe,* 2011*)*. The ordered probit regression model was used to identify the effect of independent variables on the women participation. Prior to the estimation of the regression model, the existence of multi-collinearity was checked among explanatory variables. Variance Inflation Factor was used to measure the degree of linear relationships among continuous explanatory variables and contingency coefficient was used to check the association among discrete variables.

Explaining why some individuals are low, medium or high is best done with ordered probit. Since these categories have a natural order, the ordered probit model is the appropriate model to employ the estimation of relevant probabilities (Maddala, 1983). Assuming three categories such as low, medium and high associated probabilities P1, P2, and P3 respectively), an individual would fall in category high if u <Bx in category medium if u Bx < u ≤ Bx + a and in category low if u ≥ Bx + a, where a > 0 and u is the error term in the underling response model. Thus, we have $y^* = \sum_{n=1}^{n} \beta n + e$

Where y* = is unobserved and can be thought of as the underlying tendency of an observed phenomena e is assumed if follows a certain symmetric distribution with zero means such as normal distribution.

Y = 1 if y* ≤ µ1

Y = 2 if µ1 < y* ≤ µ2

Y = 3 if µ2 < y* ≤ µ3

Y = j if µj – 1 < y*

Where y = is observed in j number of ordered categories, µs are unknown threshold parameters separating the adjustment categories to be estimated with ßs. The general form of the probability that the observed y falls in to category j and µs and ßs are to be estimated with an ordinal probit model is

Prob. (y = j) = 1 – L (µ1 $\sum_{k=1}^{k} \beta kxk$) Where L (.) represents normal probit distribution. The marginal effect on each participation status is calculated

$\frac{aprob(y=1)}{akxk}$ f(µ1-**1**- $\sum_{k=1}^{k} \beta kxk$) + f(µ1-1- $\sum_{k=1}^{k} \beta kxk$) where f(.) represents the probability density function

2.5.3. *Descriptions and Expected Signs of Variables*

2.5.3.1. *Dependent Variable*

The dependent variable for this study was the level of women participation in agriculture activities. Therefore, the major agriculture activities in the study area are cereal crop, cash crop, livestock, fruits and vegetables production. A score value was prepared from agriculture activities given for participating in each activity namely women participate in one activity, two activities, three activities and four activities. The level of participation was identified based upon the response given by the sample women in the interview schedule and cross checking the responses through observation and discussion with respondents. So, variables were measured and put in to participation index designed from different activities. The sample respondents were classified in three participation categories as low, medium and high participation according to the score obtained from the level of participation in activities. Ordinal probit model was adopted to examine the determinants of rural women participation in agriculture activities.

2.5.3.2. *Independent Variables*

Age of the women is a continuous variable and refers to the actual age of the women measured in years. It has differential impact on the women participation in agriculture activities. According to Afolabi, (2008). There is feasible relationship between the age of the women and level of the participation in agriculture activities. The

probability of labor participation increases with age for farm activity. Thus, age of women assumed to have positive influence on the participation of the agriculture activities. Therefore, in this study it was expected to have positive relation between age and level of women participation in agriculture activities.

Family size refers to the availability of family labor in adult equivalent for the women participation in agriculture activities. This indicates that women with more members would be able to undertake a variety of agriculture activities. It was measured as a continuous variable taking a number of family labour in adult equivalent. Therefore, women with larger number of active labour force was expected to be positively correlated with participation in agriculture activities.

Educational Level:

The level of education attained by the women is the attainment level of formal education and measured by years of schooling. It is obvious that education increases the knowledge and skill of the women in a society. The level of education attained is likely to affect the levels of skills using which one the more involvement in agriculture activities (Aberaet al., 2006). Therefore, the sign of the coefficient for the education level attained by the women was expected to be positive.

Farm Size:

Farm land ownership is expected to be closely linked to agricultural production, including both crop and live stock production. It has a direct effect on agriculture. However, farmers without access to land are expected to restrict their participation in activities (Nigist, 2004). It is assumed in this study that the land ownership of women the higher participation is likely to be. The farm size ownership was expected to have positive influence on the participation of women in agriculture activities while as the farm size increases, the level of women participation increases in different agriculture activities. In this study farm size, was expected to have positive relationship with level of women participation.

Contacts with Development Agents:

The women are expected to have sufficient agriculture skill in creation and modification of different activities and the participation of women in extension service like crop and livestock production play a significant role in building skill for agriculture productivity (Rahman, 2008). More contacts with development agents enterprises were expected to have higher values of participation agriculture activities. It was measured as a dummy variable taking a value of one if the women have contact with development agents and zero otherwise. Therefore, the sign of the coefficient for the contact with development agents was expected to be positive relation with level of women participation on agriculture activities in the study area.

Total Farm Income:

Total farm income is amount of annual income earned by women from different sources which is essential for women participation agriculture activities. In addition, it refers to the amount of money in Ethiopian birr women get from income activities such as sales of crops and livestock, livestock products and non-agriculture activities. Women who have participated in different income generating activity increase the level of participation in the agricultural activity (Oluwatavo, 2008). In this study, it was measured as a continuous variable taking amount of income in Birr. In this study, it was expected to be positive relationship with level of participation in agriculture

activities.

Membership in Farmers Cooperative:

Membership in the farmers cooperative refers to the participation of women in farmers' cooperative which play a significant role in supplying input for agriculture and creates the social capital (OI, 2013). Since most cooperative serve farmers by supplying input with credit. The sign of the coefficient of the variable membership in farmers cooperative was expected to be positive. It was measured as a dummy variable taking a value of one if the women have participated in membership in farmers cooperative and zero otherwise.

Access to Credit:

Access to credit for women to the provision of credit which assists the women of the participation in agricture activities. Poor women are not able to adjust their capital stock to the different needs in activities. Hence, limited access to credit can restrict their ability to invest in agricultural activities even more. Therefore, women who have sufficient access of credit are expected to have positive relationship between access to credit and level of participation. The sign of the coefficient of the variable access of credit was expected to be positive. It was measured as a dummy variable taking a value of one if the women have access of credit and zero otherwise.

Access to Market:

Is a continuous variable and measured by kilometer and also shows farmers location nearness to market center. If distance to the market is near to their resident, women may show low interest. Larger distances to market imply higher opportunity cost of time for purchasing agricultural inputs. Thus, the sign of the coefficient of the variable access of market was expected to be negative. It was measured as a continuous variable in kilometer. Hence, negative relationship was expected to the level of participation on the agricultural activity.

III. RESULTS AND DISCUSSION

3.1. *Descriptive Results*

This section deals with demographic and socio-economic characteristics of the respondents. Under this section characteristics of respondents specifically age, marital status, educational level, farm size, annual income, membership in cooperative, and access to credit were discussed. It is assumed that characteristics of women would have effects on participation of agriculture activities. Thus, the women respondents characteristi--cs were presented below.

3.1.1. *Result of Descriptive Statistics of Discrete Variables*

The descriptive analysis in Table 1 indicated that, contacts with development agents, membership in farmers cooperative, access to market, and marital status had a significant effect on the level of women participation in agriculture activities. The chi-square (x^2) value confirmed that there was a significant difference among low, medium and high women participation in agricultural activity.

Table 1. Association between discrete variables with level of women participation.

Variable	Categories	Low (n = 389)	Medium (n = 389)	High (n = 389)	$\chi 2$	P- value
Contacts with development agents	No	80	53	42	0.0402***	0.000

	Yes	60	94	60		
Membership in farmers' cooperative	No	90	107	52	64.68***	0.000
	Yes	50	40	50		
Access to credit	No	72	80	70	2.083 NS	0.149
	Yes	68	67	32		
Access to market	No	78	43	48	14.004***	0.000
	Yes	62	104	54		
Maritital status	No	59	73	56	22.00***	0.000
	Yes	81	74	48		

*** Significant at 1%; NS: not significant; n: number of observation = 389 ; $\chi 2$: chi-square

Source: Survey results (2018)

3.1.2 *Result of Descriptive Statistics of Continuous Variables*

Table 2 revealed that the average age of women who participated in the low and medium participation were 34 and 37 respectively while women with high participation had 41 years age and the mean of year of schooling of women in low partiticpation was one year of schooling and the mean of year of schooling of medium participants was two and mean of year of schooling of high particion was four years. The averge family size of the low participated women was seven family member while medium and high participate women were six and four respectively. The avarage annunal income of the low, medium and high participant women were 230, 370 and 460 birr respectively.

Table 2. Result of Descriptive statistics of continuous variables with level of women participation (n = 389).

Variables	Mean of low participants	Mean of medium participants	Mean of high partcipants
Age of the women	34.67	37	41
Educational level	1	2	4
Family size	7	6	4
Farm income	230	370	460
Land size	0.4	0.7	1

Source: Survey results (2018).

3.2. *Rural Women Participation in Agriculture Activities*

3.2.1. *Participation in Cash Crop Production Activities*

Results revealed that participation of women in cash crop production activities accounted about 14.5% in ploughing, 76.6% in harvesting and 51.4% in weeding 46% and 30.8% of them have participated in storing and transporting respectively (Figure 1). The findings of the study showed that women have participated in varied activities and their significant contribution for better and vital growth and development of the cereal crops. The results indicate that the proportion of women participation were relatively varied from one activity to another.

Among the activities, high proportion of women has been participated in harvesting while low proportion was in ploughing. The main reasons reported for the presence of low participation of women in ploughing activities were lack of labour force and decision of their husbands they to be at home activities. This finding is supported by focus group discussion and key informants. Hence, from the findings of the study, it is possible to say that rural women have played important role in cash crop production. The findings of the this work is matched with the work of (Cheryl Doss *et al*., 2011).

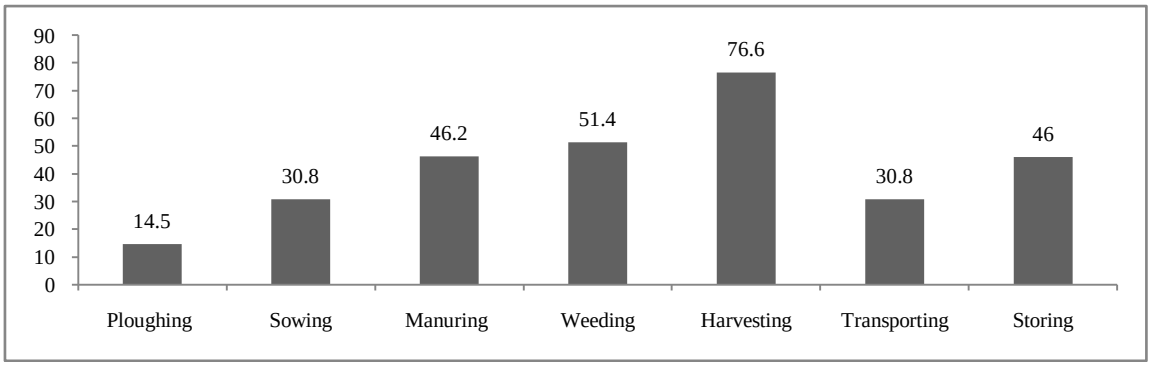

Fig. 1. Major cash crop activities performed by rural women. Source: Survey results (2018).

3.2.2. *Participation in Cereal Crop Production Activities*

Cereal crops are one of the major growing types of crop in the districts, due to this reason the study was taken cereal crops as an indication to identify participation pattern and role of women participation. Results show that about 82.2% of women have been participated in transporting activities. On the other hand about 23.9%, 8.7%, 13.1% and 8.4% of them have engaged in weeding, ploughing, sowing and harvesting respectively (Figure 2). The study indicates that high and low proportion of women have been participated in transporting and storing activities respectively (see Figure 2). This implies that the degree of women participation in crop production activities were not the same in all activity types. In general, the findings of the study reveal that rural women have been participated in varied activities, although the level of participation were not the same. Hence, rural women have contributed to production of cereal crops. The result of this study is in line with the study of (Rahman, 2008).

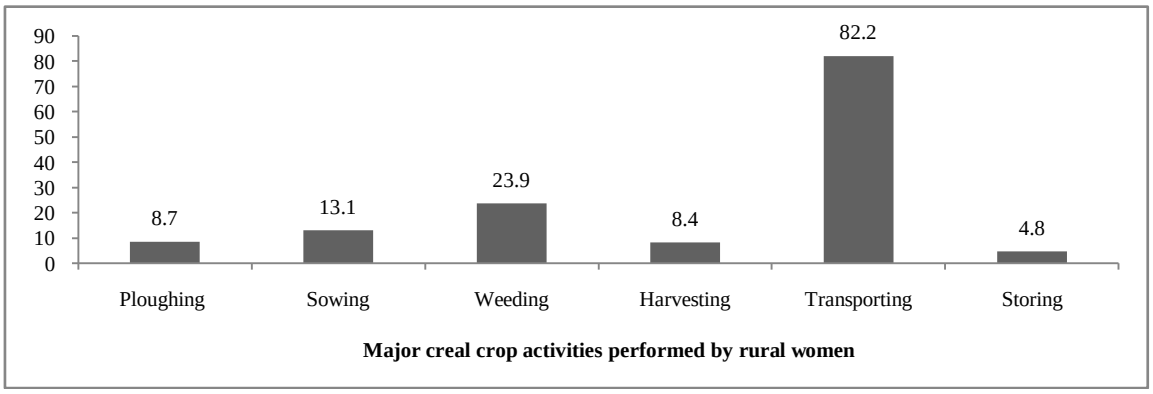

Fig. 2. Distribution of the women respondents by their participation in cereal crop production activities. Source: Survey results (2018).

3.2.3. *Participation in Fruit and Vegetable Production Activities*

The study revealed that about 16.9% of women have participated in land preparation, 68.6% respondents engaged in planting, 49.3% women involved in weeding, 28.5% and 26.2% of them have participated in storing

and transporting respectively. The findings showed that high proportion of women respondents have engaged in planting and weeding activities respectively (Table 3). This implies that rural women have played key role in fruit and vegetable production. Over all, the results of the study stated that women have participated in different activities although the degree of their participation varies. These findings are in line with the work of (Damsia and Yohanna, 2007).

Table 3. Distribution of the women respondents by their participation in fruits and vegetables production.

Major activities	Frequency (n = 389)	Percent (%)
Land preparation	66	16.9
Planting	267	68.6
Weeding	192	49.3
Harvesting	98	25.1
Transporting	102	26.2
Storing	111	28.5

Source: Survey Results (2018).

3.2.4. *Participation in Livestock Production Activities*

The findings of the study revealed that about 98.7%, 82.5%, 40.8%, and 30.8% of the sample women have participated in clearing barn, milking, feeding animals and herding respectively. On the other hand, sale and purchase of animal activities were performed by 17.7% and 8.7% of the respondents respectively. These agriculture activities by their nature are considered by the community as performed by men. The findings of the showed that women have played significant role in livestock production and they are actively involved in the livestock management. These findings are matched with the work of (Boserups, 1970).

Table 4.Distribution of the respondents by their participation in livestock production.

Major activities	Frequency (n = 389)	Percent (%)
Feeding of animals	159	40.8
Clearing barn	384	98.7
Purchase animal	34	8.7
Sale of animal	69	17.7
Milking	321	82.5
Herding	120	30.8

Source: Survey results (2018).

3.3. *Determinants of Rural Women Participation in Agriculture Activities*

Ordered probit model was used to examine determinants of level of rural women participation in agriculture activities. The variables assumed to have influence on women participation in different contexts were tested in the model and out of 10 variables five of them were found to be significant. Among variables fitted into the model age of women, educational level, farm income, access to market, and contacts with development agents were found to be significant in determining of women participation in agriculture activities.

Farm income is found significant at 1% level of significance and has a positive relationship with level of women participation on agriculture activity. This result implies that if annual income of women increases, participating in agriculture activity will increase low to higher by 0.046 birr. If respondents have more income, they will purchase different agricultural inputs and implements as well and will get more products from agriculture. This finding appears to confirm the finding of (Almaz, 2008).

Educational level of women as expected the result of model in this study show that, the level of education (years of schooling) is significant at 10% level of significance and positively influencing participation of women in agriculture activity. This implies that education level of the women increases, the participation of them in agriculture activity increase by 0.042 from low level to higher level participation. The explanation for this result is quite clear. Education increases human capital and hence, increases the skill and knowledge of the rural women to participate in agriculture activities. The result of this study is agreed with the works of (Aberaet al,. 2006).

Age of the women is a continuous variable and refers to the age of the respondents measured in years. It is hypothesized that, it has a positive relationship with level of women participation. The result of the model has shown that, age has negatively affected the participation of women at 5% significant level. This implies that age of the households increases, the participation of women in agriculture activity decrease by 0.006 low level of participation to higher level of participation. From the result of the model it is possible to say that, young women are strong and eager to participate in agricultural activity as compared to old women. This is found to consistent with study by (Afolabi, 2008).

Contacts with development agents is a dummy variable refers to the participation of women in extension service through contact with development agents play a significant role in supplying skill and knowledge for participation. As expected, in this study the contact of rural women with extension agent has found positive correlation with participation and it is significant at less than 5% significance level. This implies that the use of extension service increases, the women participation in agriculture activity increases by 0.965 from low level of participation to higher level of participation. In the study area the reason is that agricultural extension service serves those women to increase their agricultural production. Hence, they are interested to expand agriculture activities. This result is in confirmed by (Almaz, 2008).

Access to market was found to be positive relation with participation at less than 5% significant level. This result implies that when rural women have access to market center participating in agriculture would increase by 0.176. The probable reason is that access to market center can decrease transaction cost. This result revealed that they bought farm produce from other farmers and carry them to other markets, thus making markets accessible to the participants. This result is consistent with findings of (Gemechu, 2008). The women have access to market the level of participation was increase from low level to higher level of participation in different agricultural activity.

Table 5. Ordered probit model regression model results.

Variables	Coefficients	Std. err	Wald test	P-value
Age of the women	-0.006	0.007	0.734**	0.015
Family size	0 .031	0.034	0.9117NS	0.367

Variables	Coefficients	Std. err	Wald test	P-value
Educational level	0 .042	0.017	2.47***	0.098
Farm land size	-0.326	0.130	2.507*	0. 063
Access to credit	-0.185	0.155	1.424NS	0.235
Access to market	0.176	0.054	10.62***	0.001
Contact with development agents	0 .965	0. 483	3.99**	0.014
Members in farmers copperative	-0.131	0.225	0.3382NS	0.561
Farm income	0.046	0.234	0.0386**	0.014
Marital status	0.003	0.042	0.0051NS	0.930
Number of observation = 389 LRchi2 (19) = 300.23 Prob chi2 = 0.0000				
Pseudo R2				**0.4829**
Log likelihood1				**21.85205**

***, **, * significant at 1%, 5% and 10% probability level respectively. Source: Survey results (2018).

IV. CONCLUSION AND RECOMMENDATION

4.1. *Conclusion*

Women play vital roles in agricultural production in all parts of the world. The aim of this study was to assess determinants of rural women participation in agriculture activities among rural women in Gurage Zone, Southern Ethiopia to come up with evidence for sustainable agricultural development. The results of the study showed that the major agricultural activities performed by rural women in the study areas were sowing, weeding, harvesting, manuring, transporting and planting and they have been heavily involved in livestock management activities. Study revelead that about (27%) of women were belong to the low participation, (54%) of the them were in medium participation and the remaining (19%) of the women were fall under the high participation in agricultural activities.

The results of the ordered probit model indicated that rural women participation was significantly influenced by age, educational level, farm income, access to market and contact with development agents while, educational level, farm income, contacts with development agents and access to market were influenced the participation of rural women positively while the age was influenced negatively. When the total annual income of women increase, participating in agriculture activity would increases from low to high participation. Age of the women increases the participation in agricultural activity would decreases. Rural women that contacts with development agents they have high participation in agricultural activity, because of the extension agent they encourage how the rural women the diversify in different agricultural activity. Women that have access to market the participation in agricultural activity increase, because the decrease the transaction cost.

4.2. *Recommendation*

Based on the findings of the study, the following directions are recommended;

Human capital development through education was found to be important factor for promotion and expansion of rural women participation in agriculture activities. This finding implies that education should be given for rural women to promote and expand their participation and to enhance high income earning capacity from agriculture production. Enhancing the capability of rural women through education is expected from concerned stakeholders.

The findings revealed that farm income was found positive and significant influence participation of women in agriculture activities. To increases their annual income improving agriculture is important. Therefore, aids and subsidized inputs should be provided for women households to increase the purchasing level of agricultural inputs.

The development agents should have rearranged of their service delivery systems, where rural women would be treated equally with their male counter parts. This will ensure sustainable agricultural development and effective participation of women in agricultural activities.

Rural infrastructure is crucial factor in maintaining sustainable rural agricultural development especially road accessibility play vital role in facilitating access to markets, which in turn opens up opportunities for women participation. Therefore, a need for government to provide more rural roads and rehabilitate eroded ones in order to reduce the high transaction cost of buying from or selling to markets, as transaction cost reduces the returns from market sales. This will encourage the development of rural road to facilitate women 'participation in agriculture activities.

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