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Extension programme participation and smallholder's livelihood: Evidence from Awassa Zuria District, SNNPR, Ethiopia

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In this paper the extension organization that promotes packages of technologies and practices was closely examined in line with its impact to mediate the use of household resources which determine the type of livelihood strategies perused at household level and their ultimate outcomes either in more secured or vulnerable livelihoods. For this study, a survey data were collected in 2006 from a randomly selected 65 participant and 27 dropout farm households living in Maqibassa and Dure-Bafano peasant associations in Awassa Zuria district, SNNPR, Ethiopia. Empirical estimation models like limited dependent variable and switching regression analyses methods were employed to analyse the data. Marginal effects of the independent variables were also considered in the limited dependent variable estimation approaches. Estimation results show that household participation status in the extension programme significantly depends on household head characteristics (like age and level of education), family size, household wealth status and duration of stay in the programme. Household food security status increases with program participation as the use of purchased external inputs and technical advice enhance crop yield for participant households in the extension programme. Marginalizing the poor rural households from the current extension programme aggravates rural livelihood insecurity and rural poverty for which it was meant as a remedy. This capitalizes the need to consider a paradigm shift from production oriented agricultural extension to livelihood extension approach which comprises agricultural and non-agricultural rural interventions with the objective of giving the opportunity to the poor rural farm households in securing their livelihoods by making use of available resources at hand.

Key words: Livelihood extension, agricultural extension, participants, dropouts, food security.

INTRODUCTION

Despite many efforts that have been made to liberate the food insecurity scenario of Ethiopia, still majority of the citizen remained food aid recipient year after year. The magnitude of the problem is escalating and it occupies the serious attention of government and international community. Even in the best agricultural years, between 4 and 6 million people were in need of food aid (FAO, 2001). This perpetuates dependency on massive inflow of food aid at the expense of long-term domestic agricultural development. The proportion of population

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unable to attain their minimum nutritional requirements is estimated at 52% of the rural population and 36% of the urban population (MEDaC, 1999). The World Development Report indicators for the year 2000/2001 revealed the prevalence of 48% malnutrition for children under age 5 during the period 1992/1998.

Attempts to improve food production through increased use of chemical fertilizers and improved seeds, does not show notable improvement in national food production (Berhanu, 2004). Many studies and official reports explained the low productivity of Ethiopian agriculture from its dependency with nature and natural endowments. However, the poor performance of the sector could not be explained by natural endowments alone but also by inappropriate policies, lack of physical infrastructure, institutional structure and processes that neglect the strategic role of smallholder agriculture.

Since 1993, Agricultural Development-Led Industrialisation (ADLI) has been followed as a development strategy in Ethiopia. The strategy aimed at attaining food self-sufficiency in the short-term and bringing structural transformation of the economy in the long-term as its priority agenda. To this end, the new extension programme (Participatory, Demonstration Training and Extension System) is being used as a policy instrument to bridge the gap between low agricultural productivity and the potential productive capacity of the sector. Promoting full participation of clients in the process is another critical condition (Chambers, 1997). However, technological transformation through the use of external inputs such as inorganic fertilizer, improved seeds, pesticides etc. depends at least on a significant number of farmers' participation and adoption of these technologies and favourable socio-economic environment that respond to the change in the supply of outputs (Abebe et al., 2004).

A number of concerns could be raised as problems in the proposed *Green Revolution* path of technological transformation in the Ethiopian agriculture. To discuss a couple of them, the poor complementary nature of services such as extension, credit, marketing, infrastructure and inadequate institutional capacity to assemble the necessary mix is one aspect of the problems (Arega and Hassan., 2003). In addition, there are different endowment profiles prevailing at the farming communities and this has its own impact on their ability to change the existing opportunities into tangible livelihood strategies and outcomes (Abebe et al., 2004). The latter implies the importance of having a closer look at the extension programme and its consequences on the well-being of programme participants and currently non-participating households to elicit determinant factors which contribute to the participation or otherwise. The other concerns included low level of technological development and inadequate capacity to finance the technology dissemination for the poor smallholder farmers.

Besides the aforementioned discussion, analytical findings indicated that maintaining the momentum of *Green Revolution* type of agricultural development requires market oriented interventions in order to absorb or outlet the surplus production and motivate farmers to produce more. This beckons agricultural commercia-lisation where the majority of the produces are supplied to the market (Govereh et al., 1999). Markets, therefore, should function well and allow households to increase their income by directing them towards production activities that ensure higher returns to land and labour resources. Moreover, markets should ensure rural households that they could buy consumption items than being constrained to produce all goods they need to consume (Timmer, 1997).

In the technological transformation and commercialization process, rapid uptake of technology by the intended target category is a necessary condition (Niles, 1998). Many researches have been conducted to show to what extent rural farm households use the externally induced technologies. However, most of them focused their analysis on the reason and determinants of adoption from technical, economic, and social perspectives (Bezabeh, 2001). These findings are limited to the dichotomous division of adopters and non-adopters. This makes adoption studies partial and unable to provide feedback as to why some farmers withdraw from continuous application of technologies. Filling the information gap by practical evidences on the impact of extension programme on participant and dropout house-holds and identify some of the hurdles the latter faced in their straggle to achieve secured livelihoods is judicious.

The main purpose of this study is, therefore, to examine the implication of rural livelihoods for extension programme and agricultural development strategies. By so doing it generates relevant grass root information that contributes towards better understanding of rural livelihoods that has policy implication. To this effect, the following two specific objectives were addressed in the study.

(1) To examine the features contributing towards continuing as a participant in the agricultural extension programme.
(2) To shed light on household food self-sufficiency and livelihood security status as impact of agricultural extension participation.

STUDY AREA AND DATA DESCRIPTION

Study area

Awassa Zuria district is located in Sidama Zone of the Southern Nation Nationalities and People Region (SNNPR). The area lies at 07° 04' North and 38°31' East on a Map and shares boundary with Oromiya Region in the Northeast, Wolayta zone in the West, and Shabadino and Borecha districts in the South. Awassa Zuria is one of the nine districts in Sidama zone and occupies a total area of 920,000 ha. Out of this total area, nearly half is currently cultivated and covered by both annual and perennial crops. About 16.2% is

Table 1. Description of variables used in the study.

Variable	Dropouts				Participants			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Wealth status	2.29	0.83	1	3	1.72	0.60	1	3
Family size	8.89	2.94	5	16	7.89	2.78	1	16
Age of Household head	46.22	13.95	24	70	42.42	13.13	20	80
Education level of household head	1.93	0.96	1	4	1.94	1.06	1	4
Number of plots owned	1.22	0.51	1	3	1.42	0.68	1	5
Plot size (ha)	0.74	0.30	0.25	1.5	0.81	0.30	0.25	1.5
No. farm implements	3.26	2.14	0	10	3.91	2.79	0	15
Oxen ownership	1.30	2.02	0	10	1.58	1.14	0	5
Membership in CBI	1.11	0.58	1	4	1.03	0.25	1	3
Own Radio	0.15	0.36	0	1	0.20	0.40	0	1
Years of participation in CEP	2.33	1.11	2	7	4.14	1.75	1	8
No. of contact with DA	2.00	0.00	2	2	1.85	0.36	1	2
Food security index	0.65	0.28	0.15	1.28	1.04	0.98	0.21	7.96

allocated for grazing, while 2.7% is covered by bush and forests. The remaining 34.1% represents settlements, infrastructure, water body and unused land. The district can be categorised into three agro ecological zones: the middle latitudes that accounts for 75% and the high and the low altitudes which constitutes 20 and 5%, respectively.

Eutric Fluvisols and *Molic Andisols* are the dominant soils in the district. The level of land degradation is modest as compared to the central and high lands of Ethiopia although it is still one of the concerns for the study area. Most farmlands need to be fertilized annually to be productive. Significant portion of the district experience bimodal rainfall. The main rainy season (Kremet) starts in June/July and continues up to the end of September, which accounts for 48% of the total annual rainfall. The short rainy season (Belg) occurs from early March to the beginning of June and accounts for 39% of the total rainfall per annum. The remaining 13% falls during the dry spell months (Getahun et al., 2000). The mean annual rainfall for the district ranges 800 to1200 mm. However, figures from Awassa metrology station and farmers report during group discussion confirmed that the timing and duration of rains is considerably more uncertain and as a result recurrent drought become a common feature in the district.

Average land holding size in the district is a little below a hectare. Most of the farmers possess their holdings adjacent to their home.

A pair of oxen is used as a principal draught power for ploughing the land. Moreover, hand tolls such as pick axe, digging hoe, spade and others are also used for agricultural operations.

Data description

In this study both qualitative and quantitative data sets are used. Different social and economic variables expected to explain farm household participation status in the extension programme and household livelihood security were collected. Table 1 gives the general description of variables used in the analysis.

Wealth status of the households was identified using key informants. They considered all aspects of resource endowments to group the households into three different wealth status categories. Relatively well to do households were assigned to be 1 and 3 for the poor where 2 is for the average ones. Education level is computed by assigning 1 for household heads left school from primary level, 2 for junior secondary and 3 for high school. Plot size is measured in hectares. Food self-sufficiency index (FSSI) is calculated using an index as suggested by Leshan (1998). The index is computed as:

$$FSSI = \frac{two\ years\ maize\ yield\ \ average\ per\ \ HH - 15\%\ \ post\ harvest\ loss}{Adult\ \ Equivalent\ \ per\ \ household\ *\ \mathrm{Re}comended\ \ cereals\ per\ AE}$$

The index calculates the ratio of maize grain produced and made available to household consumption to the total family food requirement per year. 15% of the total harvest is assumed to be lost due to lack of appropriate storage in the rural households. The average recommended cereal consumption is taken to be 1.9 quintals per adult equivalent per year, based on Leshan (1998).

ESTIMATION METHODS

Here, the methodologies adapted to estimate farm household participation status in the current extension programme and household livelihood security status due to the *extension participation are explained.*

Participation status

After adopting the current agricultural extension programme introduced into the rural Ethiopia, a farm household may continue as a participant of the programme or become a dropout because of different reasons. The binomial Logit model helps to estimate the probabilities that a given farm household with its own specific features continues as a participant in the programme. Needless to mention is that one minus the estimated probability of continuing as a participant in the programme gives the probability to be a dropout from the programme. The binomial Logit model used for this estimation is specified as:

$$\Pr(PPS_i) = \frac{e^{\beta' X_i}}{1 + e^{\beta' X_i}} \quad (1)$$

Where PPS_i refers to household participation status in the

extension programme (that is, it takes a value of one for participants and zero for dropouts), β is a vector of parameters to be estimated and X_i is a vector of household specific features like family size, age and education level of household head, household wealth status, years of participation in extension program.

The marginal effects of each explanatory variable on the probability of farm household participation status are computed based on their average values as:

$$\frac{\partial[\Pr(PPS_i)]}{\partial X_j} = \beta_j * \Pr(PPS_i) * [1 - \Pr(PPS_i)] \quad (2)$$

Where β_j is the parameter attached to the j^{th} explanatory variable (X_j).

Livelihood security

The level of livelihood security at farm household level is attempted to be estimated through its proxy indicator, which is food self-sufficiency index (*FSSI*). In computing food self-sufficiency index, annual maize production per household is considered due to the fact that maize is the major food crop produced and consumed by households in the study area. Further analysis on livelihood security could be done by considering gross household income, marketed outputs and yield stability both in good and bad years and so on. For the purpose of this study, however, we considered self-sufficiency in maize production and consumption as a proxy to livelihood security of farm households as the current agricultural extension programme solely emphasizes a package programme that potentially enhance maize yield per farm plots. Thus, the effect of household participation in the current extension programme on food self-sufficiency (as a proxy to livelihood security) is estimated using a switching regression analysis. Extension participation status is used as a dummy variable in the explanatory variables. Since food self-sufficiency is an index computed from positive values, it has a positive real number value for each household. This makes *FSSI* a continuous variable where a household with value above one is more than food sufficient, below 1 is less than sufficient and 1 is just self-sufficient. In the regression analysis household participation status can be included as a dummy variable. However, there is a significantly strong correlation between food self-sufficiency index and household participation status. Therefore, including participation status as a dummy variable and estimating the whole effect in one equation erodes the effect of other variables as they might also explain household participation status. The regression model to explain household food self-sufficiency status can be specified as:

$$FSSI_{ij} = \beta_{oj} + \beta_{1j} WLT_{ij} + \beta_{2j} FMLSZ_{ij} + \beta_{3j} PLOSZ_{ij} + \beta_{4j} AGE_{ij} + \beta_{5j} EDU_{ij} + \beta_{6j} YPP + u_i \quad (3)$$

Where $FSSI_{ij}$ is food self-sufficiency index of the i^{th} household in the j^{th} extension programme participation status (participant or dropout), *WLT* is wealth status, *FMLSZ* and *PLOSZ* refer to family and plot size, respectively, *AGE* and *EDU* are age and education level of the household head, and *YPP* is household's years of participation in the extension programme. The β's are parameters to be estimated.

ESTIMATION RESULTS

The above-explained Logit and switching regression models are estimated using STATA E 8.0 software and the estimation results are presented in the next two sub sections for participation status and livelihood security separately.

Participation status

The probability of households' participation status in the current extension programme increases significantly with increasing years of participation in the extension program and decreases with increasing family size, age and education level of the household head, and household wealth status (Table 2).

Among all explanatory variables used in explaining the probability of farm household participation status in the current extension programme, the relative wealth status of the households has a higher marginal effect. Duration of participation in the programme also has higher marginal effect next to the wealth status. Here, it is most likely that wealthier farm households adopted the programme earlier than the relatively poor ones since participation into the programme have its own costs (Beyene et al., 2000). Even after participation started, the wealthiest households can have the capacity to sustain if there are external shocks like weather or price shocks, which can possibly endanger their likelihood of participation. Relatively educated household heads are less probable to continue as a participant in the programme. This might be due to the fact that most educated ones are the young population that might have less wealth status to cope with weather and price shocks on maize production and look for other options than continuing as a participant. On the other extreme, the probability to continue as a participant decreases with increasing age of the household head and family size. Normally, there is a strong correlation between age of household head and family size, but both significantly reduce the probability to continue as a participant.

Livelihood security

Estimation results from a switching regression are illustrated in Table 3. The results indicated that household food self-sufficiency status was explained by different variables for the different households grouped based on their extension programme participation status.

Table 2. Logit estimation results on household participation status in current extension programme.

Dependent variable (Participation status)	Coef.	Std. Err.	P-value	Marginal effect	Mean value
Family size	-0.209	0.126	0.099*	-0.028	8.2
Household head's age	-0.039	0.028	0.162ns	-0.005	43.5
Wealth status*	-1.668	0.521	0.001***	-0.226	1.9
Household head education	-0.587	0.354	0.097*	-0.080	1.9
Years of participation	0.846	0.261	0.001**	0.115	3.6
Constant	6.311	2.682	0.019**		

* Wealth status is ranked from 1to 3 where 1 indicates relatively the best wealthy household.

Table 3. Estimation results of household food self-sufficiency.

Dependent variable (FSSI)	Dropouts			Participants		
	Coef.	Std. Err.	P-value	Coef.	Std. Err	P-value
Wealth	-0.046	0.053	0.403	-0.011	0.182	0.952
Family size	-0.076	0.017	0.000***	-0.189	0.048	0.000
Age of household head	-0.011	0.003	0.005***	-0.003	0.010	0.779
Household head's education	-0.154	0.044	0.002***	0.151	0.119	0.211
Plot size	0.806	0.148	0.000***	0.918	0.394	0.024
Years of participation	-0.076	0.030	0.021**	0.001	0.062	0.988
Constant	1.792	0.348	0.000***	1.638	0.781	0.040

Food self-sufficiency decreases significantly with increasing family size and household head's age for both groups. Plot size significantly increases food self-sufficiency status of farm households whether the households are participants in or dropouts form the programme. The more the household was educated, the less the household is food secured. This might be due to the less access to land by the young but educated household heads as land redistribution prohibited ceased long time ago. Long time participation of participant households didn't show significant improvement in household food self-sufficiency. This might be due to the high risk of weather vagaries and the inappropriate credit repayment schedule that force households to sell large quantity of grain at low price just after harvest. For the dropout farm households, the longer the years they stayed in the programme as a participant, the less they are currently secured in food self-sufficiency. In addition, a unit increase in family size, age of household head and household education level decline the prospect of food sufficiency of extension programme drop out households.

DISCUSSION

This study tried to investigate the livelihood differences of farmers who stayed in maize extension programme as participant and the dropouts. In addition, it identified factors that are contributing towards continuing household's participation in agricultural extension programme. By so doing, the following useful conclusions are drawn from this study.

First, it is most likely that farm households with higher wealth status remain as participants over a long period in agricultural extension programmes with costly technology packages. Wealth, measured in whatever unit agreed by the local households, help to resist unanticipated weather or piece shocks that extremely reduce farm profits an unable households to pay their loan on technology packages forwarded through extension programmes. This knowledge can be seen from two different perspectives. The technology suppliers prefer above average farm households to ensure repayments of the technology costs supplied on credit. Poor households are reluctant to take the technology due to their limited capacity to cope up with external shocks. Therefore, resource endowment difference put farm households in different position in their decision towards technology adoption and continuation even adopted for a given good harvest and higher market prices for the crop output under question.

Second, when households are below the food security threshold level they are looking for a 'fail safe' minimum guarantee, less capital intensive and less risky ventures rather than encounters with infatuations of promises of high yields, maximum profit etc that are associated with more risk and higher capital intensity. Therefore those households below the food security threshold should not be pushed into programme participation before they pass

the household food security threshold and gain adequate resource base that enable them to bear the risk associated with programme participation.

Third, marginalizing the poor rural households from the current extension programme aggravates rural livelihood insecurity and rural poverty for which it was meant as a remedy. This capitalizes the need to consider a paradigm shift from production oriented agricultural extension to livelihood extension approach which comprises agri-cultural and non-agricultural rural interventions with the objective of giving the opportunity to the poor rural farm households in securing their livelihoods by making use of available resources at hand. Finally, this study stimulates further studies to assess why households fail to continue as a participant in agricultural extension programme though practiced the programme for a given period.

Conflict of Interest

The authors have not declared any conflict of interest.

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