

Full Length Research Paper

Factors affecting milk market outlet choices in Wolaita zone, Ethiopia

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The study was undertaken with the objective of assessing factors affecting milk market outlet choices in *WOLAITA* zone, Ethiopia. Using farm household survey data from 394 households and Multinomial Logit Model, milk market outlet choices were analyzed. Multinomial Logit model results indicate that compared to accessing individual consumer milk market outlet, the likelihood of accessing cooperative milk market outlet was lower among households who owned large number of cows, those who considered price offered by cooperative lower than other market outlets and those who wanted payment other than cash mode. The likelihood of accessing cooperative milk market outlet was higher for households who were cooperative member, who owned large landholding size, who had been in dairy farming for many years and who received better dairy extension services. Compared to accessing individual consumer milk market outlet, the likelihood of accessing hotel/restaurant milk market outlet was lower among households who were at far away from urban center and higher among households who accessed better dairy extension services and who owned large number of dairy cows. As one of the key factors to boost milk market outlet choices, dairy extension services should be strengthened through redesigning or reforming implementation strategies or improving/strengthening existing policy. It should be strengthened to enable farmers produce surplus milk for markets and should devise means to reduce local milking cow numbers by replacing them with crossbred cows. Moreover, governments should strengthen milk processing cooperatives and improve infrastructure facilities.

Key words: Factors, milk market, participation, volume of supply, *Wolaita* zone.

INTRODUCTION

Development policy of Ethiopia has placed an emphasis on increasing agricultural production to serve as a base for rural development. Even though there have been an increase in agricultural production, its attempt experienced drawbacks in the absence of household's market participation. The lack of market participation that many agricultural households face is considered to be a major constraint to combating poverty (Best et al., 2005). This shows that an efficient, integrated and responsive

market that is marked with good performance is of crucial importance for optimal allocation of resources and stimulating households to increase output (FAO, 2003). Thus facilitating market participation of households as well as developing chain competitiveness and efficiency are valuable preconditions to improve livelihoods (Lundy et al., 2004; Padulosi et al., 2004). Unless farm households adjust to rapidly changing markets which are characterized by quality and food safety, vertical integration,

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standards and product traceability, reliability of supply, there will be a risk of competitiveness and inefficiency for the entire value chain (Vermeulen et al., 2008). Household market participation is an important strategy for poverty alleviation and food security in developing countries (Heltberg and Tarp, 2002). Moreover, increasing household participation in markets is a key factor to lifting rural households out of poverty in Africa countries (Delgado, 1995).

The literature on market outlet choices has been thin, especially in developing countries where significant frictions make this question most salient. Goetz (1992) studied participation of Senegalese agricultural households in grain markets. He used probit model to analyze household's discrete decision either to participate in a market or not which was followed by a second-stage regression model to analyze the extent of market participation. Key et al. (2000) developed a structural model to estimate structural supply functions and production thresholds for Mexican households' participation in maize market, based on a censoring model with an unobserved censoring threshold. Holloway et al. (2005) used a Bayesian double-hurdle model to study participation of Ethiopian dairy farmers in milk market when non negligible fixed costs lead to non zero censoring, as in Key et al. (2000), but distinguishing between discrete participation and continuous volume marketed, as in Goetz (1992). Some others studied livestock and livestock products marketing in parts of Ethiopia (Holloway et al., 2000; Yigezu, 2000; Muriuki and Thorpe, 2001; Tsehay, 2001; Mohammed et al., 2004; Woldemichael, 2008). However, none of past studies identified factors affecting milk market outlet choices in *Wolaita* zone, Ethiopia.

Wolaita zone is one of the potential milk production and marketing areas in Ethiopia. In the zone, it is common to see household choices among milk market outlets. Then, what motivate households to choose among milk market outlets available in the study area? Systematic identification of factors faced by households in market outlet choice is increasingly seen by agricultural research as important component of any strategy for reaching the millennium development goals (Giuliani and Padulosi, 2005). Given *Wolaita* zone's potential for milk production, processing, marketing and consumption, results of the study become essential to provide vital and valid information for effective research, planning and policy formulation. Therefore the study provides an empirical basis for identifying options to increase milk market outlet choices of households. In doing so, the study attempts to contribute to filling the knowledge gap by assessing factors affecting milk market outlet choices in *Wolaita* zone, Ethiopia.

METHODOLOGY

A multistage random sampling procedure was used to select

representative households from the study area. In the first stage, *Wolaita* zone was selected purposively as it is one of the potential milk production, processing, marketing and consumption areas of the country. Within the zone, four rural districts/*weredas* (*Sodo zuria*, *Bolosso Sore*, *Ofa* and *Damote Gale*) and one town (*Wolaita Sodo*) were selected purposively on the basis of milk production, marketing and consumption potential. Then 33 peasant associations/*kebeles* from the *weredas* and the town were selected purposively on the basis of milk production and market participation potential. Sample frame of the *kebeles* was updated and sample size was determined using a simplified formula provided by Yamane (1967). Out of the total 32,972 households, 398 households were selected using simple random sampling methods. However, four households with inappropriately filled questionnaire and missing data were dropped and the data set to 394 households were analyzed.

Both quantitative and qualitative data types were used in the study under investigation. In order to generate these data types, both secondary and primary data sources were used. Secondary sources include reports of line ministries, journals, books, Central Statistical Authority (CSA) and internet browsing, national policies, zonal and *wereda* reports, among others. Primary data sources include zonal and *weredas* Agricultural and Rural Development Offices, zonal and *weredas* Agricultural Marketing Offices, *Wolaita Sodo* Cattle Breeding and Multiplication Center and dairy households. The major data collection methods used includes discussions, rapid market appraisal, observation, formal survey and visual aids. Survey questionnaires were prepared and pre-tested for households operating within the study area. Using the questionnaire, interviews were conducted to gather data on household characteristics, socioeconomic and demographic characteristics, farm information, input utilization, and access to services such as extension, credit and information, technology use, milk production, milk market outlets, among others. Trained and experienced enumerators collected data from households during July and August, 2010.

Two types of data analysis, namely descriptive statistics and econometric models were used to analyze the data collected from households. Descriptive method of data analysis included the use of ratios, percentages, means and standard deviations in the process of comparing socioeconomic, demographic and institutional characteristics of households. To identify factors affecting milk market outlet choices, multinomial logit model was used. If there are a finite number of choices (greater than two), multinomial logit estimation is appropriate to analyze the effect of exogenous variables on choices. The multinomial logit model has been widely used by researchers such as Schup et al. (1999) and Ferto and Szabo (2002). It is a simple extension of the binary choice model and is the most frequently used model for nominal outcomes that are often used when a dependent variable has more than two choices. The results revealed that households accessed milk market outlets such as individual consumer, cooperative, hotel/restaurant and combinations thereof. However, due to mutually inclusiveness of choices, fewer representation and similar collection and operation practices, only households who had access to individual consumer, cooperative and hotel/restaurant milk market outlets were considered in multinomial logit regression. For estimation purpose, the base category used was access to individual consumer; thus the model assessed the effects of various independent variables on the odds of two market outlets versus access to individual consumer market outlet. The general form of the Multinomial Logit model is (McFadden, 1973; Long, 1997):

$$P_{ki} = \frac{\exp(x_i' \beta_k)}{\sum_{j=1}^K \exp(x_i' \beta_j)} \quad (1)$$

for $i = 1, 2, \dots, N; K = 1, 2, \dots, J$

where P_i is the likelihood that a household i chooses to access J

milk market outlet from K milk market outlet choices; X_i is explanatory variable vector that contains the set of factors about household attributes and socioeconomic and demographic characteristics; and β_j is a vector of parameters relating explanatory variables to the valuation of K outlets ($K = 1, 2, 3$).

The marginal effects are obtained from the logit regression results by the following equation:

$$\frac{\partial P_{ji}}{\partial X_{ji}} = P_{ji} \left(\beta_j - \sum_{k=1}^K P_k \beta_k \right) \quad (2)$$

Where β and P represent the parameter and likelihood, respectively, of one of the choices. Marginal likelihood gives better indications and represents changes in dependent variable for a given change in a particular explanatory variable whereas holding the other explanatory variables at their sample means. The models are estimated under maximum likelihood procedures, which yield consistent, asymptotically normal and efficient estimates.

The data covered information necessary to make household level indices of social, economic, demographic and institutional indicators comparable across different categories of households and milk market outlets. In order to identify factors affecting household milk market outlet choices, continuous and discrete variables were identified based on economic theories and empirical studies as follows.

Market outlets (ACCESS)

This is a categorical dependent variable that represents milk market outlets of the study area. The results revealed that households had three milk market outlets and combinations thereof. However, due to mutually inclusiveness of outlets, fewer representation and similar collection and operation practices, only households who had access to individual consumer, cooperative and hotel/restaurant milk market outlets were considered in the regression. Accordingly, dependent variables were created from the data, which indicated sales to (1) individual consumer, (2) cooperative and (3) hotel/restaurant. For estimation purpose, the base category used was access to individual consumer; thus the model assessed the effects of various independent variables on the odds of two milk market outlets versus access to individual consumer milk market outlet.

Mode of milk sale (PAY)

This is a dummy independent variable that takes the value 1 if mode of milk sale is in cash and 0 otherwise. Most households need cash from milk sale to purchase household needs such as soap, salt, food, etc and want payment to be made in cash. Staal et al. (2006) found out that cash mode of payment negatively and significantly affected accessing cooperative and private trader milk market channel selection as compared with accessing individual consumer milk market channel. Therefore, cash based mode of payment is hypothesized to affect accessing individual consumer milk market outlet positively as compared with accessing cooperative and hotel/restaurant milk market outlets.

Milk price by market outlet (PRICE)

This is a continuous independent variable that is measured in Ethiopian birr. It is the actual price received by a household per liter of milk sold to milk market outlets. Staal et al. (2006) found out that the better the price offered by milk market channel, the more a household prefers that outlet for accessing and selling milk. They found out that price offered per liter of milk by individual consumer was lower than price offered by private trader and cooperative and thus households accessed these market outlets than accessing individual consumer milk market outlet. Therefore, the variable is hypothesized to affect accessing individual consumer milk market outlet positively as compared with accessing cooperative milk market outlet and negatively as compared with accessing hotel/restaurant milk market outlet.

Size of milk output (YIELD)

This is a continuous independent variable measured in liter. Past studies revealed that milk yield per day significantly and positively affected marketed surplus of milk (Singh and Rai, 1998; Woldemichael, 2008). Therefore, the variable is hypothesized to affect accessing hotel/restaurant milk market outlet positively than others because of hotel/restaurant capacity to purchase large volume of milk.

Distance to the nearest urban center (DIST)

This is a continuous independent variable measured in kilometer. The closer a household to the nearest urban center, the lesser would be transportation costs, loss due to spoilage and better access to market information and facilities. Berhanu and Moti (2010) found out negative relationship between market participation and distance to the nearest urban market center. Therefore, households who are at far away from urban center are hypothesized to affect the likelihood of accessing cooperative milk market outlet positively as compared with accessing other milk market outlets.

Education of household head (EDU)

This is a dummy independent variable that takes the value 1 if a household head had attended formal schooling and 0 otherwise. Literate households are expected to have better skills and better access to information and ability to process information. Education plays an important role in adoption of new technologies and believed to improve readiness of a head to accept new ideas and innovations. It also enables a head to get updated demand and supply information. Therefore, formal education of household head is hypothesized to affect accessing hotel/restaurant milk market outlet choice positively as compared with accessing other milk market outlets.

Age of household head (AGE)

This is a continuous independent variable that is measured in years. Tshionza et al. (2001) identified age of a household head as a major household characteristic that significantly affected the proportion of cooking banana plant for markets. They found out that young aged household heads tended to produce and sell more cooking banana than older aged household heads. Therefore, being young aged household head is hypothesized to affect

accessing hotel/restaurant milk market outlet choice positively as compared with accessing other milk market outlets.

Sex of household head (SEX)

This is a dummy independent variable that takes the value 1 if the head of a household is male and 0 otherwise. Female contribute more labor in the area of feeding, cleaning of bans, milking, butter and cottage cheese making and sale of dairy products. However, such constraints as lack of capital and poor access to institutional credit and extension service, may affect female participation in dairy production and markets (Tanga et al., 2000). Due to their potential dairy production advantages over female headed households, male headed households are expected to be more market oriented. Therefore, being male headed household is hypothesized to affect accessing hotel/restaurant milk market outlet choice positively as compared with accessing other milk market outlets.

Household size (HSIZE)

This is a continuous independent 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 tend to consume more milk which in turn decreases milk market participation and marketed milk surplus. Hence, controlling for labor supply, larger households are expected to have lower market participation. Heltberg and Trap (2002), Lapar et al. (2003), Edmeades (2006) and Berhanu and Moti (2010) found out negative relationship between household size and market participation of households. It is therefore hypothesized to affect accessing cooperative milk market outlet choice positively as compared with accessing other milk market outlets.

Access to dairy extension services (EXT)

This is a dummy independent variable taking the value 1 if a household had access to dairy extension services and 0 otherwise. It is expected that dairy extension service widens household knowledge with regard to use of improved dairy technologies. Agricultural extension services are expected to enhance households' skills and knowledge, link households with technology and markets (Lerman, 2004). The number of extension agent visits improves household's intellectual capitals and helps in improving dairy production and impacts milk market outlet choices. Past studies revealed that extension agent visits had direct relationship with market outlet choices (Holloway and Ehui, 2002; Rehima, 2006). Thus access to dairy extension service is hypothesized to affect accessing hotel/restaurant milk market outlet choice positively as compared with accessing other milk market outlets.

Access to market information (INFOM)

This is a dummy independent variable taking the value 1 if a household had access to market information services and 0 otherwise. Households marketing decision is based on market price information. Poorly integrated markets may convey inaccurate price information leading to inefficient product movement. Study conducted by Goetz (1992) on food marketing behavior showed that better market information significantly raised likelihood of market participation of households. Therefore, the variable is hypothesized to affect accessing hotel/restaurant milk market outlet

choice positively as compared with accessing other milk market outlets.

Milking cow ownership (COW)

This is a continuous independent variable measured in the number of milking cows owned by a household in TLU. As the number of dairy cows owned increases, milk production increases and percentage share of consumption declines and milk sales increase (Holloway and Ehui, 2002). Past studies indicated that the variable showed positive and significant relationship with market participation and marketable milk volume (Holloway and Ehui, 2002; Gizachew, 2005). Therefore, the variable is hypothesized to affect accessing hotel/restaurant milk market outlet choice positively as compared with accessing other milk market outlets.

Presence of children under six years of age (CHILD)

This is a dummy independent variable taking the value 1 if a household had at least a child less than six years of age and 0 otherwise. There is a competition between milk for child requirement and the amount needed for market. Staal et al. (2006) included the variable in probit model and found out that the variable revealed negative relation to milk market outlet choices. Therefore, households with at least a child under age six are hypothesized to affect accessing cooperative milk market outlet choice positively as compared with accessing other milk market outlets.

Dairy farming experience (EXP)

This is a continuous independent variable measured in the number of years a household has been engaged in dairy farming. Households who have been in dairy farming for many years are expected to have rich experiences regarding opportunities and challenges of dairy production, processing and marketing. Staal et al. (2006) included the variable in probit model and found out that the variable revealed positive relation to milk market participation and market outlet choice. Therefore, the variable is hypothesized to affect accessing cooperative milk market outlet choice positively as compared with accessing other milk market outlets.

Landholding size (LAND)

This is a continuous independent variable measured in hectare. As input for dairy production, land is very important for forage and pasture development to feed dairy cows. It is expected that as the size of land increases, the proportion of land allocated for feed development and improvement increases. According to Staal et al. (2006) the variable has shown negative relationship with milk market participation and market outlet choice. However, in this study the variable is hypothesized to affect accessing cooperative milk market outlet choice positively as compared with accessing other milk market outlets.

Membership to cooperative (MEMB)

This is a dummy independent variable that takes the value 1 if a household has a membership to cooperative and 0 otherwise. Households who are member to cooperative are supposed to sell milk to milk processing cooperative rather than selling to individual consumer and hotel/restaurant. Therefore, membership to cooperative is hypothesized to affect accessing cooperative market

Table 1. Mean household characteristics by milk market outlets

Variable	Mean (Standard deviation) of market outlets		
	Individual consumer (N=118)	Cooperative (N=46)	Hotel/restaurant (N=118)
Age of household head (year)	44.4(10.83)	45.3(13.04)	43.51(8.96)
Household size (number)	5.86(2.11)	6.39(2.40)	5.58(1.87)
Distance to the nearest urban market (km)	2.27(1.61)	3.36(2.16)	1.78(1.39)
Dairy cow in TLU	2.47(1.36)	1.91(1.31)	2.97(1.81)
Milk yield per day (liter)	10.02(3.03)	7.54(1.74)	10.44(3.31)
Dairy farming experiences (year)	8.7(3.81)	19.46(3.25)	7.02(3.77)
Milk price by outlet per liter (Birr)	5.40(1.21)	4.50(0.51)	5.27(0.97)
Land holding size (ha)	0.96(0.07)	1.41(1.45)	0.48(0.31)

Source: Authors collection, July and August 2010.

outlet positively as compared with accessing other milk market outlets.

RESULTS AND DISCUSSION

Mean household characteristics by milk market outlets

The mean household characteristics by milk market outlets are provided in Table 1. The mean household size by milk market outlets was 5.9, 6.4 and 5.6 with individual consumer, cooperative and hotel/restaurant, respectively. The mean household size for households who accessed cooperative milk market outlet was higher than the mean household size (6.0 people) in the rural areas of southern Ethiopia (CSA, 2007). The mean age of household heads that had access to individual consumer, cooperative and hotel/restaurant milk market outlets was 44, 45 and 43.5 years, respectively. The mean dairy cow ownership of households who had access to cooperative, individual consumer and hotel/restaurant milk market outlets was 1.9, 2.5 and 3.0 TLU, respectively. This indicates that households that owned large dairy cows accessed hotel/restaurant milk market outlet because of hotel/restaurants' capacity to purchase large amount of milk.

On average 10, 7.5 and 10.4 L of milk per day was accessed by individual consumer, cooperative and hotel/restaurant market outlets, respectively. The mean dairy farming experience was highest for households who had access to cooperative (19.5 years) milk market outlet and lowest to households that had access to hotel/restaurant (7 years) market outlet. This indicates that households who had access to cooperative milk market outlet were engaged in crop-livestock production whereas others may be peri-urban households. The mean landholding size was highest for households that had access to cooperative (1.41 ha) milk market outlet and lowest for households who had access to hotel/restaurant (0.48 ha) milk market outlet. The average

distance travelled to the nearest urban milk market was highest to households who had access to cooperative (3.36 km) milk market outlet and lowest to households that had access to hotel/restaurant (1.8 km) milk market outlets. However, the average price offered by cooperative market outlet was 4.5¹ birr which is lower than price offered by other market outlets.

Proportion of household characteristics by milk market outlets is given in Table 2. About 29, 46 and 31% of households that had access to individual consumer, cooperative and hotel/restaurant milk market outlets, respectively had at least a child under the age of six. About 60, 54 and 69% of household heads who had access to individual consumer, cooperative and hotel/restaurant milk market outlets, respectively attended formal schooling. 75, 78 and 77% of households that had access to individual consumer, cooperative and hotel/restaurant milk market outlets, respectively were headed by male. About 31, 50 and 40% of households who had access to individual consumer, cooperative and hotel/restaurant milk market outlets, respectively accessed dairy extension services.

About 76, 85 and 81% of households that had access to individual consumer, cooperative and hotel/restaurant milk market outlets, respectively accessed milk market information services. Households that had access to cooperative milk market outlet received relatively better of the service than others because cooperative were established by government. This was because they were given due attention by government extension services to ensure quality supply, support processing and to access better markets as compared to other outlets. Households who had access to cooperative milk market outlet replied that they did not have any other options as they are far from accessing urban market. About 43, 42 and 17% of households that had access to individual consumer, hotel/restaurant and cooperative milk market outlet, respectively received payment to their sales in cash.

¹ US\$ 1 = Birr 13.632 during the survey period. Birr is the currency unit of Ethiopia.

Table 2. Proportion of household characteristics by milk market outlets

Variable	Category	Proportion (%)		
		Individual consumer (N=118)	Cooperative (N=46)	Hotels (N=118)
Sex of household head	Male	75	78	77
	Female	25	22	23
Education level of head	Formal	60	54	69
	Otherwise	40	46	31
Presence of at least a child under 6 years	Yes	29	46	31
	No	71	54	69
Mode of payment	Cash	43	17	42
	Others	57	83	58
Membership to cooperative	Yes	15	85	25
	No	85	15	75
Access to market information	Yes	76	85	81
	No	24	15	19
Access to dairy extension services	Yes	31	50	40
	No	69	50	60

Source: Authors collection, July and August 2010.

About 85% of households who had access to cooperative market milk outlet were cooperative members. All the households that had access to cooperative milk market outlet replied that they had not received payment for sales made for two months before data collection.

Factors affecting milk market outlet choices

The multinomial logit model has been estimated by the maximum likelihood method. The overall model was significant at 0.01 significance level indicating 99% confidence level that the explanatory variables included in the model assessed the effects on the odds of two market outlets versus sales to individual consumer as indicated by the log pseudo likelihood value of -198.34. Moreover, based on the pseudo R^2 of 0.314, the model appears to have a good fit to the data (Table 3).

The results indicated that households were less likely to access cooperative and hotel/restaurant milk market outlets as compared to individual consumer milk market outlet. Although search, bargaining and delivery costs for access to individual consumer milk market outlet may be high, the preference for accessing it may be an indication of social values attached with. Out of 15 explanatory variables included in multinomial logit model, seven variables to cooperative milk market outlet and three variables to hotel/restaurant milk market outlet were

found to affect milk market outlet choices as compared with accessing individual consumer milk market outlet.

Compared to accessing individual consumer milk market outlet, the likelihood of accessing cooperative milk market outlet was lower among households who owned large number of cows, who considered price offered by cooperative lower than other market outlets and who wanted payment other than cash mode. Households that had access to cooperative milk market outlet received lower price per liter of milk and their mode of sales was not cash. On the other hand, the likelihood of accessing cooperative milk market outlet was higher for households who were cooperative members, who owned large landholding size, who had been in dairy farming for many years and who received better dairy extension services. These households responded that they bypassed access to relatively profitable market outlet (hotel/restaurant) because they considered the opportunity costs in terms of their labor time and transportation, compared to additional profit they could have obtained.

Compared to accessing individual consumer milk market outlet, the likelihood of accessing hotel/restaurant milk market outlet was lower among households who were at farthest distance to the nearest urban center and higher among households who accessed better dairy extension services and who owned large number of dairy cows. Households who owned large number of dairy cows produced more milk and supplied milk to hotel/

Table 3. Results of Multinomial logit regression on milk market outlet choices.

Symbol	Cooperative	Marginal effect (Coop)	Hotel	Marginal effect (Hotel)
Constant	2.653(2.394)	-	0.875(1.191)	-
AGE	-0.029(0.031)	-0.002(0.002)	0.003(0.016)	0.001(0.004)
SEX	-0.255(0.709)	-0.003(0.054)	-0.079(0.334)	-0.025(0.081)
EDU	1.071(0.653)	0.017(0.051)	0.257(0.317)	0.070(0.078)
HSIZE	0.033(0.148)	-0.007(0.012)	-0.072(0.080)	-0.016(0.019)
CHILD	-0.212(0.614)	-0.010(0.041)	0.310(0.347)	0.083(0.083)
DIST	-0.062(0.122)	-0.010(0.011)	-0.234(0.101)**	-0.057(0.025)
COW	-0.797(0.350)**	-0.057(0.027)	0.208(0.108)*	0.050(0.025)
EXT	2.107(0.668)***	0.202(0.116)	0.854(0.325)***	0.210(0.075)
YIELD	0.063(0.042)	0.008(0.003)	-0.025(0.015)	-0.005(0.003)
EXP	0.096(0.034)***	0.008(0.004)	-0.006(0.017)	-0.001(0.004)
INFO	0.569(0.863)	0.049(0.036)	0.265(0.338)	0.065(0.082)
LAND	0.658(0.231)***	0.053(0.024)	0.052(0.132)	0.011(0.030)
PRICE	-1.400(0.377)***	-0.084(0.037)	-0.237(0.158)	-0.056(0.036)
MEMB	4.000(0.727)***	0.517(0.091)	0.422(0.375)	0.102(0.088)
PAY	-2.039(0.821)**	-0.101(0.039)	0.075(0.292)	0.015(0.072)

Number of observation = 282; Wald Chi-Square (30) = 80.09; Log pseudo likelihood = -198.357***; Pseudo R square = 0.314. Source: Authors collection, July and August 2010. ***, **, and * indicate the significance level of 1, 5 and 10%, respectively. Numbers in brackets indicate robust standard error.

restaurant as they have capacity to absorb supplied milk. Households who are at farthest to access hotel/restaurant milk market considered transaction costs of travelling as a hindering factor and thus accessed neighborhood individual consumer milk market outlet.

Milking cow ownership

Number of milking cows owned by households negatively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect indicates that the likelihood of accessing cooperative milk market outlet decreases by 5.7% for an increase in ownership of milking cow by a TLU as compared with accessing individual consumer milk market outlet.

Milk price by market outlets

Price offered by milk market outlet per liter of milk significantly and negatively affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect shows that the likelihood of accessing cooperative milk market outlet decreases by 8.4% for a birr increase per liter of milk as compared with accessing individual consumer milk market outlet.

Access to dairy extension services

Access to dairy extension services such as dairy techno-

logy, information, training, field days, field visits and field tours received by households positively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect shows that the likelihood of accessing cooperative milk market outlet increases by 20.2% as compared with accessing individual consumer milk market outlet for one more member access to dairy extension services.

Dairy farming experiences

Number of years a household has been in dairy farming positively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect indicates that the likelihood of accessing cooperative milk market outlet increases by 0.8% as compared with accessing individual consumer milk market outlet for an increase in dairy farming experiences by a year.

Landholding size

Landholding size of households positively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect of landholding size shows that the likelihood of accessing cooperative milk market outlet increases by 5.3% as compared with accessing individual consumer milk market for a hectare

increase in landholding size.

Cooperative membership

Membership to cooperative positively and significantly affected accessing cooperative milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect indicates that the likelihood of accessing cooperative milk market outlet increases by 51.7% as compared with accessing individual consumer milk market outlet for an addition of a household who has membership to cooperative.

Distance to the nearest urban center

Distance to the nearest urban center negatively and significantly affected accessing hotel/restaurant milk market outlet as compared to accessing individual consumer milk market outlet. The marginal effect indicates that the likelihood of accessing hotel/restaurant milk market outlet decreases by 5.7% as compared with accessing individual consumer milk market outlet for a km distance away from the nearest urban center.

Milking cow ownership

Number of milking cows owned by a household positively and significantly affected accessing hotel/restaurant milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect indicates that the likelihood of accessing hotel/restaurant milk market outlet increases by 5% as compared with accessing individual consumer milk market outlet for an increase in milking cow ownership by one TLU.

Access to dairy extension services

Access to dairy extension services positively and significantly affected accessing hotel/restaurant milk market outlet as compared with accessing individual consumer milk market outlet. The marginal effect shows that the likelihood of accessing hotel/restaurant milk market outlet increases by 21% as compared with accessing individual consumer milk market outlet for an addition of a household who accessed dairy extension service.

Conclusion

The study was undertaken with the objective of assessing factors affecting milk market outlet choices in *Wolaita* zone, Ethiopia. Using farm household survey data from 394 households and Multinomial Logit Model, milk market

outlet choices were analyzed. Multinomial Logit model results indicate that compared to accessing individual consumer milk market outlet, the likelihood of accessing cooperative milk market outlet was lower among households who owned large number of cows, who considered price offered by cooperative lower than other market outlets and who wanted payment other than cash mode. The likelihood of accessing cooperative milk market outlet was higher for households who were cooperative members, who owned large landholding size, who had been in dairy farming for many years and who received better dairy extension services. Compared to accessing individual consumer milk market outlet, the likelihood of accessing hotel/restaurant milk market outlet was lower among households who were at far away from the nearest distance to the nearest urban center and higher among households who accessed better dairy extension services and who owned large number of dairy cows. As one of the key factor to boost milk market outlet choices, dairy extension services should be strengthened through redesigning or reforming implementation strategies or improving/strengthening existing policy. It should be strengthened to enable farmers produce surplus milk for markets and should devise means to reduce local milking cow numbers by replacing them with crossbred cows. Moreover, governments should strengthen milk processing cooperatives and improve their infrastructure facilities.

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