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Factors Affecting the Participation of Milk Producers in Dairy Marketing Cooperatives: Evidence from Ethiopia*

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Abstract

Purpose: Dairy marketing cooperatives operate in the agricultural sector of the Ethiopian economy and are supposed to increase the efficiency of the marketing system. This paper aims to study factors affecting the participation of farm households' in dairy marketing cooperatives. **Research design, data, and methodology:** The research has focused on one primary question. What are the possible factors that affect farm households' participation in dairy marketing cooperatives? The survey questionnaire was developed and an interview was made using enumerators. A total of 1500 sample households were selected randomly using the method of sampling with probability proportionate to size. Descriptive and inferential statistical analysis (binary logit model) was used for analysis. **Results:** The study result revealed that among thirteen explanatory variables hypothesized to affect dairy producer farmers' participation in dairy marketing cooperatives; eleven were found to be statistically significant. From these findings, it is observed that members of the dairy cooperatives have significant advantage over nonmembers. **Conclusions:** Both internal and external intervention measures are suggested. Internally, the cooperatives' board of directors should design appropriate strategies to attract nonmembers to improve future participation, and, externally, government, NGOs, and other stakeholders need to emphasize methods that increase nonmembers' participation in dairy marketing cooperatives.

Keywords : Marketing System, Cooperatives, Participation, Stakeholders, Ethiopia

JEL Classification Code: M3, M31, Q13

1. Introduction

For countless years worldwide, agriculture has been the main source of livelihood for lesser developed parts of the world and provide some of the main support for the infrastructure of a significant portion of their nations. It has been the key sector providing employment opportunities for nearly 70% of the rural population and contributing the largest share to their national gross domestic product (Abegaz, 2017).

Agriculture is also the mainstay of the Ethiopian economy, which accounts for 46.6% of the total GDP; it employs 80% of the population and provides the goods for 60% of exports (Kacharo, 2016). Many other economic activities depend on agriculture, including the marketing, processing, and export of agricultural products. Agricultural production is overwhelmingly driven by a need for subsistence and a large part of commodity exports are provided by the small agricultural cash-crop sector.

The current Ethiopian agricultural policy, which advocates self-sufficiency in food, has led the Ministry of Agriculture to spearhead the intensification of activities in support of agricultural development. One concern is the overall improvement and development of the livestock sector. Livestock is a source of income, which can be used by the rural population to purchase basic needs and

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agricultural inputs. Livestock comes second to coffee in foreign exchange earnings in Ethiopia. Its contribution can equally well be assessed at the household level by its role in enhancing income, food security, and social status.

Dairy production, which is among the sector of livestock production systems, is a critical area of concern in Ethiopia where livestock and its products are important sources of food and income, and dairying has not been fully exploited and promoted in the country. For years stretching into decades, Ethiopia ranked first in cattle population in Africa, but the dairy industry is not appreciably developed even when compared to east African countries like Kenya, Uganda, and Tanzania.

Besides providing income-earning opportunities for the poor, dairy development, especially at the smallholder sector level, can improve the nutritional status of Ethiopian children by making milk available for consumption and increasing the median household income amongst this population. The existing high demand for dairy products in the country is expected to induce rapid growth in the dairy sector. Factors contributing to this high demand include the rapid population growth which is estimated at 3 percent annually, increased urbanization, and expected growth in income (Bereda, Yilma, & Nurfeta, 2014). Even though the livestock sector in general and the dairy sector in particular, have a huge potential for proliferation in several areas, it is constrained by fluctuations in quality and quantity of feed, a poor and eroding genetic resource base, substandard management practices, diseases, inferior market infrastructure, underwhelming service delivery and policy, and antiquated institutional arrangements.

In terms of solving the multifaceted dairy production and marketing problems, collective action is commonly thought to assist smallholders' engagement in markets and to contribute to improvements in rural economies. Like in many other developing countries, this perception is also largely shared amongst policy-makers in Ethiopia. The perception that collective action may contribute to boosting the Ethiopian rural economy includes marked improvements to the dairy sector. Today, in an era when many people in Africa feel powerless to change their lives, cooperatives represent a strong, vibrant, and viable economic alternative.

In Ethiopia, though, dairy marketing cooperatives are established as a means to increase the efficiency of marketing of dairy products and to meet the social, economic, and cultural needs and aspirations of people, dairy producer farmers' participation in these cooperatives is minimal. Through thorough consideration of the context of this situation, the primary research question of this article arose. The following query is the premise of the investigation: what are the possible factors that affect farm households' participation in the primary dairy marketing cooperatives? Therefore, this paper aims to identify determinants of dairy producer households' participation in the primary dairy marketing cooperatives by analyzing empirical evidence in Ethiopia. The study focused on two group of dairy producer households' (members and nonmembers) of the primary dairy marketing cooperatives.

Members of the primary dairy marketing cooperatives are those households who are engaged in dairy production and marketing activities and are supplying their milk for sale to their respective cooperatives. On the other hand, nonmembers of the primary dairy marketing cooperatives are those households who are engaged in dairy production and marketing activities but are not members of the primary dairy marketing cooperatives and are not obliged to supply their milk for sale to the nearby cooperatives. Members of the cooperatives are benefiting from all the services provided by their respective cooperatives, but nonmembers are not entitled to get the respective services.

To the best of my knowledge, there has been no adequate study conducted in Ethiopia thus far specific to farm households' participation in dairy marketing cooperatives. The few existing examples of research in related areas have used descriptive information. In this research, both descriptive and inferential statistical analyses were applied to make the findings more authentic. Therefore, this results found through this study would expand the body of the literature and strengthen some of the current hypotheses of materials related to this field. It is believed that the clear understanding of factors affecting rural households' participation in dairy marketing cooperatives have practical implications at the micro and macro level. To be specific, it will help policymakers, development practitioners, and cooperative board of directors to design appropriate policies and strategies to enhance the market participation of dairy producer farmers in dairy marketing cooperatives. Hence, the findings of this study will fill the existing knowledge gap and give a clear direction for further interventions.

2. Literature Review

Increased encouragement of farmers to participate in the market through cooperatives puts a premium on understanding farmers' commitment to cooperatives. In Sub-Saharan African countries, farmers face high transaction costs which prohibit their access to better-paying markets and worsen their poverty level (Barrett, 2008). Lack of information on prices, lack of linkages between farmers and other market actors, credit constraints, and other market imperfections lead peasants to sell their agricultural products at the farm gate to intermediaries, often at a low price, and to not take advantage of market opportunities (De Janvry & Sadoulet, 2001; Fafchamps & Hill, 2005). To address the problem of high costs in the agricultural

exchanges, there have been several suggested strategies, among which the formation of farmer organizations for collective action is. Farmer cooperatives have been promoted as an efficient mechanism for increasing market access and reducing poverty (Birchall, 2003).

Cooperatives play a significant role in ensuring a sustainable supply of raw milk to the dairy industry by coordinating the flow of milk from their members and assisting them by supplying the required dairy farm inputs. According to a study conducted by Emana (2009), there are 180 primary cooperatives engaged in milk production and marketing operating in different parts of Ethiopia. However, this number makes up only 0.74 percent of the total number of agricultural and non-agricultural cooperatives (24, 167) and 2 percent of agricultural-based cooperatives (8, 985) in the country. From this particular study, it is shown that the number of primary dairy marketing cooperatives is much lower than other types of cooperatives in the country.

An agricultural marketing cooperative is an association of farmers who voluntarily cooperate to pool their production for sale. That pooled production is marketed and distributed through the cooperatives which is owned and controlled by the farmers themselves. Around the world, farmers are increasingly being encouraged to join marketing cooperatives, and cooperatives hold a significant market share in agricultural product distribution from farms to final consumers (Deller, Hoyt, Hueth, & Sundaram-Stukel, 2009). For example, according to a publication by the International Labour Office, more than 50% of global agricultural output is marketed through cooperatives in Finland, Italy, and the Netherlands. The rationale is that marketing cooperatives allow small farmers to get better and often more secure prices by overcoming the "powerful" oligopsonist Investor-owned firms (IOFs) (Sexton, 1990). With marketing cooperatives, farmers hold a much better position for price negotiation (Cook, 1995); (Cakir & Balagtas, 2012) and can have access to markets that they cannot access individually (Camanzi, Malorgio, & Azcárate, 2011). Cooperatives also enable farmers to face uncertainty about agricultural market prices (Jang & Klein, 2011; Klein, Richards, & Walburger, 1997).

Several studies have been carried out particularly in Eastern and Northern Africa to understand milk market participation and volume of supply to markets (Demissie, Komicha, & Kedir, 2014; Balirwa, Nalunkuuma, & Sserunkuuma, 2016). These studies pointed out specific important socio-economic variables that are relevant in facilitating the development of interventions to improve market participation and productivity, which ultimately leads to increases the volume of milk sales from smallholder dairy producers.

In recent years, the fast-expanding trend of cooperatives in Ethiopia has been examined, only by limited studies, some of which have found that there is un-sustainability of cooperatives in the long run. In this regard, some studies indicated that the undifferentiated services of cooperatives to members and non-members, low participation of members, and a long hand of government on the development of cooperatives, have caused great reasons for concern regarding the autonomous existence of cooperatives in the long run in the case that the government halts its support (Bernard & Spielman, 2009).

A study conducted by Benson (2014), in Ethiopia, stipulated that, although cooperatives are considered as an appropriate tool of rural development, they are facing critical challenges, which hinder them from taking on an overall positive role. Some of the challenges indicated in the study are created by the following: low institutional capacity, inadequate qualified personnel, low entrepreneurship skill, lack of financial resources, lack of market information, poor members' participation in the different activities such as financing the cooperative, patronizing the business activities of the cooperatives, and control of the overall activities of the cooperatives' board of directors.

3. Methodology

3.1. Methods of Data Collection

To generate information at the household level, a household-level survey was undertaken using a semi-structured interview. Before conducting the interview, a pre-test of the interview schedule was completed and accordingly, the revision was made and finalized. The data used for this study were collected in 2019 for three consecutive months with the help of professional enumerators.

3.2. Sampling

Among 180 primary dairy marketing cooperatives found in the country, 10 cooperatives (4 from Oromia, 3 from Amhara, 2 from Southern and 1 from Tigray) regions were selected. The respective cooperatives were selected in line with the total amount of dairy cooperatives found in each region, their performance in dairy marketing activities and the level of members' participation in the respective cooperatives.

In the peasant associations of these areas, both cooperatives member and nonmember dairy producer farmers were used as samples. Since the two groups are from the same peasant associations, other factors were assumed to be homogeneous except for being members/ nonmembers of the dairy marketing cooperatives. Using the formula

illustrated by Israel (2013); (Moroda et al., 2018), the sample size was calculated, which resulted in a total of 1500 sample households (1220 households from nonmembers and 280 households from members).

3.3. Data Analysis

To identify factors affecting the participation of households in dairy marketing cooperatives, an econometric model called the logit model was used. This model was selected due to the binary nature of the dependent variable which is the households' participation in dairy marketing cooperatives. This was given a value of 1 for members or participants of the respective cooperatives and 0 for non-participants/ nonmembers of the dairy marketing cooperatives. The functional form of the logit model is specified as follows (Gujarati, 2009).

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + U_i$$

$ß_0$ is an intercept
$ß_1$, $ß_2$ ------ $ß_n$ are slopes of the equation in the model
Xi = is vector of relevant household characteristics.
U_i = disturbance term

3.4. Description of Explanatory Variables

The farmers' decision to join cooperatives may be conditioned by several demographic, socioeconomic, and physical characteristics of the households. Based on pre-existing theories, reviewing previous empirical literature, and the researcher's observation and practical experience the following proxy variables that may have affected the propensity of dairy producer farmers to join primary dairy marketing cooperatives were hypothesized. In this study, there are 13 independent variables that are hypothesized to affect the dependent variable (households' participation in dairy marketing cooperatives). Table 1 shows the list of independent variables, variable type, and the expected sign.

Education (EDU): In this study, the education of the household head is a dummy variable taking a value of 1, if the household head has formal education. This was given a value of 0 otherwise. Education and training are important menses to change the knowledge and attitude of dairy producer farmers to join cooperatives. According to Ortmann and King (2007), the higher the education level, the better the knowledge of the farmer would be towards the cooperative and the easier it would be for the individual to acquire news and education about the benefits of the cooperative easily. An absence of training and experience sharing discourages peoples' interest in joining cooperatives (Van der Walt, 2005). As expressed in the main ideas of these pieces of literature, educated or well-trained farmers are in a better position to know the benefit of cooperatives and are more likely to participate in cooperative activities. In line with that, the researcher proposed the following:

H1: The education level of a dairy producer farmer will affect his/her participation in dairy marketing cooperatives positively.

Table 1: Hypothesized Independent Variables

No.	Hypothesized Independent Variables	Variable Type	Expected Sign
1	Educational status (H1)	Dummy	+
2	Family size (H2)	Continuous	-
3	Off-farm income (H3)	Dummy	+
4	Total Livestock holdings (H4)	Continuous	+
5	Access to Credit (H5)	Dummy	+
6	Dairy cows' holdings (H6)	Continuous	+
7	Labor availability (H7)	Continuous	+
8	Perception on the performance of cooperatives (H8)	Dummy	+
9	Perception on the purchasing price of milk by the cooperatives (H9)	Dummy	+
10	Distance of the cooperatives milk collection centers (H10)	Continuous	-
11	Availability of other marketing agents (H11)	Dummy	-
12	Availability of other services (H12)	Dummy	+
13	Access to extension services (H13)	Dummy	+

Family Size (FAMILY SIZE): In this study, family size is a continuous variable, which shows the total family members in the household. According to Bernard, Taffesse, and Gebre-Madhin (2008), Mojo, Degefa and Fischer (2017), and Abebaw and Haile (2013) family size has no effect on the likelihood of farmers' decision to participate in cooperative affairs, but other studies confirmed that having a large number of family size has a negative effect on households' participation in dairy marketing cooperatives (Abate, Francesconi, & Getnet, 2014). For this particular study, it is assumed that households with large family size consume more of what is produced in the house and little will remain to be marketed. With this justification in mind, the researcher proposed the following:

H2: Family size has a negative influence on households' participation in dairy marketing cooperatives.

Off-farm Income (OFARM): In Africa, various studies have shown that most rural households are involved in agricultural activities as their main source of livelihood. However, they also engage in other income-generating activities to augment the main source of income (Adepoju & Obayelu, 2013). However, Nasir (2014), stated that households are pushed into the off-farm sector due to lack of opportunities but off-farm activities contribute more to household income (Haggblade, Hazell, & Brown, 1989; De Janvry & Sadoulet, 2001; Ruben, 2001). Off-farm refers to all income-generating activities except crop and livestock production. In this study, dairy producer farmers' participation in off-farm/non-farm activity is a dummy variable that is assigned a value of 1 if the farm household members participate in off-farm activities and 0 otherwise. Farmers who are involved in off-farm activities will have a better opportunity to generate income, and hence better financial resources to invest in the purchase of dairy animals and other dairy inputs, which ultimately improve their participation in dairy marketing cooperatives. Therefore, in this study, it is hypothesized that:

H3: Off-farm income and participation in dairy marketing cooperatives are positively related.

Total Livestock Holdings (LIVESTOCK): In this study, total livestock holding is a continuous variable that shows the total number of livestock available in the household. The vast majority of poor households in developing countries live in rural areas and heavily rely on agriculture for their livelihoods. Households with different levels of income have incentives to keep livestock because of the wide spectrum of benefits these provide, such as cash income, food, manure, draft power and hauling services, savings and insurance, and social status and social capital. It is hypothesized that those households that own a larger number of herd animals are economically better off than those with a smaller number of livestock. Farmers with larger herd sizes are assumed to have more cash to invest in buying supplementary feed and other dairy inputs. Based on that, it is hypothesized that:

H4: Dairy producer farmers with a better herd size will participate in dairy marketing cooperatives positively.

Access to Credit (CREDIT): In this study, access to credit is a dummy variable taking a value of 1, if the household has access to credit. Otherwise, this value is assigned as 0. Small-scale farmers do not have easy access to financial credit for buying inputs to increase their productivity (Kefa, Ng'ang'a, Ogada, Omboto, Kubowon, Cherotwo, & Muiruri, 2012). Having financial shortages is one of the main reasons for the formation and promotion of cooperative societies. Participation in dairy marketing cooperatives requires a considerable amount of capital for the purchase of improved cross-breed cows and other dairy inputs. However, smallholder farmers cannot finance these inputs, if they have no access to credit. On the other hand, the availability of farm credit, especially from cooperatives and other formal sources, becomes a vital component for their participation. Hence in this study, the researcher proposed that:

H5: Access to credit and participation in dairy marketing cooperatives are positively related.

Dairy Cows Holdings (DAIRY COW): Cooperatives play a significant role in ensuring a sustainable supply of raw milk to the dairy industry by coordinating the flow of milk from their members and assisting them by supplying the required dairy farm inputs (Misganaw, Hailemariam, Mamo, Tajebe, Seare, & Nigussie, 2017). To participate in dairy marketing cooperatives, households should supply milk for sale to their respective cooperatives; to do so they should have productive dairy cows. In this study, the number of productive dairy cows holding is a continuous independent variable indicating the number of dairy cows that a household has. Households with productive dairy cows can supply milk to the dairy marketing cooperatives for sale. Hence, the researcher proposed that:

H6: Participation in dairy marketing cooperatives and productive dairy cow holdings are positively related.

Labor Availability (LABOR): Labor is an essential household resource in most African livestock production systems. The amount of household labor available (by age and sex) and how that labor is allocated between critical

farm and non-farm tasks will directly influence the size and structure of the livestock enterprise, management techniques, management performance, and levels of marketed and non-marketed offtake (Tittonell, 2014). In this study, labor availability in the household is considered as a continuous variable indicating total productive labor available in the household. The availability of economically active labor in the family is expected to undertake all dairy-related activities effectively. In line with that, the researcher proposed:

H7: Availability of productive labor in the household and participation in dairy marketing cooperatives are positively related.

Perception on the Performance of Cooperatives (PERC): Households who perceive that participating in the cooperative organization can solve their economic, social, and cultural problems will participate in these organizations. Cooperative members express high commitment to their cooperatives when they perceive the cooperative acting as their effective agent (Fulton & King, 1993; Fulton & Giannakas, 2001). In this study, perception on the cooperative organization is a dummy variable that takes a value of 1 if the household perceives participating in cooperative organizations has benefit and is given a value of 0 otherwise. In line with that, the researcher proposed:

H8: Dairy producer farmers' perception on the current and future performances of the dairy cooperatives will positively affect their participation.

Perception on the Purchasing Price of Milk by the Cooperatives (COOPPM): Price is a very important factor in the farmers' decisions to join cooperatives. Some farmers might choose their organization on the best price basis. Thus, if cooperatives often offer the best price, these people will likely decide to become members. Still, farmers may prefer to weigh prices and some specific attributes of the alternative organizations in making their final decisions. Preferring cooperatives rather than alternative choices supposes some preference for the cooperatives' attributes which differentiate them from their competitors. The respondents' perceptions of the purchasing price of milk by the dairy cooperatives are proposed to be one of the determinant factors for their participation. This variable is assigned a value of 1 if the household believes that the competitive price of milk per liter is given by the cooperatives and 0 otherwise. Hence in this study, the researcher proposed the following:

H9: The level of the dairy producer farmers' participation and the competitive purchasing price given by the cooperatives are positively related.

Distance of the Cooperatives' Milk Collection Centers (DISTANCE): In this study, the distance to the cooperative milk collection centers is a continuous independent variable, which shows the average distance (in kilometers) a household travels to get the closest milk collection centers. The strategic location of the cooperative, especially towards the main market, roads, and other services also matters in recruiting more members and in having more success. According to Bhuyan (2000), the principal reasons for not joining a cooperative are that it is in an inadequate location, the production of the cooperatives is underperforming, and a lack of member loyalty. When the proximity of the cooperative milk collection center to the farmer's house is relatively close, it reduces the cost of time and labor that the farmer spends in searching for a buyer for their milk. The other advantage is that as farmers are closer to the cooperative, they will have more knowledge about the cooperative and its benefits (Bishop & McConnen, 1999). Hence in this study, the researcher proposed that:

H10: Distance of the cooperatives milk collection centers from the farmers' house is expected to influence the marketing of milk through cooperatives negatively.

Availability of Other Marketing Agents (AOMKAG): Farmers' will get an alternative market outlet to sell their milk if there are other marketing agents in their area. Cooperatives face market competition if there are other marketing agents in the area of the farmer providing similar services as them (Bishop & McConnen, 1999). Availability of other marketing agents is a dummy variable taking a value 1, if there are other milk collectors in the area of the farmer at a distance less than the cooperative. This value is given a 0 otherwise. Hence, in this study, the researcher proposed that:

H11: The availability of other marketing agents is expected to influence the participation of farmers in dairy marketing cooperatives negatively.

Availability of Other Services (AOS): It is believed that, access to a variety of business services such as research, financial, management, inputs, or other forms of technical support is vital to the viability of cooperatives. However, in Ethiopia, dairy farmers are constrained with access to inputs and credit services. In this research, availability of other services is a dummy variable taking a value of 1, if the farmers get other services/dairy inputs from the cooperative besides getting milk marketing services, 0 otherwise. Farmers' usage and connection with the cooperative increases if they are beneficiary from different services it extends (Wilkins & Stafford, 1982; Black & Knutson, 1984; Misra, Carley, & Fletcher, 1993; Fulton & Adamowicz,

1993; Klein, Richards, & Walburger, 1997). In line with that, the researcher proposed:

H12: Availability of other services and households' participation in dairy marketing cooperatives are positively related.

Access to Extension Services (EXSERV): In this study, it is hypothesized that, by getting frequent extension advisory services through multipurpose agricultural cooperatives, members can get better knowledge regarding better production, management, and marketing. This variable is a dummy variable, which shows farm households' accessibility to extension services. It takes the value of 1 if the farmer has access to extension service, 0, otherwise. Getting extension service improves a household's intellectual capital, which improves dairy production and diverts product resources to market. Studies have shown that getting extension services and visits by extension agents improve participation and volume decision of dairy sale (Holloway, 2000). Hence in this study, the researcher proposed that:

H13: Access to extension services and participation in dairy marketing cooperatives are positively related.

4. Findings

4.1. Descriptive Analysis

4.1.1. Description of Continuous Explanatory Variables

The average family size of the sample households was 6.38 people, by which the average family size of the sample cooperative members was 5.78 people. The corresponding figure for the non-members of the cooperative was 6.98 people. The observed difference in family size between cooperative members and non-members groups was statistically significant at the 10% probability level. The average livestock holdings for members of the cooperatives was 3.92, while the corresponding figure for non-members of the cooperatives was 1.9. Based on the research results, there is a significant mean difference between members and non-members in their livestock holding (at less than 5% probability level); members of the cooperatives are in a better position in their livestock holdings.

The average dairy cow holdings for the sample households was 1.41. On the other hand, the corresponding figures for members and non-members of the cooperative were 2.12 and 0.69 respectively. The result shows that there is a significant mean difference among the two groups at less than 1 % probability level. Most of the sampled dairy producer farmers have to walk a long distance from home to the cooperative milk collection centers to sell their milk. The average distance from home to the milk collection centers for members of the cooperatives was found to be 3.5 km while that of non-members was 5.78 km. About 28.46% of the sample respondents had to travel more than 10 km to reach the nearest cooperative milk collection centers, by which all of them are found to be non-members of the dairy cooperatives.

The independent sample t-test result indicated that the mean difference between members and non-members of the dairy cooperatives in terms of distance of the cooperatives' milk collection centers from their home was significant at less than 1% probability level. The average number of productive labors for members of the cooperatives was 3, while that of the non-members was 2. The independent sample t-test result indicated that the mean difference in labor availability among members and non-members was significant at less than 5% probability level. Table 2 below shows the summary result.

4.1.2. Description of Discrete Explanatory Variables

Descriptive results of dummy explanatory variables revealed that access to credit, off-farm income, availability of other services, and access to agricultural extension services are showing significant differences among members and non-members groups at a 1% probability level. Education level and perception on cooperatives milk purchasing price are also showing a significant difference between the two groups at 5% probability level. Moreover, the availability of other marketing agents shows a significant difference between the two groups at a 10% probability level. On the contrary, perception on cooperatives organizations didn't show a significant difference among the two groups (Table 3 shows the result)

Table 2: Summary of Means of Continuous Variables

Variables	Total Sample (n=1500)		Members (n=280)		Non-members (n=1220)		T-Value
	Mean	St.Dv.	Mean	St.Dv.	Mean	St.Dv.	
Family Size	6.38	2.28	5.78	2.39	6.98	2.17	1.974*
Livestock holdings	2.91	1.97	3.92	1.99	1.9	1.88	2.184**
Dairy cow holdings	1.41	0.76	2.12	1.40	0.69	0.11	3.954***
Distance from market centers	4.64	1.97	3.5	1.92	5.78	2.01	3.193***
Labor availability	2.5	1.94	3.0	1.96	2.0	1.91	2.141**

Table 3: Proportion of Sample Households with Value 1 for Dummy Variables (%)

Variables	Score	Members (n=280)		Non-members (n=1220)		Total Sample (N=1500)		Chi-Square
		No.	%	No.	%	No	%	
Access to Credit	1 (have access to credit)	200	71.43	380	31.15	580	38.67	6.878***
	0 (no access to credit)	80	28.57	840	68.85	920	61.33	
Off-farm income	1 (have off-farm income)	193	68.93	516	42.3	709	47.27	6.728***
	0 (no off-farm income)	87	31.07	704	57.7	791	52.73	
Availability of other services	1 (yes)	140	50	305	25	445	29.67	8.438***
	0 (no)	140	50	915	75	1055	70.33	
Access to agricultural extension services	1 (yes)	189	67.5	590	48.36	779	51.93	6.828***
	0 (no)	91	32.5	630	51.64	721	48.07	
Education	1 (educated)	175	62.5	610	50	785	52.33	5.481**
	0 (uneducated)	105	37.5	610	50	715	47.67	
Perception on cooperatives milk purchasing price	1 (perceived competitive price)	167	59.64	583	47.79	750	50	5.211**
	0 (not perceived competitive price)	113	40.36	637	52.21	750	50	
Availability of other marketing agents	1 (yes)	35	12.5	66	5.41	101	6.73	7.185*
	0 (no)	245	87.5	1154	94.59	1399	93.27	
Perception on cooperative organizations	1 (good perception of cooperatives)	263	93.93	1119	91.72	1382	92.13	0.03ns
	0 (bad perception of cooperatives)	17	6.07	101	8.28	118	7.87	

4.2. Econometric Result

Before transferring each independent variable to the logistic regression model, the multicollinearity test was checked. This was checked using the Variance Inflation Factor (VIF) and correlation coefficients. The VIF, correlation coefficients, and the maximum likelihood estimates of the binomial logit model results are indicated in Table 4, 5, and 6 respectively.

Table 4: Variable Inflation Factor for Continuous Explanatory Variables

Variables	Tolerance (R^2_i)	Variance Inflation Factors (VIF)
Educational status	0.788	1.268
Family Size	0.742	1.347
Total Livestock Holding	0.698	6.432
Number of Dairy Cows Holding	0.715	6.398
Labor Availability	0.624	1.603
Distance of the Cooperatives	0.869	1.151

Table 5: Correlation Coefficients for Dummy Explanatory Variables

	OFARM	CREDIT	PERC	COOPPM	OMKAG	EXSERV	AOS
OFARM	1	0.160	0.084	0.117	0.129	0.152	0.116
CREDIT		1	0.091	0.266	0.058	0.304	0.256
PERC			1	0.285	0.103	0.326	0.321
COOPPM				1	0.027	0.250	0.029
OMKAG					1	0.175	0.165
EXSERV						1	0.308
AOS							1

Table 6: The Maximum Likelihood Estimates of the Binomial Logit Model

HH Participation (Dependent Variable)	Estimated Coefficient	Wald Statistics	Sig. Level	Odds Ratio
Education	1.795	4.499	0.034**	0.047
Family size	-0.509	2.804	0.094*	0.064
Off-farm income	1.635	3.630	0.057*	0.029
Total livestock	0.148	4.400	0.036**	0.159
Credit	2.036	3.351	0.067*	0.061
Dairy cows holdings	2.850	12.713	0.001***	0.305
Labor	0.335	4.596	0.032**	0.198
Perception on Cooperatives	1.588	4.592	0.032**	0.196
Cooperatives price of milk	0.038	0.029	0.866	1.039
Distance from cooperatives	-0.435	8.358	0.004***	0.047
Other marketing agents	-0.356	0.277	0.599	0.700
Other services	2.950	12.913	0.000***	0.404
Extension services	1.792	4.466	0.032**	0.381
Constant	-5.570	12.913	0.000	0.004

5. Discussion

According to the final logit model result of this study, dairy cow holdings and availability of other dairy-related services were found statistically significant at a 1% probability level; which shows that having dairy cows and getting additional dairy production-related services and technological improvements through the dairy cooperatives are important sources of input to determine the households' degrees of participation in dairy marketing cooperatives. *Hence H6 and H12 are supported.* Distance of the cooperatives' milk collection centers from the farmers' house was found to negatively and significantly influence households' participation in dairy marketing cooperatives at 1% probability level; which depicted that the more the distance of the cooperatives milk collection centers, the less the dairy producer farmers participation in the respective cooperatives. *Hence H10 is supported.*

Access to formal education, total livestock holdings, labor availability, perception on the performance of cooperatives, and access to agricultural extension services were found to be statistically significant at less than 5% probability level with expected sign. As a result, education, having more livestock, availability of productive labor in the households, having positive perception on the performance of cooperatives in dairy marketing activities, and getting agricultural extension services have their own significant contributions for households' participation in dairy marketing cooperatives. *Hence H1, H4, H7, H8, and H13 are supported.* Other similar studies also confirmed our findings (Bernard & Spielman, 2009; Abate et al., 2014); which reported a positive association between educational status and cooperatives' membership numbers. Moreover, (Abafita & Kim, 2014; T. Tefera & Tefera, 2014), reported a positive association between participation in rural development institutions and access to agricultural extension services.

Off-farm income and credit were found statistically significant at less than 10% probability level with the expected sign; which shows that getting off-farm income and having access to credit for dairy business have significant implications for households' participation in dairy marketing cooperatives. *Hence H3 and H5 are also supported.* Additionally, family size, which is measured in the number of household members, was found to significantly influence households' participation in dairy marketing cooperatives at less than 10% probability level in a negative way. This shows that the more family members are in the households', the less they participate in dairy marketing cooperatives. *Hence H2 is also supported.*

On the contrary the two independent variables, which were 1) Perception on the purchasing price of milk by the cooperatives (H9) and 2) Availability of other marketing agents (H11) were found to be insignificant, which is contradictory to the hypotheses. Respondents' perception of the purchasing price of milk by the primary dairy cooperatives is proposed as one of the determinant factors for their participation and it was proposed that dairy producer farmers' participation and competitive purchasing price given by the cooperatives are positively related. The statistically analyzed result shows that there is no positive relation between the cooperatives' milk purchasing prices and the price perceptions they have. Moreover, it was hypothesized that, availability of other marketing agents is expected to influence the participation of farmers in dairy marketing cooperatives negatively. However, as expected, this variable is not significant, showing that the availability of other marketing agents is not considered as the factor that might hinder dairy producer households' from becoming members of the primary dairy marketing cooperatives.

6. Conclusion

Cooperatives in general and dairy marketing cooperatives, in particular, can improve or facilitate access to market information, reduce costs of marketing, and can increase producers' access to technology, extension, and related services. This study aimed at investigating the possible factors that affect dairy producers' farmers' participation in dairy marketing cooperatives focusing on sample dairy producer farmers in Ethiopia.

Descriptive results of continuous variables carried out to examine differences among members and non-members of the primary dairy marketing cooperatives revealed that the former has lower family size, better number of livestock and dairy cows, higher number of productive labors, and travel lower distance to sell milk than the latter group. From this result, one can understand that members of the dairy marketing cooperatives benefit from numerous advantages when compared to non-members. Hence, the board of directors of the respective cooperatives and all concerned development organizations should give proper attention to target nonmembers of the dairy marketing cooperatives to allow them to get equal advantages as the members and empower them to enroll in cooperative organizations. Some of the ways to attract nonmembers could be through the following strategies: the provision of training, providing advisory services, arranging visit programs to show successful members of the cooperatives, and establishing milk collection centers closer to non-members.

Descriptive results for dummy explanatory variables that affect households' participation in dairy marketing cooperatives also showed that there is a statistically significant difference between members and nonmembers regarding the following: access to credit, off-farm income, availability of other services, access to agricultural extension services, education, perception on the cooperatives milk purchasing price, and availability of other marketing agents. This result shows that members of the dairy marketing cooperatives have better access to credit, have a better off-farm income, get many other services from their cooperatives, have better access to agricultural extension services, and are better in their educational level. In this regard, all concerned rural development actors should give more attention to nonmember dairy producer farm households. To do so, the respective board of directors of the cooperatives should design appropriate mechanisms to attract nonmember dairy producer farmers to enroll cooperatives voluntarily.

The econometric analysis was carried out to empirically examine the possible factors that significantly affect households' participation in dairy marketing cooperatives, after controlling the influence of other confounding variables. The model results revealed that among thirteen explanatory variables hypothesized to affect dairy producer farmers' participation in dairy marketing cooperatives; eleven were found to be statistically significant. More specifically, these variables include education level, total livestock holdings, number of dairy cow holdings, labor availability, participation in off-farm activities, credit, perception on cooperative organizations, availability of other services, access to extension services, family size, and distance of the cooperative milk collection centers from the farmers' houses.

The empirical results of this study clearly showed that dairy producer farmers' participation in dairy marketing cooperatives increases, if the cooperative provides them with different dairy-related services such as the provision of Artificial Insemination (AI) service, fodder seed supply, concentrate feed supply, veterinary services, and other benefits. Hence, the provision of different dairy-related services and benefits by the dairy marketing cooperatives will motivate the participation of dairy producer farmers to become actively involved as members of the dairy marketing cooperatives. To this end, the board of directors of the respective cooperatives should design appropriate strategies and apply organizational innovation techniques, to transform their cooperatives socially and economically by increasing the number of members.

The empirical results of this study demonstrate that access to credit and the number of productive dairy cows holding are positively and significantly related to the participation of dairy producer farmers in dairy marketing cooperatives. One way of extending productive/crossbred dairy cows among farm households' is through the distribution of crossbred heifers. As reported by the majority of sample households, crossbred heifers or cows are expensive in the study area, and this cost is way beyond the financial capacity of many farm households. On the other hand, the existing agricultural credit system that focuses on short-term credit which has never targeted the dairy sector. The provision of medium and long-term credit, especially from formal sources directed to the promotion of dairy development, would, therefore, is a vital step to improve the sector. Moreover, strengthening and promoting dairy-based secondary cooperatives (unions) could also be one of the solutions for the effective provision of credit to members of the primary dairy marketing cooperatives.

As indicated in the result of this study, the increased distance between farmers' residences and the cooperatives' milk collection centers has a negative influence on the participation of households in dairy marketing cooperatives. The establishment of additional fixed and satellite milk collection centers and improvement of marketing infrastructure should receive due attention by the

cooperatives and other concerned governmental and non-governmental bodies, to further enhance the participation of many dairy producer farmers in cooperative enterprises.

The study results also revealed that extension contact significantly affects the participation of dairy producer farmers in dairy marketing cooperatives. Hence, the extension service should be further strengthened to change the current livestock production and marketing system of dairy producer farmers through a cooperative's structure.

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