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Bivariate Probit Modeling of Factors Explaining Membership of Farmer Field Schools and Dairy Milk Processing in East Africa

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ABSTRACT

The need for ensuring increased production of livestock and its products in East Africa has necessitated integration of informal trainings through FFS on different aspects of animal husbandry. This study analyzed the factors influencing FFS membership and increased dairy milk processing. The data were collected by International Food Policy Research Institute (IFPRI) from FFS and non-FFS farmers using two-stage random sampling approach.Data were modeled with Bivariate Probit. The results showed that 74.37% of the total farmers belonged to FFS, while average number of cattle owned increased from 9.64-12.18. Dairy milk processed increased from 957.65-1085.43 L before and after FFS. Membership of FFS was significantly influenced by education of household heads, land size, realization of income from businesses, while increase in milk processed was influenced by education, number of boys and girls, years with FFS and livestock number. It was concluded that membership of FFS did not promote milk processing and that opportunities for labour saving technologies should be explored.

Key words: FFS, dairy milk, East Africa, bivariate probit model

INTRODUCTION

The concept of Farmer Field Schools (FFS) was borne out of the need to enhance productivity of rural farmers and ensure environmental conservation through several informal trainings mechanisms. The learning methods, which were largely based on research outcomes from keenly monitored experimental designs, were targeted at assisting farmers to adapt their production systems to some newly developed techniques (Pontius *et al.*, 2002). FFS is a need driven initiative given that many socio-economic researches in developing countries have emphasized low educational attainments as a critical factor that hinder optimal allocation of farm resources. In order to bridge the impact of existing educational gaps among farmers in many developing countries, which obviously influences farm resource productivity, the potentials of organizing local farmers in such an informal training for farm production and marketing skill acquisition cannot be under-estimated. Also, FFS is obviously a welcome idea with significant international acceptability because of its potential role in ensuring rural poverty alleviation (Dilts, 2001; Braun and Duveskog, 2008).

The premise under which FFS operates adequately defines the *Modus operandi* for enhancing the capability of local farmers for research, innovation and informed decision-making. It also ensures building of farmers' intellectual capacity for defining their own research agenda and development of their initiatives for facilitating a sustainable learning process in a multi-channel communication approach (Ashby *et al.*, 2000; Braun *et al.*, 2000; Aizen, 1998). This initiative offers substantial opportunities to farm households to integrate their indigenous knowledge into informal and institutionalized research procedures in order to ensure increased farm production, sustainable utilization of land resource and food safety.

Although, FFS initiative started in Asia, success stories from its implementation have compelled its replication in many African countries. In East Africa, one of the earliest implementation of FFS was the Food and Agriculture Organization's (FAO's) Special Programme for Food Security which was implemented between 1995 and 1998. In 1999, eight pilot districts were selected in Kenya, Tanzania and Uganda for FFS under the FAO's Global Integrated Pest Management Facility (Davis *et al.*, 2010). Similarly, FFS activities have focused on organizing trainings on different aspects of agriculture. Focusing agricultural development in East Africa through FFS is a noble idea due to its overarching role in ensuring economic stability and development as a significant contributor of the Gross Domestic Product (GDP).

The relevance of livestock husbandry in the livelihood of many African farmers, necessitates integration of livestock production into FFS. Specifically, Holloway *et al.* (2000) demonstrated that collective action through cooperative marketing among smallholder dairy farmers in Ethiopia boosted their incomes through adequate market integration. Since 2001, FFS activities have been integrated by International Livestock Research Institute (ILRI) into animal health and production in Kenya (Minjauw *et al.*, 2002). Due to growing demand, such trainings had also been organized by ILRI in Tanzania, Uganda, among others. In Kenya's FFS, Minjauw *et al.* (2003) noted that one of the areas of emphasis after its successful delivery of training on Integrated Pest Management (IPM) was animal health production. It was emphasized that FFSs organized by DFID/FAO started in 2001 with emphasis on how best to adapt and test FFS approaches for enhancement of livestock health and productivity. In Kenya, focusing on livestock development is an age-long agricultural development goal, given several untapped potentials in the sector that contributes barely 17% of agricultural GDP and 7% of agricultural exports (Government of Kenya, 2010).

This study analyzed the factors influencing membership of FFS and increase in milk processing in East Africa.

MATERIALS AND METHODS

Data: Data for this study were collected by International Food Policy Research Institute (IFPRI). The data were downloaded from the website of IFPRI after obtaining the necessary permission for its usage. Based on the documentations by Davis *et al.* (2010), the complete dataset from where dairy farmers were selected for this study contained 1126 randomly selected FFS and non-FFS households. A two-stage random sampling approach was used. The newly registered FFS in the IFAD-FAO districts formed the sampling frame from where 20 FFS per country were randomly selected from some purposively selected districts. The second stage involved selection of farmers from FFS in a manner that was proportional to the size of the FFS. In order to have a control, non-FFS villages with similar ethic, topographical, climatic, agronomic (etc.) characteristics were selected. The enumerators were adequately trained to use the data collection instrument which was closed-ended well-structured questionnaire. The questionnaire was field-tested before being finally used for data collection. The farmers that were keeping cattle were used in the analyses and they were 249 from Kenya, 44 from Tanzania and 304 from Uganda.

Specification of the estimated model: The bivariate Probit regression method was used to estimate the parameters of the factors influencing membership of FFS and increase in dairy milk processing. The model specification begins by presenting the univariate estimation of the Probit modeling of factors influencing membership of FFS. This can be presented as:

$$F_i^* = \alpha + \beta_k \sum_i^n = 1\, X_{ik} + e_i \tag{1}$$

If $F_i^* = 1$ if $F_i^* > 0$; = 0, otherwise:

$$M_i^* = \theta + \varphi_k \sum_i^n = 1\, X_{ik} + z_i \tag{2}$$

If $F_i^* = 1$ if $F_i^* > 0$; = 0, otherwise:
where, β_k, θ, φ_k are the estimated parameters and X_{ik} are the included explanatory variables with ……..

It is econometrically expected that:

With standard Probit model, we are assuming that the distribution of the error terms is such that $E(e_i) = E(z_i) = 0$; $Var(e_i) = Var(z_i) = 1$ and Cov (e_i, z_i) However, Bivariate models assumes correlation of the error terms of the two models (Greene, 2012).

From Eq. 1, it can be noted that standard Probit model:

$$\begin{aligned} P_r[F_i = 1] &= \Pr[F_i^* > 0] = \Pr[\beta_k \sum_i^n = 1\, X_{ik} + e_i > 0] \\ &= \Pr[e_i < -\beta_k \sum_{i=1}^n X_{ik}] = \Pr[e_i = \beta_k \sum_{i=1}^n X_{ik}] = \phi(\beta_k \sum_{i=1}^n X_{ik}] \end{aligned} \tag{3}$$

where, $\Phi(.)$ is the cumulative distribution function for the standard normal distribution.According to Giles (undated), Bivariate modeling equations specified as 1 and 2 offer the following cases:

$$P_{11} = \Pr[F_i = 1, M_i = 1] = \int_{-\infty}^{\beta_k \sum_{i=1}^n X_{ik}} \int_{-\infty}^{\varphi_k \sum_{i=1}^n X_{ik}} \phi 2\ (z_1, z_2, \rho)\, dz_1\, dz_2 \tag{4}$$

$$P_{10} = \Pr[F_i = 1, M_i = 0] = \int_{-\infty}^{\beta_k \sum_{i=1}^n X_{ik}} \int_{\varphi_k \sum_{i=1}^n X_{ik}}^{\infty} \phi_2\ (z_1, z_2, \rho)\, dz_1\, dz_2 \tag{5}$$

$$P_{01} = \Pr[F_i = 0, M_i = 1] = \int_{\beta_k \sum_{i=1}^n X_{ik}}^{\infty} \int_{-\infty}^{\varphi_k \sum_{i=1}^n X_{ik}} \phi_2\ (z_1, z_2, \rho)\, dz_1\, dz_2 \tag{6}$$

$$P_{00} = \Pr[F_i = 0, M_i = 0] = \int_{\beta_k \sum_{i=1}^n X_{ik}}^{\infty} \int_{\varphi_k \sum_{i=1}^n X_{ik}}^{\infty} \phi_2\ (z_1, z_2, \rho)\, dz_1\, dz_2 \tag{7}$$

Where the Bivariate normal density distribution function is:

$$\phi_2\ (z_1, z_2, \rho) = \exp[-0.5(z_1^2 + z_2^2 - 2\rho z_1 z_2)/(1-\rho^2)]/[2\pi(1-\rho^2)^{\frac{1}{2}}] \tag{8}$$

where, ρ is a correlation parameter that denotes the extent of covariation between the two error terms.

RESULTS AND DISCUSSION

Table 1 shows that 74.37% of the dairy farmers belonged to FFS. In Uganda, the highest proportion of the farmers (77.30%) belonged to FFS, while 71.49 and 70.45% belonged to FFS in Kenya and Tanzania, respectively. However, in the combined data, average year spent with FFS was 2.58 with standard deviation of 2.73. Also, average number of years already spent with FFS by the farmers was highest in Kenya with 2.98 and standard deviation of 3.40. High involvement of the farmers in FFS can be understood given that the selected regions were places where some FFS projects were on-going. Similarly, East Africa is one of the earliest regions in Africa to have established FFS (Davis *et al*., 2010). More specifically, Braun *et al*. (2007) submitted thatFFS was first established in Western Kenya in 1995 as part of a project that was funded by Food and Agriculture Organisation (FAO). FAO (2008) submitted that ever since it was first introduced, over 3000 FFS groups had been established in Uganda. Several factors have enhanced the interest of the farmers in FFS especially when initiated as an agricultural development project for which some funds are available for implementation.

Also, majority of dairy farming household heads were married with 79.39% in the combined data, 77.91% in Kenya, 81.82% in Tanzania and 78.29% in Uganda. In the combined data, 83.92% were headed by males with 83.13% in Kenya, 81.82% in Tanzania and 84.87% in Uganda. Similar results had been reported by Kaimba*et al*. (2011). Traditionally, in Eastern part of Africa, men play the role of household heads. It is only in cases of death or temporary absenteeism that women assume the status of household heads. However, Silberschmidt (2001) emphasized that in East Africa, some stereotyped notion of gender role abounds in literature with men being the ultimate beneficiaries of production resources.

Educational attainment is a critical factor influencing technology adoption and overall accruable benefits among African farmers (Batra, 2006). However, in many African countries, illiteracy still remains a critical factor militatingagricultural productivity. The results show that majority of the farm household heads -58.29% in the combined data, 52.21% in Kenya, 65.91% in Tanzania and 62.17% in Uganda-had primary education. Similar results had been reported by

Table 1: Percentage distribution of dairy farmers' demographic characteristics in East Africa

Variables	Kenya (n = 249)	Tanzania (n = 44)	Uganda (n = 304)	All (n = (597)
FFS member	71.49	70.45	77.30	74.37
Married	77.91	81.82	78.29	78.39
Single	2.01	2.27	9.21	5.70
Widowed/divorced	20.08	15.91	12.50	15.91
Male	83.13	81.82	84.87	83.92
Head has no education	9.23	13.64	0.33	5.03
Head has primary education	52.21	65.91	62.17	58.29
Head has secondary education	30.12	18.18	24.67	26.47
Head has tertiary education	8.43	2.27	12.83	10.22
Spouse has no education	9.64	2.27	12.17	10.39
Spouse has primary education	52.61	88.64	67.11	62.65
Spouse has secondary education	13.25	2.27	18.42	15.08
Farming	73.49	84.09	75.00	75.04
Civil service	5.62	4.55	15.79	10.72
Retiree	4.82	2.27	6.58	5.53
Other occupation	16.07	9.09	2.63	8.71

Njarui *et al.* (2011) among some farmers in semi-arid Kenya. Secondary education was attained by 26.47% of the household heads in the combined data, 30.12% in Kenya, 18.18% in Tanzania and 24.67% in Uganda. It should also be emphasized that when compared with household heads, higher proportions of the house head spouses were without formal education. Specifically, as against 4.02% of household heads that were without formal education in the combined data, 10.39% of the spouses had no formal education. Also, majority of the spouses had primary education with 62.65% in the combined data, 52.61% in Kenya, 88.64% in Tanzania and 67.11% in Uganda. In addition, 13.25% of the spouses from Kenya, 2.27% from Tanzania and 18.42% from Uganda had secondary education.

Table 1 further shows that 75.04% of the respondents in the combined data had farming as their primary occupation. In Kenya, Tanzania and Uganda, 73.49, 84.09 and 75.00% of the household heads, respectively had farming as their primary occupation. Such high percentages of involvement in farming are expected in rural settings, such as places used for the study. Respondents that indicated other occupations like trading, masonry etc. constituted 8.71% in the combined data, while 16.07, 9.09 and 2.63% were from Kenya, Tanzania and Uganda, respectively. Barrett *et al.* (2001) submitted that diversification is a norm in rural areas which is motivated by some push and pull factors that are meant to subvertsocio-economic dynamics through timely and persistent adjustments to households' sources of livelihoods.

Table 2 presents the distribution of other demographic characteristics of the households' heads. It shows that average age of the farmers in the combined data was 48.81 years with standard deviation of 12.06. Average age of farmers was highest in Tanzania with 52.27 and standard deviation of 13.17. Average numbers of male and female adults in the combined data were 1.70 and 1.71, respectively. In Uganda, average numbers of males and females adults were highest across the selected East African countries with 1.91 and 1.79, respectively. However, in Kenya, average numbers of boy and girls were 1.96 and 1.76, respectively. However, in the combined data, there were averages of 2.38 and 1.71 household members working full time and part time on farms, respectively. Across the countries, average number of households that was working full time in Uganda was highest with 2.79. Also, on the average, 1.87 household members were involved in working part-time on farms in Kenya.

Table 3 shows the distribution of cattle in the countries among the interviewed farmers. It shows that in the combined data, average cattle owned before FFS was 6.64 with standard

Table 2: Descriptive characteristics of dairy farmers' socio-economic characteristics

	Kenya		Tanzania		Uganda		All	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	49.920	11.7130	52.270	13.1690	47.410	12.0150	48.810	12.0570
Male adult	1.490	1.0200	1.360	0.8380	1.910	1.1220	1.700	1.0840
Female adult	1.610	1.1130	1.660	0.9630	1.790	1.0310	1.710	1.0630
Boy	1.960	1.5630	1.680	1.5220	1.560	1.4930	1.730	1.5340
Girl	1.760	1.3070	1.770	1.6690	1.740	1.4770	1.750	1.4210
Years with FFS	2.980	3.3980	2.730	3.1430	2.230	1.8800	2.580	2.7290
Land size	3.993	4.0185	2.284	2.0941	4.238	3.0344	3.992	3.4588
Member working on farm full time	1.920	1.0270	2.110	1.1040	2.790	1.3750	2.380	1.2900
Members working on farm part-time	1.870	1.5260	1.270	1.2270	1.640	1.2400	1.710	1.3740

Table 3: Descriptive statistics of the No. of cattle owned and dairy milk processed

	Kenya		Tanzania		Uganda		All	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Cattle No. before FFS	2.42	3.11	3.61	3.67	10.54	11.10	6.64	9.14
Cattle No. now	3.01	2.65	5.16	6.52	20.71	20.56	12.18	17.23
Dairy milk processed before FFS	207.07	480.80	8368.76	37449.11	499.77	589.52	957.65	10288.46
Dairy milk processed now	370.00	530.01	6407.45	11532.49	901.13	950.78	1085.43	3534.71
Increase in dairy milk processed	162.93	489.30	-1961.31	29596.40	401.36	595.36	127.78	7989.88

deviation of 9.14. In Kenya, Tanzania and Uganda, average cattle owned were 2.42, 3.61 and 10.54, respectively. Average cattle owned increased to 12.18, 3.01, 5.16 and 20.71 in the combined data, Kenya, Tanzania and Uganda, respectively. Also, it is only in Tanzania that average number of milk processed before and after FFS establishment declined. Precisely, in Kenya, processed dairy milk increased by 162.93 L, by 401.36 L in Uganda and 127.78 L in the combined data.

Factors influencing FFS membership and milk processing: Table 4 presents the results of Bivariate Probit regression. It reveals that the model produced a good fit for the data with computed Wald Statistics being statistically significant ($p<0.01$). In addition, the computed rho is 0.2879 with the Likelihood ratio test indicating its statistical significance ($p<0.01$). This implies that the error terms of the two models are significantly correlated and that estimating them individually with standard Probit model would give inefficient parameters (Greene, 2012).

The table shows that the parameters of residence in Uganda, residence in Kenya, gender (male household headship) and being married did not show statistical significance in the two models ($p>0.10$). However, the parameter of attainment of primary education parameter in the FFS membership model is statistically significant ($p<0.10$). This implies that compared to those with tertiary education, household with heads having primary education had lower probability of belonging to FFS. This can be explained from the critical role played by education in fostering adoption of innovative practices and willingness to belong to such a group that is a bit intellectually demanding. Similar results had been reported by Bennin *et al.* (2008) and Adong *et al.* (2013). While it shows no statistical significance ($p>0.10$) in the FFS membership model, the parameter of head had no education is statistically significant ($p<0.01$) in the increase in milk processing model. This shows that when compared with those with formal education, households without any formal education had lower probability of increasing processing of milk. Similarly, in both models, the parameters of household heads' attainment of secondary education are with negative sign and statistically significant ($p<0.01$). These show that compared with those with tertiary education, households that were headed by secondary school certificate holders had lower probabilities of belonging to FFS and increasing processed milk.

The parameters of number of males and females household members are statistically significant ($p<0.05$) in the milk processing model. These show that as the number of boys and girls in the households increases, the probability of increasing processed milk increased. This is expected because of the labour intensiveness of milk processing, which can be supplemented by involvement of youth male and female household members. Tumusiime-Mutebile (2013) noted that in East Africa, because family labour possesses higher incentives to work than hired labour, small farms are often more productive than large scale farmers.

Table 4: Bivariate probit regression results for membership of FFS and increase in dairy milk processing

Variables	Parameters	SE	t-statistics	p-value
FFS membership eqnation				
Uganda	-0.1719685	0.5047100	-0.34	0.733
Kenya	0.4098133	0.4730906	0.87	0.386
Male household head	-0.7898762	0.6566299	-1.20	0.229
Married	0.6799910	0.7000991	0.97	0.331
Head had no ednсation	-1.0013260	0.7528538	-1.33	0.184
Head had primary ednсation	-0.8676437	0.4925887	-1.76	0.078
Head had secondary ednсation	-1.9247810	0.5363151	-3.59	0.000
Primary occupation is civil service	-0.0398584	0.5805163	-0.07	0.945
Retiree	0.3433834	0.5459159	0.63	0.529
No. of adult males	0.0704008	0.1432862	0.49	0.623
No. of adult female	-0.1431689	0.1161839	-1.23	0.218
No. of boys	0.0262549	0.1068501	0.25	0.806
No. of girls	-0.0005588	0.0879243	-0.01	0.995
Years with FFS	1.7442140	0.1665544	10.47	0.000
Improved breed livestock	-0.0604248	0.3547496	-0.17	0.865
Livestock No. before FFS	0.0214547	0.0410011	0.52	0.601
Livestock No. now	-0.0063315	0.0176749	-0.36	0.720
Land size	-0.0636676	0.0339467	-1.88	0.061
Income realized from agricultural labor	-0.0389121	0.3134495	-0.12	0.901
Permanent job	0.2607550	0.4062538	0.64	0.521
Income realized from crafts	-0.1625448	0.3853782	-0.42	0.673
Income realized from brick	-0.1574163	0.3855938	-0.41	0.683
Income realized from brew	-0.9014684	0.3563528	-2.53	0.011
Income realized from shop	0.6097493	0.5446210	1.12	0.263
Income realized from business	-0.6153105	0.4487643	-1.37	0.170
Income realized from food	-0.2560098	0.4764175	-0.54	0.591
Income realized from relative	-1.2212300	0.3514883	-3.47	0.001
Family members working fulltime on farm	0.2297088	0.1123081	2.05	0.041
Family members working part-time on farm	-0.0196040	0.1015247	-0.19	0.847
Constant	-0.3260675	0.7225806	-0.45	0.652
Increase in milk processed eqnation				
Uganda	0.0082455	0.3253892	0.03	0.980
Kenya	0.2677268	0.2984074	0.90	0.370
Male household head	-0.0808315	0.3094787	-0.26	0.794
Married	-0.1456800	0.2961858	-0.49	0.623
Head had no ednсation	-2.1577090	0.5030795	-4.29	0.000
Head had primary ednсation	-1.5945910	0.3928349	-4.06	0.000
Head had secondary ednсation	-1.5404530	0.3955646	-3.89	0.000
Primary occupation is civil service	-0.1926435	0.3413454	-0.56	0.573
Retiree	-0.3700604	0.3686145	-1.00	0.315
No. of adult males	-0.0947760	0.0790523	-1.20	0.231
No. of adult female	0.0842972	0.0915872	0.92	0.357
No. of boys	0.2347280	0.0668804	3.51	0.000
No. of girls	0.1455378	0.0639188	2.28	0.023
Years with FFS	-0.0538353	0.0228502	-2.36	0.018
Improved breed livestock	-0.0639695	0.1980654	-0.32	0.747
Livestock No. before FFS	0.0444894	0.0184854	2.41	0.016

Table 4: Continue

Variables	Parameters	SE	t-statistics	p-value
Livestock No. now	-0.0191612	0.0089795	-2.13	0.033
Land size	-0.0239384	0.0222219	-1.08	0.281
Income realized from agricultural labor	0.5745348	0.1744590	3.29	0.001
Permanent job	-0.2417243	0.2332947	-1.04	0.300
Income realized from crafts	-0.0100412	0.2146103	-0.05	0.963
Income realized from brick	-0.3127404	0.1986720	-1.57	0.115
Income realized from brew	0.2970508	0.2277065	1.30	0.192
Income realized from shop	0.1141830	0.2778426	0.41	0.681
Income realized from business	-0.5115376	0.2143878	-2.39	0.017
Income realized from food	-0.2481093	0.2411272	-1.03	0.304
Income realized from relative	0.0646592	0.1701263	0.38	0.704
Family members working fulltime on farm	0.0183953	0.0803957	0.23	0.819
Family members working part-time on farm	-0.1112463	0.0607450	-1.83	0.067
Constant	2.1752290	0.5598177	3.89	0.000
Log likelihood = -293.92919				
Wald chi2(58) = 238.96				
Prob> chi2 = 0.0000				
Athrho	0.02962907	0.3104733	0.95	0.340
Rho	0.02879144	0.2847367		

Likelihood-ratio test of rho = 0: chi2(1) = 12.2076 Prob>chi2 = 0.0005

Similarly, the parameters of years with FFS in the two models are statistically significant ($p<0.05$). In the FFS membership model, these show that probability of belonging to FFS increased with years already spent. This implies that people were not dropping out the membership possibly due to its adjudged relevance to fostering sustainable livelihoods and households' income. Also, the result shows that as the years with FFS increased, probability of increasing milk processing reduces. This may have resulted from involvement of farmers in other Aspects of technology transfer as taught under the programmes.

The results also show that the parameters of number of cattle owned before and after commencement of FFS programmes are statistically significant ($p<0.05$). These show that as the number of livestock owned before (after) FFS commenced increased, the probability of increasing milk processing increased (decreased). This can be explained from the fact that dairy cow needs to attain certain age before producing milk. Sometimes, all other factors held constant, milk production increases with the age of the animal.

The parameter of land size is statistically significant ($p<0.10$) in the FFS membership model. This implies that the probability of belonging to FFS reduces as farmers' land holding increases. This may have resulted due to primary target of the programme on small scale farmers. Also, out of the variables that captured sources of income which were included, in the FFS membership model, the parameters for brewery income and relative are statistically significant ($p<0.05$). These imply that as the income realized from relatives and brewery increased, probability of FFS membership declines. However, in the second model, the parameters of income realized from agricultural labour and businesses are statistically significant ($p<0.05$). These show that realization of income from agricultural labour (business) increased (reduced) the probabilities of increasing dairy milk processing. This may reflect the fact that those that were primarily into farming would have sufficient to be involved in milk processing. Involvement in business ventures may hinder involvement in milk processing, thereby making it difficult to have any initiative to increase its processing.

Also, the parameter of number of household members that work fulltime on the farm is statistically significant ($p<0.05$) in the FFS membership model. This implies that as the number of household members that worked full time on the farm increased, the probability of belonging to FFS increased. This can be explained from expected availabihty of household heads or its members for FFS trainings if there are many of them working full time on farm. It should be noted that in recent times, a major limitation to agricultural development is non-availability of casual labour, especially during the peak of agricultural production (planting and processing) thereby necessitating the use of family members. It should also be noted that the parameter of number of household members that work part time in the increase in milk processing model is statistically significant ($p<0.10$). This implies that as the number of household members that worked part-time increased, the probability of increasing milk production declined.

CONCLUSION

Farmers' Field School presents a veritable platform for education farmers in several aspects of their productive activities without really bringing them inside the four walls of academic lecture rooms. The growing realization of its impact on agricultural productivity is the hub of its spread across different countries and continents. In East Africa, the relevance of the agricultural sector for promoting sustainable human development through promotion of nutritionally enriched enterprises has made introduction of FFS into hvestock husbandry a necessity. This is diametrically aligned with the goal of poverty reduction as clearly spelt in the Millennium Development Goals (MDGs). Findings from this study however underscore the need for providing more veritable platforms for integrating livestock husbandry, especially with respect to dairy milk processing into the framework of FFS design in East Africa. Adequately targeted research on labour-saving technologies will assist in promoting involvement in dairy activities, given current rural-urban migration which may limit availability of family labour.

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