

Determinants of Dairy Product Market Participation of the Rural Households' The Case of Adaberga District in West Shewa Zone of Oromia National Regional State, Ethiopia

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Abstract

Ethiopia is believed to have the largest Livestock population in Africa. Dairy has been identified as a priority area for the Ethiopian government, which aims to increase Ethiopian milk production at an average annual growth rate of 15.5% during the GTP II period (2015-2020), from 5,304 million liters to 9,418 million liters. This study was carried out to assess determinants of dairy product market participation of the rural households in the case of Adaberga district in West Shewa zone of Oromia national regional state, Ethiopia. The study took a random sample of 120 dairy producer households by using multi-stage sampling procedure and employing a probability proportional to sample size sampling technique. For the individual producer, the decision to participate or not to participate in dairy production was formulated as binary choice probit model to identify factors that determine dairy product market participation. Probit estimation showed that dairy product market participation decision was significantly and positively affected by age, education level, land ownership, adopting dairy technology and access to market information of households. The implication is that there was a requirement of the above mentioned elements which in turn increases level of dairy production highly. Therefore, local government should introduce integrated dairy sector into the area as well as enhances quality and standard control market information.

Keywords: Adaberga; Probit model; Dairy production

Introduction

Agriculture is the mainstay of the Ethiopian economy and its contributions to the economy of the country accounts 72.7% employment and 36.2% to the country's GDP (CIA, 2017) [1]. From the agricultural sector, livestock is an integral part of the agriculture and the contribution of live animals and their products to the agricultural economy accounts 40%, excluding the values of draught power, manure and transportation [2]. In other sources according to Behanke and Metaferia, the sub-sector accounts nearly 47% of total agricultural GDP.

Ethiopia is believed to have the largest Livestock population in Africa. The total livestock population estimated to be about 59.9 million cattle, 30.20 million goats, 30.70 million sheep, 2.16 million horses, 8.44 million donkeys, 0.41 million mules and 1.21 million camels. Of the total population about 11.83 million are milking cows, 1.26 million goats are kept for milk and 23.15 percent of camels are kept for milk production (CSA, 2017) [3]. From the same source in the given year the total milk production from cow and camel is about 3.1 billion, 179.66 million liters respectively.

According to CSA [4], about 11.4 million households are involved in livestock production in Ethiopia. Livestock plays a significant role in generating income for 80 % of rural smallholder households, and livestock products and by-products meeting domestic consumption meat, milk, eggs, cheese, and butter are animal protein that contributes to the improvement of the nutritional status of the people. Livestock productions has key role in providing export commodities, such as live animals, hides and skins to earn foreign exchanges to the country (LMP, 2015).

Dairy has been identified as a priority area for the Ethiopian government, which aims to increase Ethiopian milk production at an average annual growth rate of 15.5% during the GTP II period (2015-2020), from 5,304 million liters to 9,418 million liters. The government is actively encouraging the private sector to produce milk and is making

supporting investments in supply-chain infrastructure, training, improved breeds, and dairy-focused agricultural commercialization clusters. Agricultural commercialization clusters that support commercialization of smallholder farmers in dairy have been identified in all four major regions (Tigray, Amhara, Oromia, and SNNP), and the government is particularly prioritizing genetic improvement through selecting premium indigenous breeds and introduction of exotic breeds (GTP, 2016).

Oromia region is characterized by diversified agro-climatic zones, topography, agricultural potential and natural resources endowment. The region is contributing for 63% of the national volume of export of agriculture and share about 54% of grain production and 44.62% of livestock production from the country (CSA, 2014) [5]. West and South-West Shewa in the Oromia region has high market potential because of access to nearby places like Addis Ababa. Forage production conditions are good, by-products are available, artificial insemination and veterinary services are of moderate quality compared to the other milk sheds. Ambo-Woliso milk sheds are the main sourcing for most dairy processing companies and commercial dairy farms that are members of Addis Ababa chamber of commerce & sectorial associations and the most developed milk which target Addis Ababa market (TAP, 2016) [6].

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Adda Berga one of district in West Shewa which has topography with vast grazing areas, some marshy land, and rich fresh water supply from its many rivers. The district has diversified type of vegetables, crops and livestock. Livestock play important role in the economic and social well-being of the population. In spite of the greater ecological and economic value of livestock milk production is low compared to the number of milking cows. The potential for production and growing demand for dairy, marketing is characterized by weak institutional support, inadequate infrastructure and dairy commodity value chain development not significantly contributing to benefits smallholder farmer.

Milk and milk products are high value agricultural commodities and required special handling, or processed in one or more prior to reaching the end market. These products tend to be significantly more labour intensive than cereal crops. Value chain is essential for those commodities to coordinate and effective transactions, allow small producers to access to the quality services, information, value addition and increase long term benefits from participation in market. In the study area different traders/actors are involved in marketing of produced milk and milk product along different value chain. Therefore, analysis of value chain of milk and milk product of the study area is found to be important and aimed do the value chain analysis.

Ethiopia is characterized by rapid population growth in general; the demand for dairy products is increasing as ever and the country has close proximity to large regional consumers of milk such as Sudan and Kenya, as well as to the Middle East markets. Only 2% of milk is processed commercially in Ethiopia; 98% of production is driven by smallholders and about 95 million people are limited access to fresh dairy due to poor supply-chain infrastructure. As consequence, the country spends approximately \$10 million annually in foreign powdered milk imports (ATA and USAID, 2016) [7].

According to Berhanu et al. [8], current contributions of the livestock subsector to the economy both at the macro or micro level is below potential. The levels of foreign exchange earnings from livestock and livestock products are much lower than would be expected, relation to given size of the livestock population. Currently, different challenges are facing Ethiopian dairy sector predominantly, dairy value chain and dairy production is at its infant stage and highly constrained by inadequate feeding both in quality and quantity, shortage of breeding bull, poor veterinary services, unavailability of improved genotypes and poor genetic make-up [9].

The other problems are the actors along dairy value chain have weak cooperation, inadequate milk value addition, information on price, weaken bargaining power, traders have no license and the major dairy processing system traditional [10]. Milk and butter marketing system is traditional and under developed, fragmented and inefficient [11,12].

Lemma et al. and Yilma et al. [13] reported weak linkages among the different actors in the dairy value chain as some of the important factors that contribute to the poor development of Ethiopia's dairy sector. Dairy marketing highly influenced by distance, demand of buyer for fresh milk and technology to supply fresh milk long distance without perishing and also limit the outlet choice decision TAP [6]. Bedelu seasonal fluctuation in marketing and market inefficiency in camel and cow milk associated with inadequate marketing link and processing technology due to perishable nature of the milk which limit the market participation of producer.

Despite the contribution of livestock to the economy and to

smallholders' livelihood, most livestock production systems in Ethiopia are not adequately market oriented. Livestock in either the highlands or lowlands are not kept for commercial purposes. The primary reason for selling an animal is to generate income to meet unforeseen expenses. Milk also season contribution, and few markets oriented. However, 98% of all milk marketed in Ethiopia is through the informal market channels.

The study district has milk production potential and huge demand in the city like Addis Ababa, Holeta and Ambo. However, fluid milk market is not well established which could be either because of the absence of the culture or distance to market for the remote smallholder farmer. The majority of smallholders not participate competitively in the market and they are excluded from important growth opportunities. Milk produced is consumed at home and processed into traditionally butter and cheese (ayib).

The study on dairy market chain and value chain analysis conducted in different parts of country [12,14-16] and few researches were conducted in the West and North Shewa zone on dairy related issue [9,17]. However, no study has been conducted in Ada'a Barga where there is high potential for dairy. Therefore, the objective of this study was to identify factors affecting dairy, butter, market participation of the rural households in the Case of Adaberga District in West Shewa Zone of Oromia National Regional State, Ethiopia.

Research Methods

Descriptive of the study area

The study was conducted in Ada'a Barga District of West Shewa zone of Oromia Region, Ethiopia which is 64 km far away from Addis Ababa. Adda Berga is bordered on the South by Walmara, on the Southwest by Ejerie, on the West by Meta Robi, and on the North and East by the Muger River. The District has 34 kebeles and three towns include Enchini, Muger and Reji. The total estimated human population of the district is about 146,920 among male 73,192 and female 73,728 (CSA, 2014) [5]. The inhabitants are practiced Orthodox Christianity, protestant, Wakefeta and Muslim religions. Temperature ranges from 16-27.5°C and rainfall from 880-1200 mm [18]. The district has three agro-climatic condition Dega, woina dega and Kola.

Sampling procedures and sample size

Out of the 18 District found in West Showa Zone, Adeberga District was selected based on their dairy production potential and high demand of the product. A multi-stage technique was used to draw an appropriate sample. In the first stage, among 29 rural kebele administrations (RKAs) found in the District 8 kebeles were selected based on their potential of dairy production and market access. Finally by using simple random sampling technique 3 RKAs (Ulagora, mughermokoda andmarucobot) are selected. In the second stage, list of households involved in dairy production was obtained from District Livestock Development and Livestock Health Office as well as RKAs. Thirdly, at survey time 2,315 households involved in dairy production were identified from the list they belong in each RKAs. Finally, among several approaches to determine the sample size, Yamane is used and totals of 120 sample producers are selected for interview [19].

Model specification

For the individual producer, the decision to participate or not to participate in dairy production will be formulated as binary choice model that could analyze using the probit equation below.

The empirical specification of the probit model to be estimated by maximum likelihood estimation will be defined as participation equation or binary probit equation:

The participation/the binary probit model is specified as:

$$i = 1, \dots, n$$

$$DPD = 1 \text{ if } Y_i > 0 \text{ and } DPD = 0 \text{ if } Y_i \leq 0$$

Where DPD dairy production decision, Y_i is a dummy variable indicating the probability of sample household dairy production participation; X_i are the variables determining participation in the probit model; β_1 is unknown parameter to be estimated in the probit regression model; ϵ_i is random error term.

Before fitting important variables in the models, it will be necessary to test multicollinearity problem among continuous variables and check associations among discrete variables, which seriously affects the parameter estimates. As Greene [20] indicates, multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because of existing strong relationship among them. In other words, multicollinearity is a situation where explanatory variables are highly correlated.

There are two measures that are often suggested to test the existence of multicollinearity. These are: Variance Inflation Factor (VIF) for a continuous variables association and Contingency Coefficients (CC) for dummy variables association.

Definition and Measurement of the Study Variables and Hypothesis

Dependent variables

Dairy production decision (BMPRT): Is a dummy variable that represents the probability of dairy participation of the household. It takes a value of 1 for households who participated and 0 otherwise.

Children under five years old (CHILDU5YS): It is a continuous variable, measured in terms of the number of children below age of five in the sample household. Mostly milk as a major food and its importance in children growth is widely accepted and recognized both in rural and urban areas. An increase in the number of children in this age category usually increases the dairy production decision and therefore it was expected to have a positive relation with related to milk production and increases the ability of the smallholder in level of production.

Family size (FS): This is a continuous variable that is measured in the number of members in a household. Household size increases domestic consumption requirements and may render households more risk averse. Families with more household members tended to consume more milk which in turn increases production participation and volume of production.

Market price of dairy product (MPDPT): This is the price offer a farmer receives from selling his produce. It is a continuous variable in Birr and it was expected to influence production participation and volume production positively. As farmer sees better price, the probability of entering a production and it was anticipated that volume of production will increase.

Income from the non-dairy sources (INDS): Financial income from nondairy sources has negative effect on the dairy participation and volume. The negative relation between the variables indicates that any additional financial income disables the dairy household to purchase

more number of dairy cows and improved feed which can contribute to increased milk production and productivity per household.

Access to market information (MIFO): It is a dummy variable taking value of 1 if household access to market information, 0 otherwise. Farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. Therefore, it was accepted that, market information is positively related to production participation and volume surplus. Study conducted by Embaye and Diriba on butter supply chain and sheno butter market chain, respectively, showed that better information significantly raises the probability of market participation for potential selling households [12].

Frequency of extension contact (FREXTCO): It is a continuous variable measured in numbers of days dairy experts contact with dairy producers per year. It is expected that extension service widens the household's knowledge with regard to the use of improved dairy production technologies and has positive impact on dairy production participation decision and volume. Number of extension visits improves the household's intellectual capitals, which improves dairy production and divert dairy production resources. Different studies revealed that extension visit has direct relationship with market entry decision and marketable product. Embaye and Gizachew et al. identified that extension visit was positively related to dairy market entry decision and marketed dairy volume [12,21]. Therefore, number of extension visits hypothesized to impact household dairy production decision and volume of production positively.

Access to credit (ACCR): This is a dummy variable which enables dairy producers to increase their financial capacity to participate in dairy production. Therefore, it was expected to have positive impact on participate in dairy production.

Dairy technology (DTECH): It is a dummy variable which will takes the value 0 if they did not use dairy technology, 1 if yes. Owning only local cows is hypothesized to affect milk value addition decision and level of participation positively. But in this study the result was expected that owning only local breed dairy cows negatively associated with milk value addition decision and level of participation decision on milk value addition in farm level.

Livestock in TLU: This is the number of live animals measured in tropical livestock unit, excluding lactating cows. This variable was expected to have positive impact on both participation and level of participation.

Results and Discussion

Determinants of dairy product market participation of the rural households'

Table 1 presents the results of the probit estimation of factors that influenced the sustainable dairy development. The model chi-square tests applying appropriate degrees of freedom indicated that the overall goodness of fit of the probit model was statistically significant at 1% probability level. This shows that jointly the independent variables included in the probit model regression explain the variations in the households' probability dairy product market participation. The probit model explained 72.89% of the variations in the likelihood of dairy product market participation and predicted about 90.85% of the cases correctly.

The results in Table 1 showed that the age of producer household head (AGE), education level of dairy producer household head (EDU),

Variables	Coefficients	Robust Std. Err.	t-ratio	Marginal effects
AGE	0.011***	0.0031	3.6	0.0113
SEX	0.064	0.0414	1.54	0.0639
EDU	0.018***	0.0055	3.27	0.0181
TOUT	0.011	0.0094	1.16	0.0108
TLU	-0.001	0.0013	-0.80	-0.0010
CHIL5	0.047	0.0332	1.44	-0.0479
CB	0.001	0.0271	0.05	-0.0014
LB	0.023	0.0208	1.14	0.0238
MIFO	0.185***	0.0564	3.27	0.1845
FREXTCO	-0.001	0.0027	-0.25	0.0006
NDI	0.011	0.0442	0.25	0.0284
LAND	0.001**	0.0031	3.23	0.0099
ADTEC	0.002**	0.0037	1.53	0.083
EXP_B	-0.004	0.0037	-0.96	-0.0035
CACE	-0.036	0.0378	-0.94	-0.0357

chi²(1)=8385.36*** Percentage of correctly predicted=90.85%, n=126
 Log likelihood function=-28.78 likelihood function=72.89%
 predicted values **=5% sign level, ***=1% sign level

Sources: Own computation (2018)

Table 1: Probit results of butter market participation decision

land ownership (LAND) and access to market information (MIFO), are significant variable that affect the probability of households dairy producing among responding households in study area. The age of dairy producer household head have a positive and significant impact on dairy producing participation decision of the sample dairy producer at 1% probability level. The marginal effect also confirms that when the household head age increases by one year, the probability of participating in the dairy production increases by 1.13%. This is in line with Woldemichael and Diriba who illustrated that if dairy keepers get older; the milk market participation of household increases [11,22]. Because according to Ethiopian context elders hold huge land size than younger ones. Therefore it is the obstacle for youngest man to raise the number of livestock or land holding that increases butter market participation of butter producer household.

Land ownership of dairy producer household head has a positive and significant impact on dairy producing participation decision of the sample dairy producer at 1% probability level. The marginal effect also confirms that when the household head land ownership increases by one hectare, the probability of participating in the dairy production increases by 1.13%.

Education level of dairy producer's house hold also has positive effect on probability of butter market participation decision and is significant at 1% probability level. The marginal effect indicates that addition of one-year formal schooling leads to raise the probability of dairy households butter market participation by 1.81%. This is in line with Gizachew et al. [21] who found positive and significant relationship indicating that education improves the dairy household's capacity to process production and market related information, which in turn improves bargaining position.

Access to information is also positively affected dairy participation at 1% significance level. The marginal effect of the variable also confirms that as household head has access to market information the probability of dairy producing willingness increases by 18.45%. The implication is that obtaining and verifying information helps to participate more. Study conducted by Diriba [22] on sheno butter market chain analysis

identified that better information significantly raises the probability of market participation.

Adopting new technology of dairy producer household head has a positive and significant impact on dairy producing decision of the sample dairy producer at 1% probability level. The marginal effect also confirms that when the household head adopt or using new technology to process milk and reserving other perishable dairy product, the probability of participating in the dairy production increases by 8.3%.

Conclusion

The problems associated with market information seem lead to low awareness of production. Hence, market information is the important component for improving the whole production system. The availability of timely information to farmers can increase farmers' bargaining capacity and participation. Therefore, market information service has to keep on aiming to provide information for all farmers involving in dairy production and has to inform them how to reduce cost of production and marketing. The study result revealed that production of dairy is influenced by market information, land ownership, education or training level and adopting dairy technology positively. The implication is that there was a requirement of the above mentioned elements which in turn increases level of dairy production highly.

Recommendation

Therefore, local government should introduce integrated dairy sector into the area as well as enhances quality and standard control market information. Overall, the study area is agro ecologically suitable for livestock raring, specially milking cows. Therefore, by using this piece of insight information any interested private, local government, individual and non-government organization can take part in dairy production in the district.

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