

# Socioeconomic Factors that Influence Smallholder Farmers' Membership in a Dairy Cooperative Society in Embu County, Kenya

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## Abstract

Smallholder dairy farmers produce the bulk of total marketed milk in Kenya. Dairy cooperatives are one of the avenues for these smallholder farmers to harness markets for their milk. The paper sought to find out the socioeconomic factors that would influence these farmers to join dairy cooperatives in Embu County, Kenya. Systematic random sampling and simple random sampling were used to select a total of 236 smallholder farmers. The data was analysed using descriptive statistics and the binomial logit model. The results show that age, gender, household size, herd size, distance to the nearest market, access to credit and milk sold influenced the decision to join cooperative societies. The study recommends further study whether cooperatives are improving the incomes of smallholder farmers.

**Keywords:** Dairy cooperative society, smallholder farmers, Binomial logit model

## 1. Introduction

Agriculture, the mainstay of Kenya's economy, currently contributes 26 per cent of the GDP directly and another 25 per cent indirectly. The sector also accounts for 65 per cent of Kenya's total exports and provides more than 18 per cent of formal employment. More than 70 per cent of informal employment is in the rural areas (GoK, 2010). The dairy sector is the second largest contributor to livestock GDP following beef. The dairy sector contributes 14 percent of Kenya agricultural GDP and around 4 percent of total GDP (Muriuki, 2011). In 2008, the estimated milk production was 5.1 billion litres with a total population of 3.5 million heads of dairy cattle (GoK, 2010). Milk production is mainly from cattle with camels and goats accounting for a relatively small percentage. Dairy sector provides income to more than 660,000 rural households. The smallholder producers characterize the dairy industry and produce over 70% of the total milk marketed in the country (Staal, 2004). In light of this, it can be inferred that dairy's main role in Kenya's economy is its contribution to the livelihoods of the many people engaged throughout the value chain and to the nutritional well-being of many rural communities. Despite of this, the Kenyan dairy sector has not fully realized its potential. The inability of small producers to access markets is major limitation to harness opportunities in livestock production. The smallholder dairy farmers face very high transaction costs in terms of cost of information search, transportation search, contract enforcement mechanisms, access to credit facilities and weak institutions. There has been a worldwide belief that cooperatives are the appropriate vehicles to reduce transaction costs and facilitate access by farmers to inputs, markets and other vital services (Ortmann and King, 2007).

The dairy cooperative movement in Kenya began in 1931 with the formation of the Kenya Cooperative Creameries (KCC). KCC was meant to assist settler farmers in production, processing and marketing. Soon after Kenya gained independence, it recognized the importance of the cooperative movement as a tool to meeting its rural development objectives. The government subsequently gave KCC monopoly rights as the sole agent in the dairy industry (Atieno and Kanyinga, 2008). The members did not own the cooperatives and a result they were not sustainable. This led to the liberalization of cooperatives from state control to enjoy autonomy and run in a competitive environment (Ngigi, 2005)<sup>1</sup>.

Most of these dairy cooperatives societies are located in the highlands. The bulk of their members are smallholders who, besides keeping dairy animals, grow tea or coffee and other crops. Although the core function of all dairy cooperative societies is milk marketing, they provide to some varying degree other services such as AI, Veterinary services, input provision among other services. The cooperatives charge farmer members for these services on a cost-recovery basis in a cost effective manner that few of their competitor milk buyers can imitate (Owango *et al.*, 1998).

Majority of smallholder dairy farmers are faced with many problems such as seasonality of milk production, poor and unreliable quality feeds, barriers to animal health services, low quality dairy cows and poor access to milk markets. They also face transaction costs in terms of cost of information search, transportation search, contract enforcement mechanisms, access to credit facilities and weak institutions. This makes them unable to achieve higher milk production, and hence lower profits. The dairy cooperative movement can be a tool to achieving economic development. Cooperatives can play a major role in improving productivity and

minimizing transaction costs faced by their members. Since independence, the government has been advocating for smallholder farmers to join cooperatives in order to improve their bargaining power, reduce transaction costs and increase productivity. This paper seeks to find out what factors influence the smallholder farmers to join dairy cooperative society in light of dairy cooperatives as tools to improve the incomes of the farmers.

## 2. Methodology

### 2.1 Study area and sampling technique

This study was conducted in Embu County. Embu County lies between latitudes  $0^{\circ} 8'$  and  $0^{\circ} 35'$  South and longitudes  $37^{\circ} 19'$  and  $37^{\circ} 42'$  East. It occupies 2,818 kms<sup>2</sup>. The county's favourable climate conditions create a very favorable environment for growing high value crops like tea and coffee. It is also very favourable for keeping dairy animals (Franzel *et al.*, 2003).

This study collected a sample of 236 respondents in order to be able to represent the target population. Out of the 236 respondents, 118 were cooperative members while 118 were non-cooperative members. The study used systematic random sampling to select smallholder dairy farmers who were members of the dairy cooperative society from a source list available from the operating dairy cooperatives. The first respondent was selected at random and subsequent respondents were selected by taking every  $k^{\text{th}}$  item from the list where  $K$  refers to the sampling interval. Simple random sampling was used to select smallholder dairy farmers who were not members of the cooperative.

### 2.2 Method of data analysis

Upon completion of data collection, the study used SPSS 17 for data management and STATA 12 software to analyze the data. Two methods of analysis were employed, descriptive and econometric analysis. The main descriptive indicators employed were t- test and chi square test to investigate the differences between the cooperative and non-cooperative members. Binomial logit model was used to analyse the socioeconomic factors that influenced the smallholder dairy farmers to join dairy cooperative societies. Assuming that a smallholder farmer chooses from two alternatives: being a member of a dairy cooperatives or being a non- member, then the observation of the choices will reveal the farmers preference. If a smallholder dairy farmer is a member of a dairy cooperative society, this implies that  $U_{i1} \succ U_{i0}$ , where  $U_{i1}$  and  $U_{i0}$  are the utilities that a smallholder dairy farmer denoted by  $i$  associates with being a member of a dairy cooperative and not being a member of a dairy cooperative respectively.

The equation for the binomial logit method is written as (Greene, 2002)

$$p = (y = 1/x) = \frac{\exp(\beta_0 + x\beta)}{1 + \exp(\beta_0 + x\beta)}$$

Where  $y$  is membership in a cooperative society noted by MBR (1=member, 0=non-member),  $\beta$  represents parameters to estimate and  $x$  denotes the set of independent variables

**Table 7: Description of variables for the binomial logit model**

Variable	Description	Unit of measurement	Expected sign
<b>Dependent variable</b>			
Membership in a dairy cooperative	Farmer is a member of a dairy cooperative society or not	1= member, 0=non member	
<b>Independent variables</b>			
Variable	Abbreviation	Unit of measurement	Expected sign
Age	YEARSHH	Number of years	+/-
Gender	GENDER	1=Male, 0=Female	+/-
Education level	EDUC	1=No formal education, 2= Primary education, 3= Secondary education, 4=Tertiary education	+/-
Farming experience	EXPER	Number of years	-
Household size	HSIZE	Number of people	+/-
Herd size	HERDSIZE	Number of milk cows	+/-
Access to credit	CRED	1=Credit access, 0=No credit access	+/-
Access to extension	EXTENS	1= Extension, 0= no access to extension	+/-
Off farm income	OFFINCOME	1= Access to off farm income, 0= No access	+/-
Distance to market	DISTMARK	Kilometres	+/-
Milk sold	MILK SOLD	Litres sold	+/-

### 3. Results and discussion

#### 3.1. Descriptive analysis of socio-economic characteristics of smallholder dairy farmers

**Table 2: Descriptive results for socioeconomic factors**

Characteristic	Mean		T value
	Non- cooperative members	Cooperative members	
Average Age	50.48	46.86	2.010**
Household size	4.44	4.62	0.668
Number of adults working on the farm	2.36	1.86	4.698***
Number of adults working off the farm	0.75	0.69	0.351
Dairy herd size	2.41	1.42	5.962***
Litres sold per month	968.87	327.71	6.136***

Source: Survey data (2013)

The results presented in Table 2 indicate that the difference in mean age between cooperative and non-cooperative farmers is statistically significant at a 5% level of significance. The average age was higher for farmers who were not member of the dairy cooperative (50.5 years) compared to farmers who were members of the dairy cooperative (46.9 years). The result is consistent with the finding of Simelane (2011) who states that cooperative membership tends to decline with age as younger farmers tend to be risk takers thus are more likely to join cooperatives. In terms of household size, the two tailed test was statistically insignificant meaning the household size between the cooperative and non-cooperative members was not different. A closer look at the number of adults working on the farm reveals that cooperative members tend to assign more labour for dairy production; hence, they produce more milk. The sampled *t* test for the number of adults working on the farm was statistically significant at 1% level. The results are similar to the findings of Verhofstadt and Maertens (2013), whose study in Rwanda showed that cooperative member households have more household members who work in agriculture. Abate *et al* (2013) found out that farm households belonging to agricultural cooperatives have higher household size in both numbers and adult equivalents working on the farm. Table 2 also indicate that cooperative members had bigger herd sizes and sold more milk than non-cooperative members This might be due to the fact that they are paid monthly thus they are able to save and invest part of their earning in the dairy sector to improve the farm operations and asset base of the household, hence larger herd sizes Higher milk production is attributed to improved management practices resulting from training and extension services. The differences in average milk sold per cow per day was statistically significant at 1% level, implying that on average cooperative farmers sold more milk that their non-cooperative counterparts. Ghosh and Maharjan (2004),

in Bangladesh, found there was higher production of milk per cow and per household in the cooperative villages compared to the non-cooperative villages.

### 3.2 Econometric results of socio economic factors that influence smallholder farmers' membership in dairy cooperatives

Selected socio-economic variables were used to estimate the binomial logit regression model to determine the socio-economic factors influence smallholder farmers' membership in dairy cooperatives. The 12 latent variables were entered into the binomial logit analysis to determine the subset that would be a good predictor of the dependent variable. According to the results in Table 3 presents the results of the binomial logit estimation of the socioeconomic factors influencing smallholder farmers' membership in a dairy cooperative. The model correctly predicted 86.44% of the observation. The *chi-square* result was significant at 1% level.

The results indicate that out of the total number of variables considered in the model, seven variables significantly influenced farmers' membership in the dairy cooperative. Age of the respondent had negative significant effect on smallholder dairy farmers' membership in dairy cooperative at 5% level. As the age of the sampled respondent increases by one year, the likelihood of a farmer being a member of a dairy cooperative decreases by 0.68% and was similar to the finding of Alema (2008) and Abate *et al* (2013). This is an important discovery that younger people are more likely to become members of cooperatives. The reason is that younger farmers are risk takers while older farmers are more experienced and careful when making decisions (Simelane, 2011). The young farmers are more aware of the benefits of cooperatives as compared to older farmers who are reluctant because of cooperatives failures witnessed in the past.

**Table 3: Binomial logit results for socioeconomic factors influencing membership**

Variable	Marginal effects( $\delta y / \delta x$ )	Coefficient
Gender	0.1523 <sup>***</sup> (0.0482)	1.3535 <sup>***</sup> (0.4595)
Age	-0.0068 <sup>**</sup> (0.0028)	-0.08125 <sup>**</sup> (0.2110)
Education level	No formal education(Base level)	
	Primary education level	-0.1155 (0.1070)
	Secondary education level	-0.1878 (0.1145)
	Tertiary education level	-0.2161 (0.1318)
Household size	-0.0116 (0.0145)	-0.1033 (0.1294)
Number of adults work on farm	0.0768 <sup>**</sup> (0.0301)	0.6823 <sup>**</sup> (0.2789)
Herd size	0.0604 <sup>**</sup> (0.0268)	0.5371 <sup>**</sup> (0.2480)
Farming experience	0.0051 (0.0049)	0.0453 (0.0438)
Income from off farm activities	-0.0525 (0.0532)	-0.4667 (0.4766)
Distance to the market	0.0450 <sup>***</sup> (0.0077)	0.3996 <sup>***</sup> (0.0834)
Milk sold per month	0.0000 (0.0000)	0.0002 (0.0005)
Access to credit	0.2404 <sup>***</sup> (0.0368)	2.1354 <sup>***</sup> (0.4283)
Access to extension	0.0596 (0.0490)	0.5263 (0.4388)
Pseudo R2	0.4874	
Chi square	159.45 <sup>***</sup>	
Correctly classified	86.44%	

\*\*\* Significant at 1%, \*\* significant at 5%. Standard errors are presented in parentheses.

Source: Survey data (2013)

The gender of the household had a positive significant effect on smallholder dairy farmers' membership in dairy cooperative at 1% level of significance. The positive significance indicates that being male

increases the probability of a farmer being a member of a dairy cooperative by 15.23%. These results indicate that women remain under-represented at the membership level in cooperatives and might be due to the asset ownership patterns as per the findings of Majurin (2008).

The household size is a good indicator of the available labour for dairy production. Household size did not have a significant effect on smallholder dairy farmers' membership in dairy cooperative. However, a closer look at the number of people, over the age of 18 years, in the sampled household who worked on the farm, revealed that there was a significant effect on smallholder membership in dairy cooperative at 1% level. If one more person in the household began working on the farm, the probability of a farmer being a member of a dairy cooperative increases by 7.68%. The household size is a good indicator of the available labour for dairy production. This indicates that cooperative members tend to assign more labour for dairy production; hence, produce more. Abate *et al.* (2013) found out that the propensity to become a member of agricultural cooperatives is high for households with large family size. Sikawa and Mugisha (2013) results indicate that the higher the number of adults in the household, the more the likely that a cooperative channel will be selected.

Herd size had positive significant effect on smallholder dairy farmers' membership in dairy cooperative at 5% level. The positive sign indicates that addition of one more cow to the smallholder farmer's herd increases the probability of a farmer being a member of a dairy cooperative by 6.04%. This is due to the need to have a more reliable and stable market for the increase in milk production (Sulastrri and Marhajan, 2002).

Distance to the nearest market had positive significant effect on smallholder dairy farmers' membership in dairy cooperative at 1% level of significance. This implies that with increase in distance to market, increases the probability of a farmer being a member of a dairy cooperative by 4.5%. This means that the further away the nearest reliable produce market is, the more likely it will be for farmers to become cooperative members in order to access a markets through the cooperative. The farmers pool their milk together and deliver it to the cooperative society thereby incurring lower transportation costs. The results are similar to the findings of Bardan *et al.* (2012) who found out that distance to market significantly and positively increased the likelihood that a milk producer will sell to a dairy cooperative.

Access to credit had positive significant effect on smallholder dairy farmers' membership in dairy cooperative at 1% level of significance. This indicates that if the farmer can access credit this increases the probability of a farmer being a member of a dairy cooperative by 24.04%. This result coincides with the finding of Alema (2008) that credit accessed through cooperatives was essential to farmers to purchase better feeds, improve housing and care for animals and better dairy breeds.

#### 4. Conclusion

Gender, age herdsizes, distance to the market and cost of transportation significantly influence the smallholder farmers decision to participate in dairy cooperatives in Embu County. Based on the findings the study recommends the need for both County and National government to enhance support to the dairy cooperatives. This includes infrastructure development, access to credit facilities.

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