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Determinants of Coffee Husk Manure Adoption: A Case Study from Southern Ethiopia

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I

INTRODUCTION

Agriculture accounts for almost 50 per cent of the gross domestic product (GDP) and 60 per cent of official exports of Ethiopia, while employing close to 80 per cent of the population (CIA, 2009). The performance of the agricultural sector determines the economic health of the country. If the sector performs well it leads to economic boost up, on the other hand, if its growth is aborted by natural calamities the overall economic performance of the country is also affected. For instance a drought struck in 2002, leading to a 3.3 per cent decline in GDP in 2003, while a normal weather pattern helped and GDP surged to 11.6 per cent in 2004.

Studies have shown that for the last four decades food production in Ethiopia has failed to keep pace with the population growth. Food insecurity has become a chronic problem and the country is not in a position to feed its citizens without external food assistance. For instance, FAO (2001) reveals that even in the best agricultural year about 4-6 million people are in need of food aid. The annual volume of cereal aid is mounting; for the period 1985- 1996 alone it has hovered between 2.3 to 23 per cent of domestic grain production (Demelash, 2003).

Quite often officials and international agencies who are in the business of relief and humanitarian support have explained the low productivity of the agricultural sector in terms of its dependence on nature and poor natural endowments. However, the poor performance of the sector is also due to inappropriate policies, poor physical infrastructure, inefficient input and product markets, weak institutional capacity and lack of coordination and low level of technologies and input use (Tewodros and Moti, 2006).

The use of modern agricultural inputs is far from adequate. Fertiliser which is one of the major productivity-enhancing inputs is used in small quantity by smallholder farmers in Ethiopia. Although the benefit of chemical fertiliser is known by many,

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only 31 per cent of the farmers in the country used commercial fertiliser and just 37 per cent of the cultivated area was treated with fertilisers (CSA, 2007). The information on use of organic fertilisers is also not encouraging. Because of fuel wood scarcity, rural households have been forced to divert animal dung from its traditional role as soil nutrient to direct burning for fuel (Senait, 1997). Crop residues and other by-products are used for animal feed.

Mulat (1996) reveals that most farmers are not adequately compensating for the loss of soil nutrients caused by more intensive cultivation. In many densely populated areas, farmers plant cereal after cereal without resting their plots to meet their subsistence requirements with little or no application of commercial or organic fertiliser. Thus these scenarios are aggravating soil degradation and erosion.

In Ethiopia fertiliser subsidies have been abolished and liberalised as part of the Structural Adjustment programme (SAP) in 1992. The effect of this reform on fertiliser prices and use is one of the most frequently mentioned criticisms of the agricultural reforms. Fertiliser prices have generally risen as a result of subsidy removal and depreciation of real exchange rate. The stagnation in rates of fertiliser application after fertiliser subsidy was lifted in Ethiopia has adverse impact on agricultural productivity, rural poverty reduction, and soil fertility management. Hence it underscores the necessity of alternative soil fertility management options to keep the momentum of agricultural production growth with population growth.

II

COFFEE HUSK MANURE AS ALTERNATIVE FERTILISER

In coffee producing countries, coffee wastes and by-products constitute one of the major causes of severe contamination and environmental threats. For this reason, since the middle of the last century efforts have been made to develop methods for the utilisation of coffee by-products as a raw material for the production of feeds, beverages, vinegar, biogas, caffeine, pectin, pectic enzymes, protein, and compost.

Recent reports have shown that in large part of the countryside of Ethiopia where coffee is grown, particularly washed coffee processing areas, river contamination by wastes produced from coffee processing plants (water used in husking, flushing the residue and discarding husk) have been intensified (Shabedino, Department of Agriculture (DOA), 2005). This process contributes greatly for environmental pollution, health hazards and produces large quantity of wastes in the surrounding areas. Shabedino district where this study was conducted is among the major intensive coffee producing areas with a large number of coffee processing plants in Southern Ethiopia. The district has the largest share of coffee washing and processing plants as well as large tonnes of coffee husk which can be used for compost making to enhance soil fertility and crop productivity. According to the district office report, the district produces over 30 million kg of red coffee cherries annually (Shabedino DOA, *ibid*). Shabedino district Office of Agriculture estimated that in 2004 and 2005 alone around 14,000 tonnes of husk, 8,000 litter mucilage, and 7,000 tonnes of dry coffee husks were deposited yearly to rivers and around the coffee processing plants (*ibid*). The wastage of coffee processing creates immense problems for the surrounding rural community who are using nearby rivers and streams regularly for their domestic and animal consumption. Around each processing plant there is a huge heap of coffee husk, which occupies large areas and produce unpleasant smell. To minimise the problems, the District Office of Agriculture has designed a strategy to convert coffee husk into manure for soil fertility management. It has been reported that a 100 kg of dried husk manure contains 1.834 kg Nitrogen (N), 0.112 kg Phosphate (P), and 3.016 kg Potassium (K) (TERI, 1998). So application of coffee husk manure to the coffee farm or cultivated farms not only improved soil fertility and soil structure but also released a considerable amount of nutrients to provide for the crop. The application of about 1000 kg of coffee husk manure per hectare per year can reduce the amount of chemical fertilisers use by 18.34 kg of N, 1.12 kg of P and 30.16 kg of K (Braham and Bressani, 1979). In addition to manure, dried coffee husk can be used as a material to cover soil surface (mulching material) of coffee farm during the dry season in order to reduce water loss through evaporation.

The present study was conducted to identify and examine the determinants of adoption of coffee husk manure and to provide feedback to the concerned institutions and policy makers to enable them to design effective pathways for its effective promotion of using husk as manure.

III

METHODOLOGY

3.1. *Framework of Estimation*

The standard Logistic adoption model of a new technology is used to estimate the determinants of factors that affect the adoption of coffee husk manure (Amemiya, 1981; Feder *et al.,* 1985).

Let the probability that a farmer adopts a new technology be equal to P=P(Y=1). If he does not adopt it, the probability is equal to (1-P)=P(Y=0). Past studies indicate that a farmer's adoption of soil fertility amendments is influenced by socio-economic factors including household size, farm holding size, credit, membership in farmers' organisations and access to extension service or contact with development agents (Feder and Umali, 1993; Enyong *et al.,* 1999). Let X be a vector of these factors that explain the new technology adoption decision. Then the estimable equation of the model can be written as follows:

$$Ln[p/(1-P)]=\alpha+\beta.X_i+\mu_i \qquad i=1, 2,...,n \qquad .... (1)$$

Where {α and β} are the parameters to be estimated and μ_i is the random error term. The model in (1) is inherently non-linear and estimated by techniques of non-linear maximum likelihood method, using the econometric software, STATA.

Using the estimated coefficients in (1), the marginal effect of each explanatory variable and elasticity of probability of policy relevant variables in X are computed.

3.2. *Data Base for the Study*

The study was carried out in Shabedino district of Sidama zone in southern Ethiopia which is located 21 km away from the Southern Nation Nationalities and Peoples Region (SNNPR) capital city, Awassa. Shabedino is one of the most populated districts in the zone with a population of 297400 persons. A good number of the people (about 96 per cent) are living in rural area and derive their livelihood from agriculture (Shabedino DOA, *ibid*). The district has 50 peasant associations (PAs) and out of which 32 PAs are located around 25 washed coffee husking plants. The total area of the district is 40536 hectares out of which 64 per cent are covered by perennial crops. The major annual crops grown in the area are maize, tef, haricot bean, sweet potato, and potato; while perennial crops include coffee, enset, banana, avocado, mango, etc. The share of coffee in the perennial crop area was 63 per cent.

The Sampling Frame

A multistage stratified random sampling method was used to select 90 farming households from three PAs namely, Howolso, Taramessa and Fura. In the first stage, PAs were divided into two groups, viz., nearby and far PAs in relation to their distance from the nearby coffee processing plant to capture the influence of the plant location on the household's adoption of coffee husk manure. In the second stage, three PAs one from far located and two from nearby areas were selected randomly. In the third stage the respondent households were randomly selected using proportional sampling procedure from three different sampling frames prepared for each PA.

Structured questionnaire was employed to collect information from the head of the household through personal interview. Data on different variables and farming practices pertaining to the year 2005-06 were collected. The study was also adequately supplemented by secondary sources of information including published and unpublished ones.

Variables for Estimation

A farmer's decision to adopt or reject new technologies is influenced by the combined effect of a number of factors related to farmer's objectives and constraints such as farmer's socio-economic circumstances (age, and formal education, etc); farmer's resource endowments as measured by size of family labour, farm size and oxen ownership, and institutional support systems available to farmers (credit, extension and availability of inputs) (CIMMYT, 1993). A number of variables were hypothesised to influence the adoption of coffee husk manure and their list and expected signs are presented in Table 1.

TABLE 1. DESCRIPTION OF VARIABLES USED IN THE LOGIT MODEL AND THEIR EXPECTED SIGN

Variables (1)	Expected sign (2)	Remarks (3)
Household size	+/-	
Age of household head	-	
Sex of household head	-	If female headed household
Education of household head	+	
Farm size (in ha)	+	
Distance from farm to coffee processing plant	+	For nearby areas
Socioeconomic status of the respondent	+	
Tropical Livestock Unit (TLU)	+	
Man Equivalent (ME)	+	
Perception of farm plot fertility status	+	if the plots are less fertile
Institutional support	+	
Number of contact with DA[1] per month	+	

Household size is measured in numbers and it hardly reflects the actual labour force that a farm family owns. Hence Man equivalent (ME)[2] unit was computed to standardise the differences in labour endowment that arise due to age and sex differences between households. The respondent households owned different types of animals, viz., cattle, small ruminants, equines, chicken, etc. with different age groups. For the purpose of comparison between adopter and non-adopter of coffee husk manure technology, a standardise measurement which enables the varieties of animal mix that households keep into a common unit namely Tropical Livestock Unit (TLU) was employed. Education was a categorical variable for this study and it was measured in ordinal fashion as (1=illiterate, 2=read and write, 3=elementary and 4=secondary). The socio-economic status of the respondent households-measured in a subjective judgement using key informants as a resourceful person from the respective PA. The key informants prior to assigning the economic status they decided the criteria that enable to differentiate the relative position of the household in the community. The criteria used were landholding, number of cattle, number of coffee plants, formal or informal decision making position in the community and housing type (hatch roof, corrugated iron). Accordingly a household which is better endowed with the indicated criteria was assigned in better off position while those median and less endowed households categorised as medium and low respectively. Distance from coffee processing plant to farm plots was measured in terms of the time it took for average person. Soil fertility is measured according to farmer's perception in to three categories namely poor, medium and highly fertile. Institutional support in the form of credit, training, farm tools and farm cart could be used as inputs for preparing and transporting coffee husk manure and if a household got any of these services it was assigned one score: otherwise zero. DA contact is measured in terms of number of times the household got the advice of DA per month.

V

RESULTS AND DISCUSSION

Tables 2, 3 and 4 presents the results of the chi-square and t-statistics analysis on selected demographic, socio-economic and institutional variables between adopter and non-adopters of coffee husk manure.

Demographic Characteristics

The mean age of adopters and non-adopters of coffee husk manure was 44 and 45 years in the respective order. The average household size of adopters was 7.61 persons with average labour availability of 3.84 men equivalent while the average household size of non-adopters was about 5.09 with 2.68 average men equivalent. The difference in family size and ME between the two groups measured in t-statistics was found to be significant at 0.05 and 0.1 per cent level of significance. The farmers who adopted coffee husk manure (51.7 per cent) were significantly more educated (attend elementary and secondary level) than non-adopters (27.9 per cent) ($\chi2$=10.734, P<0.05). Out of the adopters of coffee husk manure 17.2 per cent were illiterate, 31 per cent could read and write, and 20.7 per cent and 31 per cent reached elementary and high school, respectively (Table 2).

TABLE 2. DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Sr. No. (1)	Variables (2)	Adoption Status: Adopter Mean (3)	Adopter Std. (4)	Non-adopter Mean (5)	Non-adopter Std. (6)	t-statistics (7)
1.	Household head age	43.79	11.19	44.93	12.9	-0.51 NS
2.	Household size	7.61	2.8	5.09	2.17	1.862*
3.	Man Equivalent (ME)	3.84	1.86	2.68	0.942	28.502***
		N	per cent	N	per cent	$\chi^2_{\text{(chi square)}}$
4.	Household head sex					NS
	Male	26	89.7	55	90.2	
	Female	3	10.3	6	9.8	
5.	Education status of household head					10.734**
	None	5	17.2	31	50.8	
	Read and write	9	31.0	13	21.3	
	Primary	6	20.7	10	16.4	
	Secondary	9	31.0	7	11.5	

***, ** and * Significant at 0.01, 0.05 and 0.1 per cent, respectively; NS= Not significant at 0.1 per cent level.

Socio-Economic Characteristics

The average farm size of adopters of coffee husk manure was significantly larger (0.776 hectares) than non-adopters (0.563 hectares) (t = 6.082, P<0.01). The difference in livestock endowment measured in TLU did not show a significant difference between adopters and non-adopters. The only exception to this was the average number of cows owned by adopter which was significantly larger than the non-adopters (t=3.44, P<0.01). The results of the study also revealed that adopters significantly employed casual labour and mobilised neighbor's labour[3] than the non-adopters. However, the expense incurred for neighbour labour was not significant while for casual labour it was significant. The majority of the adopters (65 per cent) were located near the processing plants as compared to non-adopters (41 per cent).

TABLE 3. SOCIOECONOMIC CHARACTERISTICS

Sr. No. (1)	Variables (2)	Adoption status: Adopter Mean (3)	Adopter Std. (4)	Non-adopter Mean (5)	Non-adopter Std. (6)	t-statistics (7)
1.	Total farm size (ha.)	0.776	0.473	0.563	0.300	6.082***
2.	Land allocated for coffee production (ha.)	0.264	0.140	0.236	0.134	0.701 NS
3.	Number of cow owned	3.538	2.106	2.170	1.100	3.44 ***
4.	Number of bull owned	1.000	-	1.250	0.500	
5.	Number of ox owned	-	-	1.000	-	
6.	Number of sheep owned	1.833	0.753	1.810	0.700	
7.	Number of goat owned	1.500	0.707	2.170	1.580	
8.	TLU	2.583	1.750	2.335	1.730	0.06NS
9.	Number of contract labour employed	3.500	2.120	2.600	0.890	0.86**
10.	Labour raised from neighbor in ME	7.050	3.500	3.100	2.700	2.739**
11.	Expense for neighboring labour	83.50	67.15	68.25	60.33	0.53 NS
12.	Expense on contract labour (Birr)†	150.00	70.71	104.0	16.73	1.57 **
		No.	per cent	No.	per cent	χ^2 (chi-square)
	Household location to processing plant in minutes	29		61		4.735**
	Near	19	65.5	25	41	
	Far	10	34.5	36	59	
	Do have sufficient land?					6.36**
	Yes	9	31	6	9.8	
	No	20	69	55	92.2	
	Perception on plot fertility					19.239***
	High					
	Medium	13	44.8	5	8.2	
	Low	15	51.7	56	91.8	
	Self rated wealth position					NS
	Better- off	2	6.9	3	4.9	
	Medium	19	65.5	48	78.7	
	Poor	8	27.6	10	16.4	

*** = Significant at p< 0.01; ** = Significant at p <0.05; * = Significant at p<0.1; NS= Not significant at less than 0.1 level.

†Birr is the currency of Ethiopia. 1 USD=9 Birr.

About 31 per cent of adopters and 9.8 per cent of non-adopters reported that they do have sufficient land. The respondents perception on their plot fertility revealed that the plot fertility of both the adopters and non-adopters is not high. However, adopters perception on their plot fertility was found to be significantly different from their non-adopter counterparts (χ^2=19.239, P<0.01). The socio-economic status of adopters and non-adopters was found to be statistically not different.

Institutional Support and Access to Services

The average distance from home to processing plant for coffee husk manure adopters was 12.24 minutes of walk while it took 20.46 minutes for the non-adopter. This difference was statistically significant (t= -16.085, P<0.01). Similarly, the finding for the distance from home to main road was significantly different for the two groups. However, the distance from home to development agents' office, market and farm was not significant. Nearly 56 per cent of the adopters got institutional support in the form of training, farm implements, and credit while only 9.8 per cent non-adopters reportedly did the same.

TABLE 4. INSTITUTIONAL SUPPORT AND ACCESS TO SERVICES

		Adoption Status				
		Adopter		Non-adopter		
Sr. No. (1)	Variables (2)	Mean (3)	Std. (4)	Mean (5)	Std. (6)	t-statistics (7)
1.	Distance from farm to processing plant (minutes)	12.24	6.74	20.46	11.55	-16.10***
2.	Number of contact with DA	2.93	1.25	2.13	1.08	1.253***
3.	Distance from home to Development Agent office (minutes)	19.61	9.23	15.32	9.092	1.57 NS
4.	Distance from home to farm	6.23	8.22	4.39	6.90	0.86 NS
5.	Distance from home to market (minutes)	32.76	16.62	33.82	12.71	-0.26 NS
6.	Distance from home to main road (minutes)	6.3	4.36	10.08	8.58	2.078 ***
	Nominal variables	No	per cent	No	per cent	χ^2 (chi-square)
1.	Do you get institutional support?					21.874 ***
	Yes	16	55.2	6	9.8	
	No	13	44.8	55	90.2	
2.	Type of support					
	Training	5	17.2	3	4.9	
	Farm implements	5	17.2	2	3.3	
	Credit and training	6	20.7	1	1.6	

*** = Significant at p< 0.01; ** = Significant at p <0.05; * = Significant at p<0.1; NS= Not significant at less than 0.1 level.

Logit Estimation and Adoption Determinants

A binary logit maximum likelihood estimation of parameters and influence of each exogenous variable on the probability of coffee husk manure adoption was conducted and is presented in Table 5. Among the twelve factors considered in the model, eight factors with the expected sign were found to have a significant influence on the adoption decision of coffee husk manure. These are household head, sex, education level, farm size, distance from farm to nearby coffee processing plant, socio-economic status, man equivalent, institutional support and number of contact per month with development agents. With high significance ($P<0.05$, model $\chi 2=66.741$ and a 46.395 log-likelihood ratio), the model achieved 89 per cent correct prediction. The percentage of adopters and non-adopters of coffee husk manure were 85.2 per cent and 90.4 per cent, respectively.

TABLE 5. PARAMETER ESTIMATES FOR A LOGISTIC MODEL OF FACTORS AFFECTING ADOPTION OF COFFEE HUSK MANURE

Explanatory variables (1)	Parameter estimate β (2)	S.E. (3)	Exp(B) (4)	Marginal effect (≠) (5)
Household size	-0.206	0.196	0.814	-0.023
Age of household head	0.045	0.036	1.046	0.005
Sex of household head #	3.284**	1.522	0.037	0.641**
Education level of household head	1.604***	0.595	4.974	0.177***
Farm size	5.832***	2.227	341.14	0.642**
Distance from farm to coffee processing plant	-0.106***	0.044	.899	-0.012**
Socioeconomic status of the respondent	3.286**	1.396	26.734	0.362**
Tropical Livestock Unit (TLU)	0.226	0.252	1.253	0.024
Man Equivalent (ME)	0.710**	0.292	2.033	0.08**
Perception of farm plot fertility status	0.121	0.651	0.886	-0.013
Institutional support	2.559**	1.040	0.077	0.281**
Number of contact with DA per month	1.078***	0.389	2.938	0.12***
Constant	12.570**	5.299	0.000	

Model χ^2= 66.741***
Log likelihood= -23.196
Overall case correctly predicted = 88.9 per cent
Correctly predicted adopter= 85.2 per cent
Correctly predicted non-adopter= 90.4 per cent
Sample size 90
Sensitivity Pr(+| D) 79.31 per cent
Specificity Pr(-|~D) 93.44 per cent

***=Significant at p<1 per cent; ** = Significant at p <5 per cent; * = Significant at p<10 cent; (#) dy/dx is for discrete change of dummy variable from 0 to 1; ***=Significant at p<1 per cent; ** = Significant at p <5 per cent.

Household head sex was the significant predictor of adoption of coffee husk manure, being a male head of household was related to adoption and it increases the odds of adoption by 0.037. Women's wide range of responsibility at household and community level limits their ability to adopt labour intensive technology such as coffee husk manure. Education had a positive effect in adoption of coffee husk manure. For every one level increase in education level (e.g., from read and write to elementary), the odds of adoption increased by a factor of 4.974. Similarly for one minute increase in the walking distance between home and coffee processing plant, the odds of adoption decreased by a factor of 0.89 while for one hectare increase in farm holding, the odds in favour of adoption of coffee husk manure increased by a factor of 341. It seems that adoption of coffee husk manure was highly related with ownership of relatively large farm size. The estimation result also indicated that adoption of coffee husk manure is positively and significantly related with high socio-economic status, organisation support and frequent contact with development agent. This suggests that adopters of coffee husk manure are better off in their socio-economic status, have ready access to organisation support, viz., training, farm implements, credits and have more contact with extension agents than the non-adopters. Although earlier studies on the determinants of adoption of coffee husk manure are not available at least in the Ethiopia case, it was found that many of the factors which influence adoption of chemical fertiliser also hold good for coffee husk manure. For instance, education, landholding size, extension support, and wealth were found to be positively and significantly influencing adoption of chemical fertiliser (Itana 1985; Zegeye *et al.,* 2001; Getahun *et al.,* 2000*;* Mulugeta, 1994, 1995).

The model was used to calculate the predicted probability of coffee husk manure adoption for a change in the significant explanatory variables. The probabilities were calculated keeping the continuous variables constant at their mean values and dummy variables at zero. The predicted probabilities show the likely effect of changes in the significant variables. The changes in the probability of adopting coffee husk manure keeping other variables included in the model at average level revealed that a change in the education level of the household head from illiterate to elementary level change the probability of adoption of coffee husk manure from 2 per cent to 38 per cent while the change was about 77 per cent for secondary level education. An increase in landholding size from 0.25 ha to 1 ha increase the probability of adoption increase by 3.5 per cent while further increase in land size to 1.75 ha increase the probability of adoption by 31 per cent. Likewise if the farmers receive institutional support the probability of adopting coffee husk manure increase by 78 per cent. It was also found that increasing the frequency of contact with development agents increases the probability of household's adoption of coffee husk manure. For instance, while the probability of adoption for household with only one contact per month with development agent was 45 per cent; three times contact per month with development agent increases the probability of adoption to 88 per cent.

The calculated marginal effect indicates the change in predicted probability of adopting the relevant technology for a unit change in an explanatory variable. The marginal effects of continuous variables were calculated at the means of the data. For dummy variables, a value of 0 was used if the mean was less than 0.5 and a value of 1 if the mean was greater than or equal to 0.5. A discrete change from a state of no institutional support to accessing institutional support and from female headed to male headed increase the probability of adoption by 0.641 and 0.28 respectively. For a unit change in landholding, TLU, ME and number of contact with developments agent the predicted probability will change by 0.642, 0.024, 0.08 and 0.12. The finding is significant at 5 per cent and less level except for TLU. While a discrete change in education and socio-economic status categories increase the probability of adoption of coffee husk manure by 0.18 and 0.362 in that order, a minute increase in walking distance from the processing plant to the plots reduce the probability of coffee husk manure by 0.012.

Elasticity of Probability

Gender of a head of a household was positively associated with the probability of adoption. Male head of a household was more likely to adopt and the effect of sex on the probability of adoption was elastic suggesting that policy which impact out migration and marital status would also affect adoption of coffee husk manure. Education had a significant and elastic effect on the probability of adoption. Elasticity at the sample mean is 2.992, which underscores the importance of education in technological uptake. Households with large farm size, better socio-economic status, endowed with labour (ME), access to institutional support and more number of monthly contacts with development agents were more likely to adopt and this is confirmed by a positive elasticity. The elasticity estimate of distance from farm to coffee processing plant had shown a negative effect on adoption. This finding corroborates that the policy measure to promote coffee husk manure should target large landholders, households with economic capacity, high labour supply or who can afford to hire labour and closer to the coffee processing plant while simultaneously underline the need to promoting institutional support in the form of credit, farm equipment, training and extension as it would encourage adoption of coffee husk technology significantly.

TABLE 6. ELASTICITY OF PROBABILITY OF ADOPTION OF COFFEE HUSK MANURE WITH RESPECT TO POLICY RELATED VARIABLES (ESTIMATED AT THEIR MEANS)

Variables (1)	Elasticity of probability (2)	Std. Err. (3)	Z (4)	P>z (5)
Sex of the household head	2.585	1.299	1.99	0.047**
Education level of head of the household	2.992	1.260	2.37	0.018**
Farm size	3.222	1.350	2.38	0.017**
Distance from farm to coffee processing plant	-1.655	.7429	-2.23	0.026**
Socioeconomic status of the respondent	6.161	2.880	2.14	0.032**
Man equivalent	1.896	.8474	2.24	0.025**
Institutional support	3.927	1.791	2.19	0.028**
Contact with DA	2.251	.9635	2.34	0.019**

** = Significant at p <5 per cent.

V

CONCLUSION AND POLICY IMPLICATIONS

A perusal of the data related to demographic and socio-economic characteristics of adopter and non-adopter households revealed that family size, labour availability (ME), household head's level of education, farm size, household's wealth status and number of casual labour employed were significantly different. It was found that household location with respect to the coffee processing plant between the two groups was significantly different. Access to institutional support and frequency of contact with development agents was also significantly different between adopters and non adopters. The finding implies that progressive and better-off farmers' bias might be involved in the extension service provision in coffee husk manure package since the adopters of coffee husk manure are significantly better-off (own large farm size, TLU, more number of labour force), and more educated than the non-adopters.

A logit estimate results revealed that gender of household head, education level, farm size, distance from home to nearby coffee processing plant, socio-economic status, labour availability measured in men equivalent units institutional support and number of contacts with development agent significantly influenced the adoption of coffee husk manure. Negative marginal effect of household size and distance of the farm from coffee processing plant implies that the actual work force per family rather than the family numbers and nearness of farm to the coffee processing plant influence the likelihood of adoption. The elasticity estimate shows that resource endowment (farm size, better socio-economic status and high supply of work force), institutional support and literacy have positive effect suggesting that they are important policy variables in promoting adoption of coffee husk manure. Hence, policy interventions in farmers' training and education, institutional support such as credit, supply of farm equipments and planned home and farm visit by DA will lead to optimal adoption of coffee husk manure. The following policy implications emerge from the study:

1. District Agricultural Offices should effectively target households which are closely located to coffee processing plants, with large labour force or with financial capacity to hire labour. In the meanwhile they should support labour deficient and poor households with efficient and locally adoptable transportation technologies such as animal drawn cart through credit facilitation.

2. Institutional support in the area of training and education, credit, research and extension should be strengthened to enhance the adoption of coffee husk manure in coffee producing areas. The extension service should stretch to reach all needy households and those who are not yet reached by its service due to lack of access and awareness. The extension approach should liberate itself from being the servant of progressive farmers who demand its service by proactively targeting the poor and women farmers.

3. Partnership among District Level Agriculture Offices, private sector and NGOs is critical to better address the issue of education and training, and credit so as to enhance the institutional efficiency.

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NOTES

1. DA stands for development agent and in Ethiopian case this term is used interchangeably with extension agent.

2. Man equivalent was computed following the standard conversion factor that takes the age and sex of family members into account. For age group < 10 and between 10 and 13, zero and 0.2 is assigned for both sexes respectively. For age group between 14 and 16, 0.5 is assigned if family member is male and 0.4 if female. Similarly for family members aged between 17 and 50 and > 50, it is given 1 and 0.8, and 0.5 and 0.4 if male and female in that order.

3. In most rural Ethiopia households mobilise labour from their neighbours during peak agricultural season. It is a tradition that the labour recipient household's arrange food and local drinks and no wage payment is made.

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