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Factors Influencing Farmers' Participation On Off Farm Activities: A Case Study in East Gojjam Zone, Ethiopia.

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Abstract
An increase in number of population causes a large number of youths in rural area are landless and depends on their family. This creates disguised unemployment and unemployment to the rural labor force. Therefore, strengthen the participation of farm households on off farm activities, is paramount important not only to increase their income but also for efficient and effective utilization of rural labor forces to ensure food security at household and national level. Therefore, this study is conducted to analyze the socio-economic and institutional factors which determines farmers Participation on off farm activities in East Gojjam Zone; Ethiopia. To address the objectives, both quantitative and qualitative data were collected from primary and secondary sources. The primary data were collected from 200 selected sample household. Binary Logit-model and a household level analysis were used to analyze determinants of farmer's participation on off farm activities. A total of 12 explanatory variables were included in the analysis. The result of the analysis indicated that among the hypothesized explanatory variables included in the model, seven variables namely, sex of a household head (SEX), age of the household head (AGE), Education level of a household head (GRADE), distance of residence from the marker center (DISTMAR), total size of area cultivated (AREACULT), shortage of food (FDSHRO) and number of economically active family labor (ACTLABFNU) were found to be significantly affecting the farmers participation on off farm activities. Therefore, The findings of this study recommends that any effort which will be undertake to strengthening the off farm activities in rural areas should recognize the household ,socio-economic and institutional characteristics and greater attention should be given in creation of off-farm employment in the rural areas to reduce the increasing rural under employment and unemployment . Besides, strategies which focus on enhancing the knowledge and /or ability of farmers and strengthen learning opportunities should be adopted, establishment of market centers to nearby areas and developing the infrastructures to rural areas should also give emphasis.

Keywords: *East Gojjam zone (Ethiopia), logit model, participation; off farm activities.*

Introduction

Off-farm activities have an important role in household economy to increase a household income and increase household's farm productivity under credit constraint and risky environment by mitigating risk and promoting farm investment (Evans and Ngau 1991) and finance consumption. Off-farm income also provides farm households with insurance against the risk of farming and thereby enables them to adopt new technologies.

Off farm income defined as the sum of agricultural wage income and non farm income. Some authors consider income from agricultural employment as a farm income, but in this paper income from agricultural employment included as component of off-farm income.

For a very long time, the perception of farm households in developing countries exclusively focus on agriculture and undertake little or no off farm activities. This perception has led policy makers to concentrate on the farm sector at the expense of the off-farm sector. However, since the last three decades or so, there has been increasing evidence showing that small-holder farm households in developing countries rarely rely on agriculture alone, but often maintain a portfolio of income activities in which off-farm activities are an important component (Barrett et al., 2001).

Farming as a primary source of income has failed to guarantee sufficient livelihood for most farming households in developing countries, as the size of family member increases with a constant landholding size and erratic and uneven distribution of rainfall affect their farm production and productivity. Thus, diversifying household's income sources through diversification of off-farm activities has become paramount important.

In the labor abundant poor agrarian country, like Ethiopia creation of off farm employment opportunities will pave the way for reduction of poverty. Therefore, Knowledge on the determinants of farmer's participation on off-farm activities is undoubtedly important in the provision of information to device appropriate strategy for the development of the sector. Empirical studies in this area are, however, limited in Ethiopia in general and nothing is done in the study area in particular as far as my knowledge. Therefore, the purpose of this paper is to identify the socio-economic and institutional factors which determine farmers Participation on off farm activities in the study area and to put recommendations which help all concerned bodies to expand off farm activities performed by farm households in the rural community.

Empirical Studies

Development economics literature has identified two main factors that drive diversification into off-farm activities among farm households in developing countries. These factors are broadly classified into "pull factors" and "push factors". Reasons why a farm household can be pulled into the off-farm sector include higher returns to labor and or capital and the less risky nature of investment in the off-farm sector (Kilic et al., 2009). The push factors that may drive off-farm income diversification includes, the need to increase family income when farm income alone cannot provide sufficient livelihood (Minot et al., 2006); the desire to manage agricultural production and market risks in the face of a missing insurance market (Barrett et al., 2001) and the need to earn income to finance farm investment in the absence of a functioning credit market (Kilic et al., 2009; Oseni and Winter, 2009).

As cited in Bezabih, et'al (2010) a study conducted by Honduras, te'al (2001) on off farm employment participation is showed that educated and wealthier households tend to participate in off farm activities, indicating the importance of human and physical capital. Besides, Deininger and Olinto (2001), in their study of off farm employment in Columbia Showed that investment in a single income source is the most beneficial to capital constrained households with limited education/human capital.

Bhatata Bp. and Arethun, T. (2013) On their study found that households' decision to enter into a labor market significantly depends on the characteristics of the households such as sex, age of the household heads and labor endowments in the households. Moreover, Bezabih M. et,al (2010) on their study also confirmed that the off-farm activity choice of households is also influenced by climatic factors or weather conditions. A study conducted by Destaw (2003), on non-farm employment and farm production of small holder farmers, using logit model also showed that Age, education, credit use, distance from road and distance from market were found to be highly important variables influencing participation in non-farm activities.

Hypothesis

Based on literature reviewed and authors experience the expected sign, code, type and unit of measurements of independent variables included in the binary logit model were summarized in the following table 1.

Research Methodology

Sampling Design and Data Collection

The study was conducted in east Gojjam zone, Amhara National Regional State, Ethiopia. The study area is highly populated area with a small average landholding size of farming households. Data were collected from 200 sample household heads through conducting formal survey based on structured questionnaire that was prepared. Three stage sampling technique was used to draw the sample respondents of the study. Three stage sampling technique was used to draw the sample respondents of the study. In the first stage, out of 16 districts 3 districts were selected. Secondly, from each district 2 Kebeles (the lowest administration level of the government) and a total of 6 Kebeles were selected using simple random sampling technique. Finally, Probability proportional to size random sampling technique was used to draw individual sample households from each kebeles.

Analytical Methods

Both descriptive statistics and econometric model were employed to study the relationship between the dependent and explanatory variables. Descriptive statistics such as mean, standard deviation and percentage were used. The result obtained was used as an indicator of the difference between the two groups (participant and non-participant). Besides, binary logit model was used to identify the determinants farmers' participation on off farm activities.

Following Hosmer and Lemshew (1989), the logistic distribution function for identification of the participant and non-participant household heads can be defined as:

$$P_i = \frac{1}{1+e^{-z_i}} \quad \text{.....1}$$

Where:

P_i is the probability of being participate for the i^{th} farmer and Z_i is a function of n explanatory variables (X_i), and expressed as:

$Z_i = \beta_o + \beta_1X_1 + \beta_2X_2 + \text{-----+ } \beta_mX_m$ 2

Where β_o is the intercept and $\beta_{i,s}$ are the slope parameters in the model. The slope tells how the log-odds in favor of being participate on off farm activities change as change in values independent variables.

Table 1. Definitions and Units of Measurement of Variables Included In The Logit Model

Variable	Variable code	Type of variable	Unit of measurement	expe. sign
Participation on off farm income	OFFFAIN	Dummy	1; if a house hold participate on off farm activities; and 0 otherwise	
Sex of house hold head	SEX	Dummy	1; male and 0; female	+/-
Age of the household head	AGE	Continuous	Measured in years	-
Responsibility	RESP	Dummy	1 if the household head has social position in the PA, 0 other wise	-
Education level	GRADE	Continuous	Measured in number	+
Distance of residence from the market center	DISTMARK	Continuous	Measured in minutes	-
Access to credit	ACCR	Dummy	1 if a household responded as he has access to credit and 0 otherwise	+
Extension contact of a household head	EXTCON	Dummy	1, if a household gets extension service during the year, 0 otherwise	+
Total size of cultivated land	AREACUL	Continuous	Measured in hectare	-
Irrigation use	IRRUSE	Dummy	1; If a household has owned irrigated plot and 0; otherwise	-
Shortage of food	FDSHOR	Dummy	1 if a household has faced food shortage in 5 years time ; 0 , otherwise	+
Total tropical livestock unit	TLU	Continuous	Measured in tropical livestock unit (TLU)	+
Number Economically active family labor	ACTLABFNU	Continuous	Measured in number	+

Since the conditional distribution of the outcome variable follows a binomial distribution with a probability given by the conditional mean Pi, interpretation of the coefficient will be understandable if the logistic model can be rewritten in terms of the odds and log of the odds, (Gujarati, 1995). The odds to be used can be defined as the ratio of the probability that a farmer will participate (P_i) to the probability that he/she will not ($1-P_i$).

But

$1-P_i = \frac{1}{1+e^{z_i}}$ 3

Therefore,

$\frac{P_i}{1-P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{z_i}$.....4

And

$\frac{P_i}{1-P_i} = \frac{1+e^{z_i}}{1+e^{-z_i}} = e^{\beta_0+(\sum_{i=1}^{n}\beta_iX_i)}$ 5

Taking the natural logarithm of the odds ratio of equation (5) will result in what is known as the logit model as indicated below:

$\ln\left[\frac{P_i}{1-P_i}\right] = \ln\left[e^{\beta_0+(\sum_{i=1}^{n}\beta_iX_i)}\right] = Z_i$ 6

If the disturbance term U_i is taken into account the logit model becomes

$Z_i = \beta_o + \sum_{i=1}^{n}\beta_iX_i + \cup_i$ 7

Hence, the above econometric model was used in this part of the study to identify variables that affect the household heads to participate on off farm activities.

Results and Discussion

Descriptive Analysis

The difference between off farm and non farm income is that off-farm income is much broader than non-farm income. Off farm income includes both agricultural wage income plus non-farm income. Therefore in this study agricultural employment from the family labor on others people's farm also considered as off farm activity for a household. The finding of the study showed that employment on other people's farm as daily laborer or, permanently for yearly basis, working different type of labor work in nearby towns, petty cash trading (i.e. Farmers were purchase crops, sheep and goat, poultry and other farm products at the place where price is low and sell them in the potential markets i.e. price is relatively high and small shopping of manufactured goods), sale of firewood and charcoal, rent from livestock and farmland and carpentry are the off farm activities performed by respondents.

The survey results also indicated that about 34.5% of the total respondents were participated on off farm activities, while the rest 65.5% of the respondents were not. Busy in agricultural works; lack of cash availability, fear of risk and lack of knowledge, absence of off farm activities in the area and no interest are the key reasons reported by non participant respondents for not participating in off farm activities

In order to investigate the presence of group mean difference with respect to the hypothesized social, economic, and institutional factors uni-variate tests were used. Student's t-test and Chi-square statistics were used to identify the potential continuous and dummy variables differentiating participants from non participants respectively. Participant and non participant households significantly different in three of the six hypothesized continuous variables (Table 2).

The average age of the sample household heads was found to be 45.69 years ranging from 22 to 82 years with standard deviation of 12.10. Of the total sample household heads 47 percent of them have an age of greater than 45 years. The mean age of participant and non participant respondents of off farm activities are 42.26 and 47.19 years with standard deviation of 10.55 and 12.4 respectively. The mean age of participant was found to be less than that of non participant. The result of t-test showed that the mean difference of age of two groups was significance and negative effect on participation.

Table 2. Continuous Variables Differentiating Participant from Non Participant Households on off farm Activities among 200 Sample Households

Variable	Participant	Non-participant	Total	T-value
Age	42.26	47.19	45.69	-2.806***
Grade	3.16	1.87	2.31	2.732***
Distmark	37.21	47.41	43.89	-3.145***
Areacul	1.73	1.99	1.89	-1.553
Tlu	5.51	5.32	5.38	0.425
Actlabfnu	3.68	3.64	1.55	0.139

,,*** indicates Significant at 10%,5% and 1% probability level respectively*

Source: Survey result

The education level of household heads is expected to increase the ability to obtain, process and use of information relevant to the use of off farm activities. Concerning the educational level of sample household heads, the survey results indicated that about 31% of the total respondents are illiterates, while the rest 69% of the respondents had various educational levels ranging from the ability to read and write up to 12th grade. The average grade level of sample respondents was found to be 2.31 with standard deviation of 3.22. The mean grade level of participant and non participant respondents are 3.16 and 1.87 with standard deviation of 3.69 and 2.86 respectively. The result of t-test showed that significant difference between the mean grade level of the two groups and positive effect of education for participation. The average walking time required to reach in nearby market center in minutes was found to be 43.89, 37.21 and 47.41 for total sample households, participant and non-participant with a standard deviation of 22.27, 24.67 and 20.12 respectively. The difference between mean average walking time for participant and non-participant households was statistically significant and distance has negative effect for participation.

The total area of cultivated land by a household was assumed to influence the participation on off farm activities because of the fact that the farm and nonfarm activities are computing with the same labor force. The survey results showed the average cultivated land of total sample households was found to be 1.9 hectares with standard deviation of 1.15 ha. The average cultivated land size of participant and non-participant was found 1.73 and 1.99 ha with a standard deviation of 0.97 and 1.22, respectively. Their own land size of most households (82%) falls between 0.25 and 2 ha. It was found that only about 18% of the sample households have a farmland size of above two hectares. There was a slight difference in the mean total cultivated land size between the two groups. However, the result of t-test showed that the mean cultivated land size difference between the two groups was insignificance.

The average size of livestock in TLU was found to be 5.38, 5.51 and 5.32 for total sample households, participant and non-participant with a standard deviation of 3.08, 3.93 and 2.55 respectively. The difference between mean livestock holdings of participant and non-

participant households was statistically insignificant. About 51% of total sample household heads has more than 5 TLU sizes of livestock. The number of economically active labor force in the household is assumed to bring about differences in a decision on participation of off farm activities. Households having large economically active household members will be able to supply labor that might be generating additional income from employing on off farm activities. However, the result of t-test showed that there was no significance difference in the mean number of economically active labor force between the two groups. The average number of economically active labor force available was estimated to be 3.67 for total sample households, 3.68 for participant and 3.64 for non-participant respondents, with a standard deviation of 1.55, 1.75, and 1.44, respectively.

Participant and non-participant households not only differ in quantitative variables but also in terms of qualitative variables. It was, therefore, desirable to use a method of testing the differences between participant and non-participant with respect to qualitative variables. Hence, the chi-square test was used to test the presence and absence of difference between the two categories of households (Table 3).

The survey result indicated that among the total sample household heads, 94% were male and 6% of them were female. Likewise 88.4% of participant and 96.9% of non-participant were male. The chi-square test for sex distribution between the two groups was found to be significant.

Table 3. Dummy Variables Differentiating Participant from Non Participant Households on off farm Activities among 200 Sample Households

Variable	Score	Participant	Non-participant	Total	$\chi 2$
Sex	0	8	4	12	5.845**
	1	61	127	188	
Resp	0	37	64	101	0.411
	1	32	67	99	
Accr	0	4	10	14	0.234
	1	65	121	186	
Extcon	0	6	11	17	0.005
	1	63	120	183	
Irruse	0	35	68	103	0.025
	1	34	63	97	
Fdshor	0	47	117	164	13.758***
	1	22	14	36	

,,*** indicates Significant at 10%,5% and 1% probability level respectively*
Source: Survey result

Of the total sample household heads, 49.5% were reported that they have responsibility at their village or peasant association level. It was also 46.37% and 51.14% for the participant and non-participant farmers respectively. The chi-square test showed that there is no significance difference between the two groups in responsibility distribution. Shortage of money may encourage or discourage farmers from participating off farm activities. For a household who needs to participate on petty trade, the shortage of money limits their participation. But on the other hand the shortage of money leads a household to shift from participating on off farm activities which needs initial capital to off arm activities which is not like sale of family labor. Therefore, the presence of credit institution and availability of adequate loan is an important factor for the participation of household on off farm activities. The study found out that only about 7% of the respondents have faced problems in getting adequate loan. Of which 5.7% and 8.2% the participant and the non-participant farmers, were suffered the same problem respectively. The result of $\chi 2$-test also showed that insignificant difference between household heads of the two groups.

Extension service is a very important element of institutional support to farmers to enhance their information access. Development agents (DAs) were assigned in all sample kebeles. It was expected that sample farmers in the study area have an access to get information about alternative income generating activities. However, about 8.7% of participant, 8.4% of non participant households have reported that they did not get extension services (visits) in the study year. The result of $\chi 2$-test also showed that insignificant difference between household heads of the two groups. Of the total respondents, 48.5% have reported that they have of their own irrigation plots and had also practiced small scale irrigation. Of which 49.3% and 48.1% were participant and non participant households, respectively. The figure is almost the same for the two groups. The result of $\chi 2$-test also showed that insignificant difference between household heads of the two groups. Concerning food shortage 18% of total respondents reported that they had faced food shortages. Of which 31.9% and 10.7 % were for the participant and non-participant farming households respectively. The result of $\chi 2$-test also showed that significant difference between household heads of the two groups.

Econometrics Analysis

Determinants of Farmers Participation on Off Farm Activities

Under this section the important socio-economic and institutional factors, which were hypothesized to affect households to participate on off farm activities were analyzed. Logit-model was used to analyze. The unit analysis was a house hold level analysis. Multicollinearity problem for continuous explanatory variables was assessed using a technique of variance inflation factor (VIF) and the degree of association between each dummy/discrete variable was also assessed using contingency coefficient. Finally, the variables were considered for further analysis after verifying that multicollinearity is not a problem.

Generally, twelve (12) explanatory variables were included in the model. The various goodness of fit of measures was checked and validate that the model fits the data. The chi-square value of a likelihood ratio is significant at conventional probability level. The maximum likelihood econometric estimation method was used to estimate the coefficients of the explanatory variables in the Binary logit model. The results of Binary logit model regression analysis are presented in Table 4.

The results indicated that, among the 12 hypothesized explanatory variables included in the model, seven variables were found to be significantly affecting the farmers' participation on off farm activities in the study area. Among the statistically significant explanatory variables Education level of a household head (GRADE), shortage of food (FDSHRO) and number of economically active family labor (ACTLABFNU) were found positively affect the farmers' participations on off farm activities. The rest variables such as sex of a household head (SEX), age of the household head (AGE), distance of residence from the marker center (DISTMAR) and total size of area cultivated (AREACULT) were also affect negatively the farmers participation on off farm activities. The coefficients of other five variables were not statistically significant at the conventional probability levels implying that they were less important in effecting the farmers' participation on off farm activities. The effects of the significant variables on the farmer's participation on off farm activities are discussed below.

The result of the study showed that sex of a household head is significant at 1% probability level and negatively influence participation of farmers on off farm activities. It means that female household heads are engaged in off farm activities than male house hold heads. This is due to the fact that in the study area as women often do not take part in ploughing activities, so that female-headed households are engaged in off farm activities and earn off farm income than men headed households. Age of the household head was significant at 5% probability level and related negatively with the farmer's participation on off farm activities. This is because; younger farm households cannot get enough land to support their livelihood as compared to the older farm households. Therefore the younger households have to engage more on off-farm employment than the older ones to support their livelihood.

Table 4. Maximum Likelihood Estimates of a Binary Logit Model

Variables	B	S.E.	Wald	Sig.	Exp(B)/odds ratio
Sex	-2.400	.806	8.863	.003***	.091
Age	-.050	.021	5.802	.016**	.951
Resp	-.291	.409	.507	.476	.747
Grade	.126	.061	4.216	.040**	1.134
Distmkt	-.031	.010	10.444	.001***	.970
Accr	1.095	.753	2.116	.146	2.988
Extcon	-.339	.645	.277	.599	.712
Areacult	-.453	.248	3.330	.068*	.636
Irruse	-.065	.359	.033	.856	.937
Fdshro	1.428	.472	9.162	.002***	4.170
Ttlu	.103	.077	1.792	.181	1.108
Actlabfnu	.410	.155	6.960	.008***	1.507
Constant	2.750	1.293	4.526	.033**	15.643
Chi-square ……. 53.678*					
-2 log likelihood…….. 204.041					
correctly predicted ……..76					
Sensitivity…….. 47.8					
Specificity…….. 90.8					
Number of cases…… 200					

****'**&* Significant at 1%, 5%, and 10% probability level respectively*

Source: Survey result

Education also had a significant influence at 5% probability level and positively affect farmers' participation on off-farm activities. Off-farm activities require some skill and training hence households with some skills and education tend to engage in off-farm activities. Distance of market from residence variable was significant at 1% probability level and related negatively with the farmer's

participation on off farm activities. Households far away from market places have no easy and quick physical access to the market place, to transport output and inputs from and to their residence.

Total size of area cultivated (AREACULT) was significant at 10% probability level and negatively influences the farmer's participation on off farm activities. It showed that household heads that had relatively more cultivated land needs more labor for farming activities and gives more focus on farm activities than off farm activities. The presence of food shortage in the household affects positively and significantly households' participation on off farm activities. It implies that in the presence of food shortage the family members engaged more in off farm activities to earn additional income to mitigate the problem the faced rather than in the absence of food shortage. The number of economically active family was significant at 10% probability level and related positively with the farmer's participation on off farm activities. It means that a household that has relatively large number of economically active family labor can supply labor to off farm activities. This supports the reason given by non participants respondents that busy in agricultural works is the cause for their non participation of off farm activities.

Conclusions

In countries like Ethiopia, where the subsistence agriculture and the small holder farming dominates the overall economy of the nation (in GDP contribution, employment and export earning) small holder farmers often face scarcity of capital and are prone to livelihood risk. Moreover, farming as a primary source of income has failed to guarantee sufficient livelihood for most farming households, as number of family member increases with a constant size of landholding and, erratic and uneven distribution of rainfall affect their farm production and productivity. Thus, diversifying household's income sources through diversification of off-farm activities to solve their livelihood risk has become paramount important. Hence, Knowledge on the determinants of farmer's participation on off-farm activities is undoubtedly important in the provision of information to device appropriate strategy for the development of the sector. Therefore, the purpose of this paper is to identify the socio-economic and institutional factors which determine farmers Participation on off farm activities in the study area..

The finding of the study indicated that about 34.5% of the total respondents were participated on off farm activities, while the rest 65.5% of the respondents were not. Busy in agricultural works; lack of cash availability, fear of risk and lack of knowledge, absence of off farm activities in the area and no interest are the key reasons reported by non participant respondents for not participating in off farm activities. Employment on other people's farm as daily laborer or, permanently for yearly basis, working different type of labor work in nearby towns, petty cash trading (i.e. Farmers were purchase crops, sheep and goat, poultry and other farm products at the place where price is low and sell them in the potential markets i.e. price is relatively high and small shopping of manufactured goods), sale of firewood and charcoal, rent from livestock and farmland and carpentry were the off farm activities performed by respondents.

The results of logit model analysis based on a sample of 200 farmers selected from three districts namely, Motta, Enebsiesarmider and Enarjenawuga districts of East Gojjam zone; Amhara region; Ethiopia in 2013 showed that among the 12 hypothesized explanatory variables included in the model, seven variables were found to be significantly affecting the farmers' participation on off farm activities in the study area. These are sex of a household head (SEX), age of the household head (AGE), Education level of a household head (GRADE), distance of residence from the marker center (DISTMAR), total size of area cultivated (AREACULT), shortage of food (FDSHRO) and number of economically active family labor (ACTLABFNU).

Based on the findings of the study the following points need to be considered in order to enhance the participation of farmers on off farm activities.

As income from off-farm activities ensures guarantee for sufficient livelihood when income from farming declines due to effect of erratic and uneven distribution on farm production and productivity diversifying household's income sources through diversification of off-farm activities has become unquestionable. Therefore the rural development strategy should not only give emphasis in increasing agricultural production but also give unreserved attention on creation of off-farm employment to rural labor force.

The result of the study also showed that age of the household and total area cultivated was negatively related with participation in off-farm activities. This implies that younger farm households cannot get enough land to support their livelihood compared to the older farm households. On the other hand, involvement on off farm activities requires some knowledge and skill younger's are more participate than aged one's .The variable education also had a positive and significant influence on participation in off-farm activities. These all, tells us the need for designing development strategies which focuses on enhancing the knowledge and skill of farmers on off farm employment through establishment of skill training centers at local level. The extension service in the area off farm activities should also be well established. Likewise, distance of residence from market place is negatively and significantly affects the participation of farmers this implies that the need to consider establishment nearby markets and developing the transport infrastructure in the area. Moreover, creation of alternative off farm employment opportunities, development of infrastructure which helps for the expansion of off farm employment needs special focus by the government to increase the income or rural poor and achieve food security.

Ethics

All the authors read and approved the manuscript and no ethical issues involved.

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