

Determinants of Smallholder Farmers' Participation in Dairy Contract Farming North Shewa Zone in Ethiopia

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ABSTRACT

Milk production is one of the major income generating activities for smallholder dairy farmers in Ethiopia but the sector is currently facing production and marketing challenges. Contract farming has been introduced as solution. This study examined factors that influence farmers' participation in dairy contract farming in North shewa zones of Oromia region, Ethiopia. The main objective of this study was to identify the factors affecting participation decision and volume of milk sold through dairy contract farming. To achieve this objective, multistage sampling techniques were used to select sample respondents. Descriptive statistics, inferential statistics, and econometric model were used for data analysis. Data were collected from 398 randomly selected farm households. The results of survey show that, there is a statistically significant mean difference between the two groups in terms of milk productivity at 1% significance level. The average milk productive of participant and non-participant households were 2.09 and 1.49 liters per lactating cow respectively. The t-test result shows that there is a statistically significant mean difference between the two groups in terms of average of milk produce per day. Even though, the average milk yield of participants were greater than that set by agricultural sample survey during 2019 for North Shewa zone (per day is 1.66 Lt). The double hurdle model showed that sex, Age and lactating cow had positive and significant effects on decision regarding contract farming participation, while it is negatively related with family size and Distance to milk collectors. Based on this result, the study recommends the stakeholder to focus improvements on the above significant variables to increase participation level and volume of milk sold in contract farming in the study area.

Keywords: Marketing challenges; Agriculture; Livestock; Milk production

INTRODUCTION

Contract farming is an efficient way to coordinate and encourage production and marketing in agriculture. However, it is important to identify when contract farming is most appropriate. Depending on the type of product, buyer and the nature of market one can decide when contract farming is most suitable in agriculture [1]. Contract farming arrangements are important in linking commercial and development objectives. The inclusion of small scale farmers in market-oriented value chains is expected to both augment the volume for the market and boost farmer income [2]. The reasons for undertaking contract farming are multiple for buyers (firms) and growers

(farmers). Both parties want to reduce overall market uncertainty and transaction costs cited by Holtland G. For the firms, the priority is to secure a reliable, predictable flow of raw materials that meet their specifications in terms of quality and volume at reasonable cost.

Ethiopia's poverty stricken economy is based on agriculture, accounting for half of GDP, 90% of exports, and 80% of total employment. The sector is essentially composed of smallholders, as 63% of the farmers cultivate less than 1 hectare, and 87% less than 2 hectares [3]. Subsistence agriculture accounts for the most part as it is estimated that roughly 30% of agricultural production is marketed. Over the past decade, the federal

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government of Ethiopia has taken important steps in promoting cooperatives as a means to connect smallholders to markets.

In Ethiopia the livestock sub-sector is estimated to contribute about 12%-16% of the total GDP and 30%-35% of total agricultural GDP and 60%-70% livelihoods of the Ethiopia population. The major Livestock population in Ethiopia is estimated to be 65,354,090 cattle, 39,894,394 sheep and 50,501,672 goats. The major species used for milk production in Ethiopia are cattle, camel and goats. Cattle produce 83% of the total milk and 97% of the cow milk comes from indigenous cattle breeds.

According to ASS done on livestock and livestock characteristics. The results obtained indicated the total cattle population for the country is estimated to be about 65.35 million. Out of this total 25,031,068 of cattle presented Oromia region. Specifically, in North Shewa zone 1,267,893 cattle are present. Among those, 109,792 are dairy cattle and 218,155 are milking cows. Average milk yield per day is 1.66 Lt and producing 86,582,492 liters per year. Although milk production is increasing by 1.2% per annum, the demand-supply variance for fresh milk is ever widening and the per capita consumption is diminishing [4].

Knowledge of how CFAs impact participants and of the factors that influence participation is important to policymakers seeking ways of promoting broad-based economic growth in rural areas [5]. Interventions intended to shape CFAs in ways that promote and sustain broad-based growth should be based on information that is reliable and relevant. Hence, the overarching goal of this study is to generate information about the factors affecting smallholder farmers' participation in dairy contract farming in the study area. Therefore, this study was designed to assess the factors affecting smallholder farmers' participation in dairy contract farming in North shewa zone. This was because factors affecting smallholder farmers' participation in dairy contract farming have not been systematically studied and documented in the study area. Hence, this study was interested to fill the knowledge gap existed on the factors affecting smallholder farmers' participation in dairy contract farming in the study area.

MATERIALS AND METHODS

Description of the study area

This study was conducted in North shewa zone of Oromia region state, Ethiopia which is one of the 22 Zones of the Oromia regional state. It is bordered on the south by Oromia special zone surrounding addis ababa, on the southwest by West Shewa, on the North by the Amhara region, and on the southeast by East Shewa. Its absolute location is 9°15'N-10°15'0"N latitude and 38°01'36"E-39°30'0"E longitude. Based on the 2007 census conducted by the CSA of Ethiopia, this zone has a total population of 1,431,305, of whom 717,552 are men and 713,753 women with an area of 10,322.48 square kilometers. It has a population density of 138.66.

The altitude of the study area is generally in the range of 1024 masl to 3453 masl. The economic activities in North shewa zone are

mainly focused on mixed farming system. Animal production activity is one of the integral components of the farming system in the zone. Livestock production has paramount importance for the households in the study area that augments the subsistence requirement of the community in terms of milk, milk by products and meat production, and generates household income. The annual crops produced in the zone include teff, wheat, barley, beans, sorghum, lentil, pea and chicken pea (Figure 1).

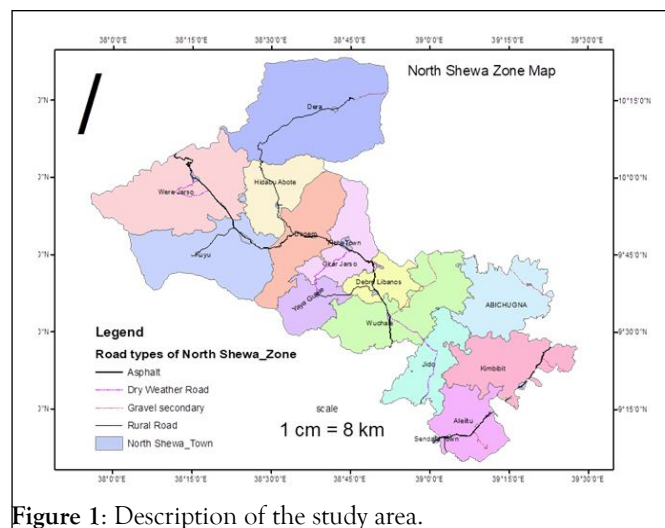


Figure 1: Description of the study area.

The types and sources of data

This study was used both qualitative and quantitative or primary and secondary source of data. In primary data sources include sample respondents, key informants, milk collectors, contracting firms, woreda and zonal experts while secondary data source include annual reports, internets, published and unpublished documents. Before actual data collection was made simple survey, depend up on survey the questionnaire was first pre-tasted and on the basis of the results, give necessary modification like clarity, validity, and sequence of the question will made before the execution of the main survey

Key informant interview

Semi-structure interview or interview guideline was organized for key informants like contracting firm, woreda and zonal livestock and marketing experts, milk collectors and selected small holder farmers. to identify the criteria used by contracting firms to select their contracting part, factors that influence the smallholders' participation decision and sales volume of dairy contract farmers and challenges that smallholder farmers face in engaging in dairy contract farming in study area and also to describe the current situation of contractual arrangement and to identify challenges.

Sampling design and sample size

Multistage sampling technique was used to draw sample farmers'. At the first stage, with the consultation of zone livestock and resource development experts' four woreda (namely Kuyu, Girar Jarso, Debra Libanos and Sululta were purposively selected based on milk production potential in the

zone. In the second stage, a total of 8 kebeles (two kebeles from each woreda) were selected randomly from the four woreda. In the third stage, Proportional random sampling method was employed to choose a sample of households participating in dairy producers from selected woreda. This study was apply sample size determination formula developed by Yamane L provided below [6].

$$n = \frac{N}{1+N(e)^2}$$

Therefore 398 samples of dairy producers' households were sampled from each of the four selected woreda using probability to proportional size.

Methods of data analysis

Data was edited and coded to ensure accuracy, validity, uniformity, consistency and completeness. Descriptive analysis (percentages, means, and standard deviation), inferential analysis and the double-hurdle model Cragg J were used to answer the research objectives [7].

The double-hurdle model Cragg J was used to assess factors influencing smallholders' participation decision and intensity of participation in contract farming. Double-hurdle model is a generalization of the Tobit model, where the decision to participate and the level of participation are determined

simultaneously. Whereas, in some aspects, parameterization of the double-hurdle model is similar to that of Heckman procedure, in that, two separate sets of parameters are obtained in both cases; the double-hurdle model was considered to be less restrictive. This is because in the Heckman model, non-participants were never participating under any circumstances. Conversely, in the double-hurdle model, non-participants were considered as a corner solution in a utility maximizing model [8].

RESULTS AND DISCUSSION

Descriptive and inferential analysis results of sampled households

The result indicates that there is low female participation in dairy contract farming. The result also revealed that, 83.6% of the sample households were married and about 9.2%, 6.2% and 1% of the sample farmers were single, divorced and widowed respectively within participate of dairy contract farming. Inadequate information was one of the reasons that hindered dairy contract participants and non-participants'. Table 1 show that about 63.01% of dairy contract participants and 47.17% of non-participants had access to information.

Table 1: Descriptive and inferential analysis results of sex, marital status and access of information of sample household head.

Variables	Participants		Non-participants		x ² Value	
	frequency	%	frequency	%		
Sex HH	Male	237	81.16	59	55.66	26.53***
	Female	55	18.84	47	44.34	
Marital status	Single	27	9.2	1	0.9	16.04***
	married	244	83.6	104	87.4	
	Divorced	18	6.2	0	0	
	widowed	3	1	1	0.9	
Access of information	Yes	184	63.01	50	47.17	8.06***
	No	108	36.99	56	52.83	

Experience in dairying

It is an important variable of intellectual capital measured by the number years the farmer engaged in activities of participation in milk production. As is stipulated in Table 2 the respondents were categorized in to four groups, those who were engaged less

than >2 years constitute 4.3% with a frequency of (17), 3-5 years' experience were 11.3% (45) of the total, 6-9 years' experience were 26.4% (105) and above 10 years experienced group were found 58% (231) of the total respondents.

Table 2: Distribution of experience in dairying (N=398).

Description	Frequency	Percent
0 yrs-2 yrs	17	4.3
3 yrs-5 yrs	45	11.3
6 yrs-9 yrs	105	26.4
10 yrs above	231	58
Total	398	100

Factors influencing the decisions of dairy contract Participation and sale volume in the study area

The results of double hurdle selection estimation for the level of participation are given in Table 3. The coefficient of sigma in the double hurdle estimation was statistically significant at 1%. This indicates goodness of fit, and the correctness of the distributional form assumed for the composite error term. The adjusted R-squared is 0.47, indicating that 47% of the variations on dependent variable (extent of dairy contract Participation) was explained by the independent variables. As shown in Table 3, sex, age and lactating cow positively and significantly

influenced the extent of contract participation among the respondents. On the other hand, distance to milk collectors and family size had a negative effect on the contract participation. Out of the ten variables analysed in this study, only five significantly influenced dairy contract participation. The negative sign indicates that as the family size increases the probability to participate in dairy contract farming would be decreased.

Table 3: Maximum likelihood estimation of double hurdle model.

Variables	Participation			Selection (intensity)		
	Coef	Std. error	Z-value	Coef	Std. error	Z-value
AgeHH	0.232948	0.049891	4.67***	0.068477	0.015195	4.51***
SexHH	3.15772	1.547902	2.04**	0.997584	0.750063	1.33
Education	0.014287	0.055458	0.26	0.138431	0.042091	3.29***
Family size	-0.66369	0.219765	-3.02***	0.274202	0.174651	1.57
Lactating cow	3.030982	1.017108	2.98***	0.822472	0.176496	4.66***
DMC	-0.54025	0.160313	-3.37***	-0.35339	0.289665	-1.22
Non-farm income	-0.00105	0.001475	-0.71	0.000627	0.000421	1.49
Amount credit	-0.00014	0.000103	-1.38	0.000346	0.000131	2.64***
land size	0.20907	0.145812	1.43	0.201519	0.101777	1.98*
Extension	0.04465	0.086005	0.52	0.141594	0.067426	2.10**
cons	-19.6466	2.729025	-7.20***	-6.35118	0.896299	-7.09***

sigma	0.655	0.041	15.7
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Cragg hurdle regression: Number of obs=398; LR Chi square (10)=1185.93***; Prob>Chi square=0.0000; Log likelihood=-660.51279; Pseudo R²=0.4731

***, ** and * indicate significance at 1, 5 and 10 percent probability level, respectively

Age: The result indicated that age of the household heads affect participation in dairy contract farming and sale volume positively at 1% level of significance. This suggested that older farmers were more participant and sold milk through contract than their young counterparts. This result agrees with the findings [9-11].

Sex: Sex of the household head appears to affect participation in dairy contract farming positively and significantly at a 5% probability level but not significantly affect sales volume of dairy contract farmers in the study area (Table 3). The possible explanation is that male headed households do have better opportunities of discussing with milk collectors, signing contract, collecting sales money and making negotiations. This result is consistent with the findings [11].

Education: Education influenced sale volume at 1% level of significance. As education in farming level increases sale volume in contract farming increases. This could be because; educated farmers have the ability to use information from various sources, interpret the information received, marketing decisions and show quick respond to new information. The result obtained is similar to the findings of [12].

Family size: Family size was negative and statistically significant for participation in dairy contract farming at 1%; imply that those farmers having large family size are less participant than farmers having small family size. This was due to poor managerial ability to effectively utilize the available labor force in the family. In other words, household with a large family size needs more resource to satisfy its energy and food requirements. Therefore, the household had large family size has more milk consumption rather than sold through contract farming. This result is also similar to those obtained.

Land: The estimated coefficient of land size was positive and statistically significant for sale volume in dairy contract farming at 10 percent. This result implies that as size of land increases, proportion of land allocated for feed development and improvement increases. This result is consistent with our expectations and previous studies.

The result of double hurdle model presented that number of extension was positive for participation in dairy contract farming but not significant. However, the coefficient for the number of extension contact has statistically significant positive relationship with sale volume at 5 percent. This is consistent

with the priori expectation that those farmers that had relatively longer extension contact will more contribute milk in dairy contract farming. This finding is the similar with.

Distance to milk collector: In this study area, distance to milk collector significantly negative affect level of participation at 1 percent level of significance. The findings suggest that there is a dire need to invest heavily in road network in the study area to effectively link the smallholder producers to milk collators. This result is also similar to those obtained.

Lactating cow: It is a continuous variable measured as the number of lactating cow owned by the household. In this study area, number of lactating cow significantly positive affect level of participation and sale volume at 1 percent level of significance. This result implies that farmers who own more number of lactating cows will be more dairy contract participant than others. This result is also similar to.

Credit: Amount of credit influenced sale volume at 1 percent level of significance, which indicates that farmers who get more amount of credit at the given dairy production from either formal or informal sources were expected to be more produce than those who get less amount of credit. Amount of credit to farmers might act as an instrumental motivation to sale more apart from being able to purchase the required inputs (forage) for dairy production. This result is also similar to those obtained.

CONCLUSION

Contract farming play magnificent role to prove the productivity of smallholder farmers, in this regard credit, lactating cow, education (awareness), extension, and other support services are one of the option to enhance farmer production. The results from double hurdle regression showed that sex, Age and lactating cow had positive and significant effects on decision regarding contract farming participation. Finally, family size and distance to milk collectors' centers influenced the participation in contract farming significantly and negatively.

The government should strength the existed extension services especially specific efforts to train and monitor farm households with regard to improved dairy management practices

Since lactating cow was positively and statistical significant effects on decision regarding contract farming participation. This may be because an existence of increased in number of

lactating cow might entail that the farmer involve in dairy contract farming. Therefore, it would be better if the regional government or concerned body supply cows either on credit bases or cooperative rendering rental service.

Strengthening marketing information mechanism in a more structured way will enable them to better link with the consumer market. Shortage of loan is considered to be one of the factors that hinder farmers' participation in dairy contract farming. Facilitating credit access for smallholders and forming well-functioning rural financial system with no or less collateral demands are more significant to promote investment in dairy production and influencing participation in milk contract farming.

DATA AVAILABILITY

Data for this study has been included in the manuscript.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest

REFERENCES

- Gebremedhin B, Motijaleta. Commercialization of smallholders: Does market orientation translate into market participation? Improving Productivity and Market Success (IPMS), international Livestock Research Institute, Addis Ababa, Ethiopia. 2013;1-30.
- CSA (Central Statistical Agency). Agricultural sample survey. Central Statistical Agency (CSA), Addis Ababa, Ethiopia, 2007.
- Mahamoud A. Determinants of participation in milk marketing of small holders in jijiga woreda, Thesis, Mekelle University, Ethiopia, 2010.
- Miyata S, Minot N, Hu D. Impact of contract farming on income: Linking small farmers, packers, and supermarkets in China. *World Dev.* 2014;37(11):1781-190.
- Yamane L. *Statistics: An Introductory Analysis*, 2nd Ed. Harper and Row, Manhattan, New York, 1967.
- Cragg J. Some Statistical Models for limited dependent variables with application to the demand for durable goods. *Econometric.* 1971;39(5):829-844.
- Yami M, Solomon T, Begna B, Fufa F, Alemu T, Alemu D. Source of technical inefficiency of smallholder wheat farmers in selected waterlogged areas of Ethiopia: A translog production function approach. *Afr J Agric Res.* 2013;8(29):3930-3940.
- Bardhana D, Sharmab ML, Saxenac R. Market participation behavior of smallholder dairy farmers in Uttarakhand. *Agric Econ Res Rev.* 2012;25(2):243-254.
- Seba ST. Impact of Contract Farming on Smallholders in Ethiopia: The Case of Chickpea Growers. Thesis, Lincoln University, Ethiopia, 2016.
- Bezabeh A, Beyene F, Haji J, Lemma T. Impact of contract farming on income of smallholder malt barley farmers in Arsi and West Arsi zones of Oromia region, Ethiopia. *Cogent food agric.* 2020;6(1): 1834662.
- Ntaganira E, Jaya SH, Robert M, Mbabazi M, Kanuma T. Determinants of farming among participation in contract small holder dairy farmers in Rwanda. *Int J Proj Manag.* 2017;5(3):11-19.
- Getaneh G. Dairy marketing patterns and efficiency: The case of Ada Liben district, Eastern Oromia. M.Sc. Thesis, Haramaya University, Ethiopia, 2005.