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Determinants of Dairy Value Chain Upgrading by Smallholder Farmers in Central Ethiopia

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Abstract: The study was conducted in Ada'a and Debre Tsege districts of Oromia regional state, Ethiopia to characterize raw milk value chains and value added dairy chains, determine the factors that influence the decisions to upgrade by actors along the selected milk value chains, analyze the determinants of smallholder actors participation in milk processing and value added dairy chains and propose possible interventions to improve the performance of dairy value chain upgrading in study areas. A multi-stage random sampling technique was implemented to select dairy producing districts, kebeles and and135 smallholder dairy farmers based on proportion to the population size of the selected kebeles. Results of the study shows that distance to the nearest main road significantly and negatively affects the participation decision of smallholder farmers in dairy value chain upgrading at ($p<0.01$) significance level. This implies that the further away the dairy farm from the main road, the less likely the farmers' participation decision in dairy value chain upgrading. Moreover, quality milk supply to market significantly and positively affects the participation decision of smallholder farmers in dairy value chain upgrading at ($p<0.05$) at significance level. Besides to this, reliability of milk supply to processors positively and significantly affects the participation decision of smallholder farmers in value chain upgrading at ($p<0.05$) significance level. This implies consistent milk supply to the processing company would increases the probability of dairy value chain upgrading by 4.7%. Access to market information significantly and positively influences the participation decision of smallholder farmers in dairy value chain upgrading at ($p<0.01$) significance level.

Key words: Value Chain Upgrading · Value Addition · Smallholder Dairy Farmers · Probit Model · Ethiopia

INTRODUCTION

Agriculture is the main stay of Ethiopian economy contributing about 43% of the GDP, 80% of employment, provides livelihood for 65% of the population and 90% of the export [1]. Nevertheless, the predominance of subsistence agriculture and lack and/or absence of business oriented agricultural production system, limited or no access to market facilities resulting in low participation of the smallholder farmers in value chain or value addition of their produces [2]. The roles livestock play in Ethiopia, especially in augmenting rural livelihood improvement by providing draft power, food, transportation, alternative energy sources, social prestige and status in communities are well recognized [3]. Livestock production also creates income opportunities for landless poor who provide fodder and engage in value addition and marketing. However, production is characterized by very low input that varies according to the levels of market orientation of a farmer. According to the Ministry of Agriculture about 300,000 crossbred dairy cows are found in Ethiopia and milk production has been improved over the past years for instances, from the years 2008/09 to 2010/11 2,765, 2,940 and 4,058, million liters of cow milk was produced, respectively [4]and these statistic exhibits that per capita milk production has grown by about 41% over the past three years. This accounts for the increments of average milk production of about 1.3 liters per day in 2008/2009to 1.9 liter in 2010/11, indicating a growth of 46%.

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However, the dairy sub-sector is increasingly facing challenges such as increased demand for safety standards and consumer satisfaction, climate change and poor road infrastructure affecting transportation of milk from farms to collection points. As a result dairy products are channeled to consumers through formal and informal marketing systems. In Ethiopia, the share of milk sold in formal market is less than 2% compared to 15% in Kenya and 5% in Uganda [5]. The national average annual consumption of milk is 19 kg as compared to 26 kg for other African countries and 100 kg to the world [6]. The dominant informal market directly delivers dairy products by producers to consumer (Immediate neighborhood or sales to itinerant traders or individuals in nearby towns) in the form of butter, cottage cheese and fermented milk. Out of the milk produced per year in rural Ethiopia, 6.55% was sold in the market, 48.48% was home consumed, 0.41% was used for wages in kind and 44.56% was processed into butter and cottage cheese. Out of the total butter production in rural Ethiopia per year, 58.97% was used for household consumption and 36.58% was sold. Out of the total cottage cheese produced in rural Ethiopia per year, 81.85% was used for household consumption, 14.35% was sold and 3.8% was used for wage in kind and other purposes [7].Generally, the low marketability of milk and milk products pose limitations on possibilities of exploring distant but rewarding markets. Improving position of dairy farmers to actively engage in markets and improve traditional processing techniques are important dairy value chain challenges of the country [8].

On the other hands, the demand for processed milk in rural areas is currently low and raw milk is still dominant in Ethiopian dairy market. On the contrary, upgrading dairy value chains encompass building technological and managerial capacity, acquiring knowledge and technologies for pasteurization and packaging at a faster pace than other actors in competing chains that allows local players to participate effectively in value chains. The growing demands in the value chain have shown the increased willingness to pay for high quality and safe milk products by consumers. There is a need to shift focus and study the traditional chains and ways of improving processes, products as well as functions along the traditional chains to provide high quality and safe dairy products [9]. It is therefore imperative to characterize and identify the key drivers of upgrading decisions along the dairy channels in terms of specific factors determine value chain upgrading.

MATERIAL AND METHODS

Description of the Study Areas: The study was conducted in two districts, Ada'a and Debre Tsege. Ada'a district is located at 38 km South East of Addis Ababa, at 8°44N and 39°2E and an altitude of 1880m above sea level. The districts receive a mean annual rain fall of 865mm with mean minimum and maximum annual temperature of 15 and 28°C, respectively, covering an area of 1750 km^2. Debre Tsege district is located at 98km northwest of Addis Ababa in the North Shewa zone of Oromia regional State.

Sources of Data and Sampling Procedure: Both primary and secondary data sources were used in the study. Primary data were collected from randomly selected smallholder dairy farmers. A structured questionnaire were used to generate primary information vital to socio-economic characteristics, volume of milk production, buyer information, access to extension service, dairy value chain up grade activities, size of actors' enterprise, access to storage equipment, production cost, input and output prices, herd size, labor availability, land size, distance to market, legal environment, access to credit and market, contracts market coordination, transaction cost, market infrastructure, physical infrastructure, communication and network of technical support. Primary data was collected from March 2015 up to April 2015. Secondary data were collected from the district agricultural office, central statistical Agency, previous studies, administrative office, other published and unpublished materials and non-governmental organizations. A multi-stage random sampling were used to select dairy producing districts, kebeles and 135dairy producing households included in the study in consultation of zonal agricultural experts. In the first stage, with the, dairy producing districts were purposively selected. Out of the districts, dairy producing kebeles were also purposively selected based on the level of dairy production. In the second stage, from the selected rural kebeles, sample kebeles were selected randomly. In the third stage, using lists obtained from the sampled kebele sample farmers were selected randomly based on proportional to the population size of the selected kebeles.

Data Analysis: The data collected was cleaned, coded, entered into computer and then analyzed using the Statistical Package for Social Scientists (SPSS) and STATA. The study was employed descriptive statistics and probit model for analyzing the data.

Analytical framework Smallholder farmers who produce dairy milk in general in Ethiopia and in particular in the study area may or may not participate in milk value chain upgrading and/or smallholder farmers who produced milk may add value or not before sale for different reasons. Accordingly, maximum likelihood estimation procedures probit model was used to approximate the mathematical relationship between explanatory variables and dependent variable with the following model.

$$Prob(y_i = 1 \mid X) = \int_{-\infty}^{X'\beta} \Phi(t)dt = \Phi(X'\beta) \quad (1)$$

where y_i is an indicator variable equal to 1 if the value chain actor chooses to upgrade or otherwise. $\Phi(.)$ is the standard normal distribution function βs(the parameters to be estimated) and Xs are the determinants of the dependent variable(The choice of adding value to milk) and the probit model as:

$$Y_i = X_i B_i + \sum_i \quad (2)$$

where i = 1,2,3--------n

Y is the probability of a chain actor to add value to milk and milk products and $\beta_0, \beta_1, \beta_2, \beta_3$ and β_4 are the parameters to be estimated

X_1 is a vector of socio economic factors
X_2 is a vector of institutional factors
$X_3$is a vector of economic factors and
X_4 is a vector of resource factors
ε_{ij} is an error term

Factors Hypothesized to Influence Dairy Value Chain up Grading: The study assumed that smallholder dairy farmers faced with decisions on whether to upgrade dairy value chain or not. These decisions are influenced by a number of factors categorized under socioeconomic, institutional, technical and the characteristics of the actors that interact together to impede or enhance the decisions they choose. The study conceptualizes that those actors who are willing to upgrade are likely to improve their margins and institutional and technical factors in this case, therefore, act as moderating variables to the decisions that dairy farmers make.

RESULTS AND DISCUSSION

Demographic Characteristics of the Respondents: The majority of the respondent dairy farmers were male headed (73.1% at Ada'a and 84.4% at Debre Tsege) showing that majority of dairy farmers were male headed thus, intervention has to be made to increase the involvement of female farmers in dairy production. The mean average family size of sample respondent dairy farmers was found to be 5.73 and 5.5 persons at Ada'a and at Debre Tsege, respectively indicating family size in the study area is higher than the average national family size of Ethiopia which is 5 people. The mean age of household head was 41.58 and 42.72 years at Ada'a & Debre Tsege districts, respectively (Table 1). This implies that middle-aged farmers were involved in dairy production in study areas because of the fact that old age and its associated physical and economic constraints would limit the old household head to manage the dairy cattle. About 34.6% and 31.2% of the respondent farmers were illiterate and 42.3% and 43.8% of them falling in1-8 grade range at Ada'aand at Debre Tsege, respectively (Table 1). The overall mean of dairy farming experience was found to be 9.81 years and about 60.5 % of the respondent farmers were residing in peri urban areas and 39.5% were urban dwellers.

Table 1: Demographic Characteristics of dairy farm households at the two case study sites (Ada'a N=68; Debre Tsege N=67)

Particulars		Adea	Debre Tsege	Over all mean
Sex of household head	Male	73.1	84.4	78.8
	Female	26.9	15.6	21.2
Age of household head		41.58	42.72	42.3
Marital status	single	4.4	4	4.2
	married	91.2	90.2	90.7
	separated/divorced	4.4	5.8	5.1
Family size of household		5.73	5.5	5.63
Dairy farm experience		9.27	10.35	9.81
Educational status	illiterate	34.6	31.2	32.9
	1-8 grade	42.3	34.8	38.5
	9-10 grade	15.4	25	20.3
	Diploma	7.7	9	8.3

Table 2: Smallholder cross breed dairy production cost estimation

Cost items	Mean costs of items (Eth Birr)
Labor per year per animal	978.35
Cost for AI and bull services per year per animal	460.25
Cost concentrate feed per year per year per animal	4853.50
other feed ingredients per year per animal	1211.5
Cost for medicament and veterinary service per year per animal	396.30
Transport (For feed and marketing costs) per animal	798.55
Drinking water per year per animal	423.50
Miscellaneous costs(Cost of salt, death loss of animal and ropes, etc) per animal	272.45
Total variable costs per dairy animal per year	9394.4

Table 3: Awareness of milk standards by small holder farmers in the study areas

	Average of total	Ada'a district(71)	Debre Tsege district(64)
Awareness of standards			
no	77.9	79.7	76.1
yes	22.6	21.3	23.9
Respondents participated in a group			
no	74.2	73.8	74.6
yes	25.8	26.2	25.4
Respondents added value to milk			
no	85.5	86.8	84.7
yes	14.8	14.1	15.5
Average herd size	7	2.8	4.2
Sold evening milk			
no	34.45	22	46.9
yes	65.55	78	53.1
Preserved milk			
no	69.2	53.8	84.6
yes	30.8	46.2	15.4

Dairy Cow Ownership: About 32.3% the respondent farmers involved in dairy production as their primary activity whilst 66.2% of them are involved in both crop and livestock production. The overall mean herd size at household level at both districts was found to be 7 animals and about 2.8 and 4.2 dairy cows were found at household level in Ada'a and DebreTsege districts, respectively. On average about 1.5dairy cows cross breed was present on the farm at household level out of which 0.75 was pure line breeds cows and was in milk. About 49.2% and 19.5% of the respondent dairy farmers who produce milk ,dairy cows belongs to both husband and wife in Ada'a and DebreTsege districts respectively whereas 24.2% and 31.8% of the respondent farmers explained dairy cows belongs to wife only.

Variable Costs of Dairy Production: Concentrate feed, roughage feed, health care and hired labor costs were found to be main costs of dairy production (Table 2). The mean cost of concentrate feed cost was 4853.50 birr per year per animal and about 1211.5 birr cost incurred per year for other feed ingredients. Similarly 396.30 and 978.35 birr cost incurred for health care and hired laborers respectively. Concentrate feed cost cover around 64.5%of dairy production cost whereas hired labor cost cover 10.4 % of dairy production cost. About 37% of the respondent farmers used family labor for dairy production and the dairy farmers elapsed 25 minutes/day in waiting for milk collectors. Table 2. Smallholder cross breed dairy production cost estimation

Awareness of Milk Marketing Standards: About 22.6% of the respondent farmers had information on national and international standards and regulations requirements of safe milk production and marketing whereas the remaining 77.9% of them had no information on national and international milk marketing standards (Table 3). This implies that awareness creation need to be done so that smallholder farmers would get information on national and international milk marketing standards. The survey results revealed that about 15.8% of the respondent dairy farmers reported they were using improved technologies to fit at least national milk marketing standards in terms of milk quality and safety to gain competitiveness, increase profit and for effectiveness and expansion of customer in the last three years. This implies that a few of the producers

were upgraded milk production system and internal processes to be competent in milk marketing and avoid loss of milk due to downgraded quality during production and processing and to increase profit from the dairy sub sector in the last three years in the study areas.

Milk Marketing: About 81.5% of dairy farmers regularly supply milk to collection centers and about 67.3% of them were supplied milk to collection center twice a day (Morning and afternoon) whilst, the remaining percentage of them supply milk only once to collection centers due to low volume milk production. Milk quality tests was made using lactometer and alcohol tests routinely at collection centers to corroborate health of dairy cows since need to be free of any disease to satisfy the health standard. About 91.7% of the respondent dairy farmers use plastic container for packing and the remaining percentage of them were used local container for packing of milk. About 65% of the respondent farmers explained that they sold evening milk to collectors and/or local consumers whereas the remaining percentage of them were reported they use milk for home consumption and/or add value to sell for better price. Besides to this, a few of dairy farmers sold milk to super markets and restaurants, dairy cooperative and local consumers.

About 85.7% of the respondent farmers indicated farmers sold milk to merchants and cooperatives on basis of credit; they were paid after two months of milk sold. The mean milk price was 9.03 birr per liter with the maximum price of 13birr /liter. About 2.92 birr/day cost was incurred for communication for marketing of milk. On top this; farmers were elapsed much time in waiting for milk collectors. Taking milk to collection center is the responsibility of milk producing farmers. About 90.2% of dairy farmers enlightened that they had had no bargaining power to influence customers, milk processing company on the selling price of milk and milk products. About 69.5% of dairy farmers had face to face communication with their customers/buyers on milk marketing price whilst 30.5% of them had the communication to customers by means of an intermediary people. Milk producers and buyers met each other to discuss business related issues and exchange market information such as prices, market requirement (Quality standard) at every three months in the districts. About 48.5% of interviewed milk producing farmers had formal contract agreement with dairy cooperatives and 37.7% of them had verbal agreement whereas the remaining percentage of dairy farmers had dairy farmers' irregular agreement with their customers.

Access to Road: The survey results indicated the mean walking distance from homestead to the main road and nearest market was found to be 3 km and 4.5km, respectively. Furthermore, 34.6% of them had no motor driven transport to take milk to collection centers whereas only about 8.4% and 16.4% of them had access to asphalt and coble stone road type. About 69% of the farmers transport milk to collection centers. These results indicated that there are poor road infrastructures in the study areas which call for the intervention of government and nongovernmental organizations to reverse the situation.

Dairy Value Chain Upgrading: The dairy farmers had few information on dairy production services such as improved dairy technologies (e.g. milking machine, methods and other machineries) to enhance the production and productivity of dairy subsector According to the survey about 79.7% of dairy farmers had obtain dairy production inputs from private company and/or individual merchants and the reaming farmers purchased dairy input from the spot market in the vicinity. About 53.1% of dairy farmers had access to artificial insemination from private enterprises and government organization. The remaining 46.9% of them were used local bulls for breeding. This implies that government dairy extension services were in the area is weak. On top of this, majority of dairy farmers,(75.8%) reported that available feed resource had poor quality and getting quality dairy feed is tricky and at the same time the price of the feeds is un affordable. About 97.7% of the respondent dairy farmers had not purchase any new machinery to improve milk production process in last three years due to financial limitations. However, a limited number of producers engaged in functional upgrading, to increase value addition by changing the mix of activities conducted within dairy value chain actors.

Extension and Credit Services: About 92.1% of the respondent dairy farmers pointed out that there is limited dairy extension and veterinary services in the study districts. Similarly, about 67.8% dairy farmers had no credit services due to lack of collaterals. This results call for intervention of government and non-governmental organization to make access to extension and credit services to improve the dairy production and marketing via strengthening the dairy value chain actors.

Cooperative Membership and Decision Making: The survey results revealed that only about 25.8% of respondent farmers were members of dairy cooperatives

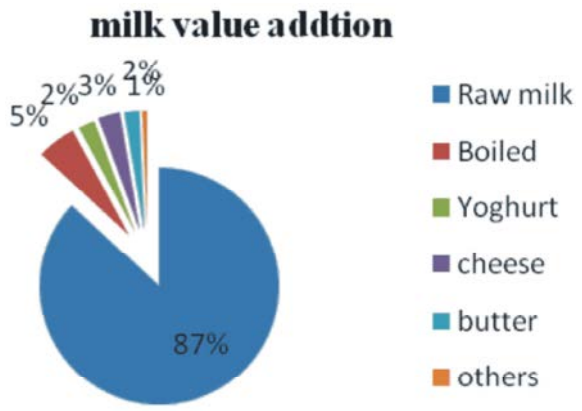

Fig. 1: Milk value addition activities of small-scale dairy farmers in the study areas

which was initiated by government to resolve marketing problems of dairy farmers in order to assist farmers in production, processing and to boost bargaining power of dairy farmers. This implies only few dairy smallholder farmers were members of dairy cooperatives and majority of them had no bargaining power on milk selling price.

Regarding gender issue on income obtained from milk sale, it was indicated that about46.6% of the respondent farmers revealed that decision on dairy income and amount to be sold was made by both husband and wife jointly. The remaining percentage of them was revealed decision was made by wife only.

Milk Value Addition: The survey results revealed that 85.9% of the respondent dairy producers were sold raw milk while the remaining percentage of them were processed milk in the forms of cheese, yoghurt and butter (Figure 1).

Majority of farmers (77.1%) of dairy farmers did not practice milk boiling before selling. On top of this, about67.5% of them did not perform milk processing/ value addition activity due to high cost of value addition equipment, in adequate value addition skills and lack of storage facility.

Access to Training: The survey results indicated that about 83.3% of dairy farmers had no formal training on milk value addition methods in the study areas which calls for improving knowledge and skill of dairy producing farmers so that dairy farmers traditional way of milk production and value addition would be improved there by upgrade dairy value chain. On the other hands few dairy farmers were trained in milk value addition methods such cooling and yoghurt, cheese and butter making by NGO, ministry of agriculture and research institution in the form of work shop. Other dairy farmers perform value addition activities via traditionally acquired knowledge and skill for own consumption and in few cases, for sale.

Dairy Production Constraints and Opportunities: The existence of high demand for raw and processed milk in Ethiopia has induced the development of new livestock master plan that gave great emphasis on the development of the dairy sector to cope up with increasing urbanization and growing incomes of the consumers. Poor infrastructure, high costs of transport and weak linkage between dairy producers and potential milk markets became a barrier for efficient and effective marketing of milk and milk products. Furthermore, the results of the survey also indicated those high and ever increasing inputs prices were found to be the most critical constraints hindering the development in dairy production. Milk quality problems coupled with shortage of storage technology, weak market linkage, long fasting epoch of the Orthodox Christian followers, lack of legal enforcement for milk quality standards were the critical constraints recognized in the milk value chain in the study areas.

On top of this, diseases prevalence, poor livestock extension services, poor health service, limited access and supply of inputs, feed shortage and high feed price were the major constraints hampered milk value chain up grading in the study areas.

The proximity of the two study districts to the capital city with potential market for dairy producers is a big opportunity for dairy production. The deployment of development agents at each kebele based on their academic back ground is also important policy dimensions for dairy improvement. Furthermore, provision of infrastructure facilities like roads, telecommunication, power supply and financial institutions are the infrastructural advantages that facilitate the production and marketing of milk production in the study area. Furthermore, growing number of buyers, high experience in milk trade and growing price were some of the opportunities available for milk the producers.

Milk Marketing Constraints: The survey results revealed that all dairy producers reported that there are market challenges in the study areas. The major constraints are non- availability of milk market/limited access to market, low price of milk in contrast to feed price, year round transport problem, poor quality product that cannot meet consumers demand and perish ability of milk and milk products, limited power of price setting, lack of storage facility, poor information flow, lack of

Table 4: Probit regression results of dairy value chain upgrading by Smallholder Farmers

	Maximum likelihood estimates				Marginal effects	
Variables	Coefficient	S.E	z	p-value	Coefficient	p-value
Constant	2.64	1.40	1.88	0.000	0.056	0.002
Distance to the main road	-0.357***	0.076	4.65	0.001	-0.0028	0.000
Experience	0.378***	0.063	5.87	0.001	0.219	0.002
Awareness to Production standards	0.280	0.35	0.8	0.96	0.93	0.72
quality milk supply	2.16**	1.23	1.76	0.078	0.035	0.087
Sex of household head	0.17	0.54	0.32	0.85	0.15	0.43
Age	0.52	0.049		0.284	0.017	0.38
Level of Education	0.145**	0.068	2.21	0.054	0.046	0.045
Reliability of milk supply	0.57**	0.32	1.78	0.049	0.047	0.047
Total income generated	0.115***	0.052	5.75	0.001	0.027	0.000
Operational cost	-0.62**	0.28	2.22	0.062	-0.019	0.053
Access to market information	4.9***	2.13	2.34	0.019	0.032	0.000

Number of obs = 135 Log likelihood = -19.0423;LR chi2 (11) = 80.03;
Prob. > chi2 = 0.0000; Pseudo R2 = 0.7190
*Significant at p<0.1 **significant at p<0.05 and *** significant at p<0.01

institutional support, shortage of supply and high monopolistic power of wholesalers/milk processing companies.

Econometric Analysis: The assessments of demographic and socioeconomic variables have identified to influence the decision to upgrade dairy chain. The Probit regression estimation results are presented in Table 4.

Table 4, presents the maximum likelihood estimates and the marginal effects from the probit regression and it shows that the likelihood ratio statistics as designated by chi-square statistics are highly significant (Over all P <0.0000), signifying the model has a strong explanatory power The Pseudo R2 is0.7190, indicating the specification fits the data well the variables included in the model explain 71.9% of the variation dairy value chain upgrading decision in small scale farmers. Among all the exogenous variables considered, distance to the main road, dairy farm experience, total income generated, access to market information were significantly influenced (p<0.01) the probability of participation in dairy value chain up grading whilst level of education, reliability of milk supply, operational cost and quality milk supplywere significantly influenced (p<0.05) the probability of smallholder farmers participation in dairy value chain up grading.

Distance to the nearest main road significantly and negatively affected the participation of smallholder farmers in dairy value chain upgrading at (p<0.01) significance level. The marginal effect indicates that the likelihood of participation of dairy farmers in value chain upgrading decreases by 0.28% for a km distance away from the nearest main road. This implies that the further away the dairy farm from the main road, the less likely the farmers participate in dairy value chain upgrading. Similarly, number of years a household has been in dairy farming significantly and positively affected the participation of smallholder farmers in dairy value chain upgrading at (p<0.01) significance level. The marginal effect indicates that the likelihood of dairy farmers participating in dairy value chain upgrading increases by 21.9% for an increase in farming experiences by a year.

Similarity, level of education of dairy small holder farmers significantly and positively affected the participation of smallholder farmers in dairy value chain upgrading at (p<0.01) significance level. The marginal effect indicates that the likelihood of dairy farmers participating in dairy value chain upgrading increases by 4.6% for an increase in educational of dairy farmer by a year. This would be due to the fact that more educated farmers are more likely to seek information and easily acquire skill during training which would be useful for value chain upgrading. Thus, education plays vital role in uptake of new technologies and thought to enhance the gameness of a farmhouse head to accept new ideas and innovations. Therefore, adult education and training has to be organized to uplift the dairy value chain upgrading and other new agricultural technologies adoption in the study areas.

Moreover, quality milk supply to market/processors significantly and positively affected the participation of smallholder farmers in dairy value chain upgrading at ((p<0.05) at significance level. The marginal effect indicates that the likelihood of dairy farmers participating in dairy value chain upgrading increases by 3.5 % for an

increase in quality supply of milk to market by one unit. This implies the existence of quality milk supply to market encourage milk value upgrading.

Besides to this, reliability of milk supply to customers/processors positively and significantly affected the participation of smallholder farmers in value chain upgrading at ($p<0.05$) significance level in the study areas. The marginal effect indicates that the likelihood of participating in value chain upgrading increases by4.7% for an increase in reliability of milk supply of milk to market/processors by one unit. This implies increasing the reliability of milk supply to processors has substantial effect on increasing the probability of dairy value upgrading decision.

The estimated coefficient of total income has shown that value chain actors, who obtain more total income from the activity, are more likely to participate in milk value chain upgrading. The marginal effect points out that the likelihood of dairy farmers to participate in dairy value chain upgrading increases by 2.7% for an increase in the total income from value chain upgrading by one birr.

Moreover, evidence from the probit regression results designates that the actual operational cost incurred by dairy farmers negatively and significantly influences the decision of dairy farmers to participate in dairy value chain up grading at ($p<0.05$) significance level. . The marginal effect reveals that the likelihood of dairy farmers to participate in dairy value chain upgrading decreases by 1.9% for an increase in the operational for value chain upgrading by one birr.

Access to market information significantly and positively influences the participation decision of smallholder farmers in dairy value chain upgrading at ($p<0.01$) significance level. The marginal effect discloses that the likelihood of dairy farmers to participate in dairy value chain upgrading increases by 3.2% for an increase in the access to market information enabling value chain upgrading by one unit.

CONCLUSION AND RECOMMENDATIONS

The study results reveal that consistent supply of quality milk to processing company enhances dairy value chain up grading and hence, need enhancement of productivity through improvement of feeds, dairy health service, provision of improved dairy breeds and institutional support. Poor transportation facility, lack of credit service and lack of milk processing machine impede smallholder dairy farmers 'participation decision on dairy value chain up grading.

The distance to the main road has a key role in determining the likelihood of participating in dairy value chain upgrading and any plan to enhances market participation and competitiveness of dairy farmers has to give due attention in developing road access to dairy farmers. Quality milk supply is another crucial factor that requires sustainable improvement of dairy technologies support and continuous training on how to manage a dairy farm followed by strongest milk quality control and quality base payment to increase the supply of quality milk to market.

Furthermore, dairy cooperative organization should be strengthened and supported to increase bargaining power and financial capacity of dairy farmers in order to purchase equipment that might helpful for dairy value chain upgrading activates. Moreover, government should strengthen milk processing cooperatives and improve their infrastructure facilities. The operational cost is one of the key factors in dairy vale chain upgrading thus, has to be decreased via establishment and distribution of feed resources for dairy producers and other accompanying inputs of dairy production. Besides, farmers' access to information should be improved through enhancing linkage with development partners and modern ICT technology.

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