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Determinants of Cattle Market Participation Decisions by Smallholder the Case of Wolaita Zone, SNNRP, Ethiopia

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Abstract
This study was initiated to analyze determinants of cattle market participation with special emphasis to Wolaita Zone of SNNPR of Ethiopia. The main objectives of the study were, to examine the level of cattle keeper market participation and determinants of value of cattle marketed and factors influencing their participation level in the study area. Both primary and secondary data sources were used and a total of 150 cattle keeper sample households from two potential cattle producing Woredas of the Zone were surveyed. Heckman two stage models was applied to identify factors affecting the cattle keeper' participation decision in cattle marketing and value of cattle marketed in the study area. Results from Heckman's two stage shows among eighteen explanatory variables hypothesized to affect cattle market participation decision age of the household head, number of cattle owned, access to grazing land, access to market and lagged price as significant. Access to credit, total number of cattle owned, lagged price of cattle, access to market information and number of new born calves were also found to be significant variables influence the value of cattle marketed. The findings suggests that, effective market information service has to be established to provide accurate and timely market information to cattle keeper on current supply, demand and prices of cattle at national and regional levels. Concerned bodies government and non government organization may act on improved feed production and conservation technologies.
Keywords: Market participation decision, Value of cattle marketed and Heckman's two stage

Introduction

The estimates of Ethiopia's livestock population in 2012/13 indicated that the counter stands first in Africa with 53.99 million cattle, out of which female cattle constitute about 55.48% and 44.52% males; 98.95% of the total cattle are local breeds and the remaining are hybrid (0.94%) and exotic breeds (0.11%), Over 60% of the cattle and sheep are reported to be found in the high lands, while goats and camels are predominantly found in the low lands (CSA,2013). Livestock rising always has been largely a subsistence activity. They are raised in all of the farming systems of Ethiopia by pastoralists, agro-pastoralists, and crop/livestock mixed farmers. Livestock play a vital role in economic development, particularly as societies evolve from subsistence agriculture in to cash-based economies (Agajie et al.,2002). The contribution of the livestock sector is estimated to be about 12 to 16% of the total growth domestic product (TGDP). However the market participation of smallholder of developing countries including Ethiopia is characterized by unpredictability, uncertainty and risk. Meanwhile, smallholders are often ill-equipped or resource poor to respond to the rapidly changing market conditions and weak capacity in competition to take advantage of the opportunities in the market (Killick et al, 2000).

Ana *et al.* (2008), defined market participation in terms of sales as a fraction of total output, for the sum of all agricultural crop production in the household which includes annuals and perennials, locally-processed and industrial crops, fruits and agro-forestry. This sales index would be zero for a household that sells nothing, and could be greater than unity for households that add value to their crop production via further processing and/or storage. On the other hand, the commonly approach in the literatures is to divide the market participation decision into two stages. In the first stage, households that produce a particular commodity decide whether to be net buyers, net sellers, or autarkic in the market for that commodity. In the second stage, net buyers and net sellers determine the extent of market participation (Goetz, 1992; Key *et al*., 2000; Holloway *et al*., 2005; Bellmare and Barrett, 2006).

As argued by Reardon and Timmer (2005), market participation is both a cause and a consequence of economic development. Markets offer households the opportunity to specialize according to comparative advantage and thereby enjoy welfare gains from trade. Recognition of the potential of markets as engines of economic development and structural transformation gave rise to a market-led paradigm of agricultural development. He explained further as households' disposable income increases, so does demand for variety in goods and services, thereby inducing increased demand-side market participation, which further increases the demand for cash and thus supply-side market participation.

Market participation of smallholder farmers and intermediaries is affected by numerous factors, including government policies relating to infrastructure development, price controls and taxes. Socio-economic factors, cultural factors and external factors such as political stability of the nation, natural disasters and calamities also affect market participation. These factors could have positive or negative effects, which could either improve or cause a decline in the welfare of the actors. The point of departure is that greater market

participation of farmers and intermediaries results in more commodities being traded and this may lead to more revenue being obtained by the actors. In the case of farmers, this becomes an incentive to increase production and hence a positive supply response is achieved (Escobal and Torero, 2006; Omiti et al., 2009). With regards to cattle keeper market participation level, factors influencing their participation and value obtained as market participants were not studied. Therefore this study was conducted to analyze cattle keeper market participation level, factors influencing their participation and value obtained as market participants in Wolaita zone southern Ethiopia.

2. RESEARCH METHODOLOGY

This chapter presents description of the study areas, source and types of data requirement, sample size determinations and sampling technique use, methods of data collection. It also contains data analysis both in terms of descriptive and econometrics approaches followed.

2. 1. Description of the Area

SNNPR is located in the south and south western part of the country and cover an area of 113,639 km^2 which is about 10 percent of the total area of the country Boarded with Oromia region in the east and southeast with Sudan and Gambella region in the west and with Kenya in the south. The latitudinal range of the region is from 500 to over 3000 meter above sea level Four major Agro ecologies, semi-desert (6.2%), Kolla (49.8%), Dega (6.5%), Weyena Dega (36%), and Perch (0.7%) exist in the region (BOFED,1998).

The population of the region was 15,042,531 million of which male 49.74% and female 50.26% (CSA, 2007).The highest population of the region is located in Gedio Zone of Wango Woreda which is about 890 persons per kilometer square and the least population in the south Omo Zone which is about three people per kilometer square (WZFEDD,2004)

Wolaita is one of the 13 Zones found in the southern region and located 390 km southwest of Addis Ababa and 165 km from the capital city of the region, Hawassa .Astronomically the area is located between6.47^0 N-7.1^0 N latitude and 37.4^0 E-$38.^0_E$ longitudes. It is bounded by Kambata-Tambaro and Hadiya zone in the North, Gamo Gofa Zone in the South, Dawro Zone in the West, Sidama Zone in East and Oromia region in the South east. Nowadays the area has12 Woredas (7 formers and 5 news) namely Kindo Koyisha, Boloso Sorie, Offa, Sodo Zuriya, Damot Woyede, Humbo, and Damot Gale are the former ones While Bombe Boloso, Damot Sorie, Duguna Fango, Kindo Didaye and Shanto are the new ones. Its total areas is 4383km square (438370 ha) (ibid).

According to CSA (2007) census result the population size of Wolaita Zone was 1,527,908 million of which male 49.2% and female 50.8%. Wolaita Zone is one of the most densely populated areas in the region next to Gedio zone. For instance a population density of about 600 people per kilometer square was recorded in Damot Gale Woreda within the Zone. The annual growth rate is estimated to more than 3% with population density of 342 persons per square kilo meter and average size of 7.3 persons per house hold (WZFEDD, 2004). The economic base of the area is agriculture. It employs 92% of total population and mainly mixed farming system is dominant in the zone. It has mean annual temperature of 19^0_c. Wolaita has a bimodal rainfall pattern. The first and short rainy period is (Belg/Boniya) occurs from March to May, while the second main rainy period (Kiremt/Balguna) occurs from July to October. The average rain fall is 1014mm. Wolaita Zone has moderately drained soils (nitosols), it is representative of medium altitude, medium rainfall and acid soil areas of western Ethiopia. Wolaita has an Enset based mixed farming system where Enset is a co-stable food together with cereals root and tuber crops.

2.1.1. Sodo Zuriya Woreda

Sodo Zuriya Woreda is bounded in the East and North East by Damot Woyede and Damot Galle Woredas, in the South by Humbo and Offa Woredas, in the West, Northwest and Southwest by Kindo Koyisha, Boloso Sorie and Offa Woredas respectively. Astronomically, the Woreda is located approximately between 6o 50'N-7o53'N and 37o36'E-37o 53'E. Most of the land area of the Woreda is found in the altitude range 1400 meter above sea level to 2950 meters above sea level at Damota Mountain. The land area of the Woreda is dominated by rolling hills, plateaus and plains that extend into the low lands of Damot Woyede and Humbo Woredas which are part of the lowlands of rift valley that extend to lake Abaya. Most part of the Woreda experience Weyena Dega (warm to cool) type of climate. Except the mount Damot top areas that experience colder climate some times. The South and south west peripheries of the Woreda experience a transitional type of climate warm to hot (Weyena Dega to Kolla) mainly due to the South east rift valley that cross the surrounding Woredas (Damot Woyede and Humbo) and run in to the low lands of lakes Abaya and Chamo which are rift valley lakes. The climatic condition of the Woreda is similar to most of southern parts of the country. The maximum (summer) rain fall comes between June-August and the minimum (spring) rainfall very important for agricultural activities in the Woreda comes between March to May. Maximum rainfall ranges between 1200mm- 1300mm per annum. Maximum Temperature also ranges between 20 ^{0}C-25 ^{0}C and average minimum temperatures of10 ^{0}C-15 ^{0}C.

Sodo Zuriya covers an area of 481.25 square kilometer. The total population is about 163,771. And the

crude density is about 417.6 people per kilometer square. From the total population 49.2 and 50.8% are males and females, respectively (CSA, 2007). The main crops are maize, beans, sweet potatoes and "teff", which are harvested from June to November. Small amounts of other root crops (taro, yams, cassava, and Irish potatoes), wheat and sorghum are also grown. Maize and beans are intercropped, while sweet potatoes and "teff" are grown in single stands. Land use is intensive, with a second cycle of crops often planted as soon as the previous crop is harvested. Cash income is obtained from the sale of "teff", coffee, maize, root crops livestock and livestock products.

2.1.2. Damot Gale Woreda

Damot Gale is one of the 77 woredas in the SNNPRS. It is part of the Wolaita Zone. Damot Gale is bordered on the south by Sodo Zuria, on the west by Boloso Sore, on the north by the Hadiya Zone, and on the east by Damot Woyede. The major town in Damot Gale is Boditi. Based on figures published by the Central Statistical Agency in 2007, this woreda has an estimated total population of 311,560 (50.7% males and 49.3% females); 24,281 or 7.79% of the population are urban dwellers. With an estimated area of 429 Km^2, Damot Gale has a population density of 726 persons Km^2.

Total annual rainfall is in the range 800-1,000 mm (long-term average). The main production season runs from March to November, beginning with the *belg* rains and continuing into the *kremt*. The main crops are maize, beans, sweet potatoes and teff, which are harvested from June to November. Small amounts of other root crops (taro, yams, cassava, and Irish potatoes), wheat and sorghum are also grown. Maize and beans are intercropped, while sweet potatoes and teff are grown in single stands. Land use is intensive, with a second cycle of crops often planted as soon as the previous crop is harvested. Cash income is obtained from the sale of teff, coffee, maize and root crops. Coffee, "teff" and potato are grown mainly as cash crops. Maize also plays a vital role in cash generation activity. All types of livestock are reared in both Woredas. Among livestock cattle is the first ranked in contributing for livelihood of household as source of income and used for draft power. The cattle breed found in both Woredas are short horn zebu and few cross breed cattle. Fattening of oxen for local market and Addis Ababa terminal market provides an important source of cash income for the zone. Typically oxen are purchased at the beginning of the year. After being used for plowing they are then fattened for sale at *Meskel*e a first big holiday among others in Wolaita. Households of both Woreda have a traditional fattening experience and the meat of Wolaita bull is favored for its tenderness by many consumers in the Zone**.**

2.2. Type and Sources of Data

The data for the study were collected from both primary and secondary sources. Primary data were collected using two types of questionnaire, one for cattle keeper household and the other for cattle traders. A checklist was also used to guide the informal discussion conducted to generate data that could not be collected from individual interviews. Primary data collected from households were focused on factors affecting market participation decisions, value of cattle marketed, access to market, market information, total annual income of the households' annual income from non-farming activities, livestock ownership, land holding, agricultural extension service contact, credit access, veterinary service, farmers training, etc. from farmers using pre-tested questionnaire. Secondary data on prices, number of licensed cattle traders, and traders' legal requirement to enter cattle trading business were collected from Central Statistical Authority (CSA), Woreda and zonal planning offices, Woredas branch offices of Ministry of Agriculture, and Disaster Prevention and Preparedness Offices of Woredas and web site.

2.3. Sampling Technique and Procedures

Multiple -stage sampling techniques were used to draw sample cattle farmers. First, two Districts Sodo Zuriya and Damot Gale were selected from the Zone through purposive sampling approaches. During the selection, the Woreda*s* potential for cattle production, number of cattle market existed and the accessibility of the areas to travel were taken into consideration. In the second stage, using systematic random sampling three and two Kebele Administrations were selected from Sodo Zuriya and Damot Gale Woreda*s*, respectively. In the third stage, population list of cattle keeper household from selected Kebele Administrations were determined proportionally to population size of cattle farmers in the sample Kebele Administrations. From the 31 KAs, of Sodo Zuriya three KAs were selected randomly and from the three KAs, 30 cattle keeper households from each KA were selected and a total of 90 cattle keeper households were selected. From the 30 KAs, of Damot Gale two KAs were selected randomly. From the two KAs, 30 farmers from each KA were selected and a total of 60 farmers were selected and interviewed using systematic random sampling technique. So that150 households were selected and interviewed from both Woredas.

2.4. Methods of Data Collection

A formal survey was employed for the collection of primary data. Before starting the actual data collection, five enumerators who have college diploma and working as development agents were recruited and trained for data

collection. Necessary cares were taken in recruiting the enumerators and strict supervision were made during the course of survey work. The enumerators were fluent speakers of the local language. An intensive training was given on data collection procedures, interviewing techniques and the detailed contents of the questionnaire for two consecutive days in each Woreda independently. Before data collection, the questionnaire was pre-tested on five cattle keeper households and three traders to evaluate the appropriateness of the design, clarity and interpretation of the questions, relevance of the questions and time taken for an interview. Hence, appropriate modifications and corrections were made on the questionnaire. Data were collected under continuous supervision of the researcher.

The survey work for the collection of primary data was done from August, 2011 to December, 2011. It was found convenient to interviewed two members of household (the head of household and spouse, where applicable) in order to improve the accuracy of the data and reduced the problem of memory lapses. Personal observations of physical features, informal discussions with households and DAs of the selected Kebeles were also made. Moreover, secondary data were obtained through discussions with concerned expertise and officials of line-offices of the respective Woredas. District Offices of Rural and Agricultural development (DoRAD), District Offices of Finance and Economic Development (DOFED), are some of the district offices from which secondary data were obtained. In addition to the questionnaire survey, an informal survey in the form of Rapid Market Appraisal (RMA) technique was conducted using checklist for both households and trader in order to get the overall picture of cattle marketing chain. The discussions were made with key informant households, traders, and agricultural and relevant experts from both government and non-government organizations. RMA was made independently for each group before and parallel with questionnaire survey.

2.5 Data Analysis

2.5 .1 Descriptive

The data collected from the cattle keeper households and other sources was analyzed using descriptive statistics. The descriptive statistics analysis employed using diagrams, charts, ratios, percentages, means and standard deviations in examining the cattle marketing chain as well as households demographic and socio-economic characteristics

2.5.2 Econometric analysis

Econometric model was also being applied with the help of statistical software packages such as SPSS and STATA. To look at factors that increase the level of participation in the cattle market chain ideally, the OLS model is applicable when all households participate in the cattle value addition and market. In reality, all households may not participate. Some households may not prefer to participate in a particular market in favor of another; while others may be excluded by market. If the OLS regression is estimated excluding the non-participants from the analysis, the model would have sample selectivity bias problem (Gujarati, 2003). If only the probability of selling is to be analyzed, Probit or Logit models would be adequate techniques for addressing it. But if one is interested to know factors that influence the level of sales, at the same time, there is a need for a model that is a hybrid between the Logit or Probit and the OLS. The appropriate tool for such is the Tobit model that uses maximum likelihood regression estimation.

According to Gujarati (2003) a sample in which information on the regressand is available only for some observations are known as a censored sample**.** The Tobit model is also known as a censored regression model originally developed by James Tobin**.** Some authors call such models limited dependent variable regression models because of the restriction put on the values taken by the regressand. Hence, a Tobit model answers both factors influencing the probability of selling and factors determining the magnitude of sale.

Following the Tobit model specified in Maddala (1992), the maximum likelihood Tobit estimation (Tobin, 1956) with left-censoring at zero is specified as:

$$Y^*_i = \beta_0 + \sum_{i=1}^{m} \text{遡} X_i + U_i, \quad i = 1, 2 \ldots m \qquad (1)$$

Where $Y = Y^*$, if $Y^* > 0$, $Y = 0$ if $Y^* \leq 0$ and $Y = \max(Y^*, 0)$

Where Y^*_i = market supply of cattle (dependent variable)

β_0 = an intercept

β_i = coefficients of i^{th} independent variable

X_i = independent variable, and 'i' is 1, 2, 3… m

U_i = unobserved disturbance term

The model parameters are estimated by maximizing the Tobit likelihood function of the following form:

$$L = \prod_{y^*>0} \frac{1}{\delta} f\frac{(Y - \beta_i X_i)}{\delta} \prod_{y^* \leq 0} F\frac{(-\beta_i X_i)}{\delta} \qquad (2)$$

Where f and F are respectively, the density function and cumulative distribution function of $Y_{i*}\prod_{yi*}>0$ means the product over those i for which $y_{i*}>0$, and $\prod y_{i*} \leq 0$ means the product over those i for which $y_{i*} \leq 0$. β is a vector of tobit maximum likelihood estimates and σ is the standard error. Since Tobit model has some notable limitations, it can be remedied with the use of a sample selection model in its place. Firstly, in the Tobit model, the same set of variables a coefficient determine both the probability that an observation will be censored and the value of the dependent variable. Secondly, this does not allow a full theoretical explanation of why the observations that are censored are censored (Blaylock and Blisard, 1993). Sample selection models address these shortcomings by modifying the likelihood function.

According to Heckman (1979), sample selection bias may arise in practice for two reasons, first there may be self-selection by an individual or data units being investigated. Second sample selection decision by analysts or data processors in much the same fashion as self-selection. Selective samples may be the result of rules governing collection of data or the outcome of economic agent's own behavior. The latter situation is known as self-selection. Statistical analyses based on those non-randomly selected samples can lead to erroneous conclusions and poor policy (Heckman, 2008).

The Heckman's correction, a two-step statistical approach, offers a means of correcting for non-randomly selected samples. The first stage formulates a model for the probability of participation used to predict the probability for each individual and then in the second stage, removing the part of the error term correlated with the explanatory variables and avoiding the bias. Though the Heckman procedure was easy to apply and it yields consistent estimates of the parameters, they are not as efficient as the ML estimates (Gujarati, 2003). Hence, in this analysis Tobit used for comparison purpose and was discussed whenever needed. Study by Makhura (2001), Rehema (2006) also used Tobit for comparisons for market participation.

James Heckman has proposed an alternative to the ML method, which is comparatively simple. This alternative consists of a two-step estimating procedure. In the first stage, a 'participation equation', attempts to capture factors affecting participation decision of farmer/cattle producer. The second stage provides heckit analysis that determines the level of participation. The probability of participation was modeled by Maximum Likelihood Probit, from which the inverse Mill's ratios were estimated. The specifications for Heckman's two stage models are as follows:

i. The participation Equation: The Probit model is specified as:

$Y_i = x_i'\beta_i + \varepsilon_i, \quad i = 1 \ldots n$ (3)

$Y_i = 1$ if $Y_i > 0$, otherwise $Y_i = 0$ Where, Y^*_i is the latent dependent variable which is not observed and Yi is a binary variable that assumes 1 if household *i*, sells cattle and 0 otherwise

β_i is a vector of unknown parameters in participation equation.

x_i is a vector of explanatory variables in the probit regression model.

ε_i, is random error term that are assumed to be independently and normally distributed with zero mean and constant variance.

ii. Regression: Selection model is specified as:

$Y_i = x_i'\beta_i + \mu\lambda_i + \eta_I$ (4)

Where Yi, is the value of cattle marketed in year 2011/12

β_i, are the explanatory variables determining value of cattle marketed

x_i is unknown parameter to be estimated value of cattle marketed

μ is a parameter that shows the impact of participation on the value of cattle marketed,

η_i is the error term corrected for selectivity bias

Lambda, which is related to the conditional probability that an individual household will decide to participate (given a set of independent variables), is determined by the formula.

$$\lambda_i = \frac{f(\chi\beta)}{1 - F(\chi\beta)} \quad (5)$$

Where $f(\chi\beta)$ is density function and $1 - F(\chi\beta)$ is distribution function

An econometric Software known as "LIMDEP" was employed to run the models (Tobit and Heckman two-stage selection). Before fitting important variables in the models (Tobit and Heckman two-stage selection) it was necessary to test multicollinearity problem among continuous variables and check associations among discrete variables, which seriously affects the parameter estimates. As Gujarati, (2003) indicates, multicollinearity refers to a situation where it becomes difficult to identify the separate effect of independent variables on the dependent variable because existing strong relationship among them. In other words, multicollinearity is a situation where explanatory variables are highly correlated.

There are two measures that are often suggested to test the existence of multicollinearity. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and Contingency Coefficients (CC) for dummy variables. Thus variance inflation factor (VIF) was used to check multicollinearity of continuous variables. As R^2 increase towards 1, it is a collinearity of explanatory variables. The larger the

value of VIF, the more troublesome or collinear is the variable X_i. As a rule of thumb if the VIF greater than 10 (this will happen if R^2 is greater than 0.80) the variable is said to be highly collinear (Gujarati, 2003). Multicollinearity of continuous variables can also be tested through Tolerance. Tolerance is 1 if X_i is not correlated with the other explanatory variable, whereas it is zero if it is perfectly related to other explanatory variables.

A popular measure of multicollinearity associated with the VIF is defined as

$$\text{VIF } (X_j) = \left(1 - R_j^{\ 2}\right)^{-1} \quad (6)$$

Where, $R_j^{\ 2}$ is the multiple correlation coefficients between explanatory variables, the larger the value of R_j^2 is, the higher the value of VIF (X_j) causing higher collinearity in the variable (X_j).

Contingency coefficient is used to check multicollinearity of discrete variable. It measures the relationship between the raw and column variables of a cross tabulation. The value ranges between 0 - 1 , with 0 indicating no association between the raw and column variables and value close to 1 indicating a high degree of association between variables. The decision criterion (CC $\leq$0.75) is that variables with the contingency coefficient is computed as follows

$$CC = \sqrt{\frac{\chi^2}{N + \chi^2}} \quad (7)$$

Where, CC is contingency coefficient, χ^2 is chi-square test and N is total sample size.

As cited in Paulos (2002), if the value of CC is greater than 0.75, the variables are said to be collinear.

2.6. Hypothesis and Definitions of Variables

In the course of identifying factors influencing market participations, the main task is to analyze which factor influences and how? Therefore, potential variables, which are supposed to influence cattle market participation and value of cattle marketed, need to be explained. Accordingly, the major variables expected to have influence on both cattle keeper household market participation decision and value of cattle marketed was explained as follows:

2.6.1. Dependent variables

1) Market participation decision (MKT_PART): The dummy participation decision variable is the dependent variable that is regressed in the first stage of the Heckman two stage estimation procedures. For households who participate in cattle market = 1, and = 0 for the households who did not participate in 2011/12.

2) Value of cattle marketed (VCMTD): It is a continuous variable which represents the actual value (birr) obtained from cattle marketed by sample cattle keeper household in year 2011/12.

2.6.2. Independent variables

Age of the household head (AGE): Age is continuous variable and measured in years. The expected influence of age could assumed positive taking the presumption that as households' gets older they could acquire skills and hence produce much and developed skills to participate to a market. It is also a proxy measure of farming experience. Gebremedhin and Hoekstra (2007) in their study found that there is a U-shaped relation between age of household head and market orientation of household in the cereal crops. On the other hand Tshiunza, et al (2001) used age as the major farmers' characteristics that significantly affected the proportion of cooking banana planted for market. He found that younger farmers tended to produce and sale more cooking banana for market than older farmers. Aged households are believed to be wise in resource (cattle) management and use of them. They consider cattle us assets which will be sold during risk time, on the other hand young household heads have long investment horizon. Therefore, it was expected to have either positive or negative sign on market participation and value of cattle marketed.

Sex of the household head (SEX): This is a dummy variable. No sign could be expected a priori for this variable. It could take positive or negative signs. A study by Makhura (2001) on the households' participation process in livestock markets indicated that women are more inclined to sell their livestock than men. A study by Lewis *et al. (*2008) on gender difference and the marketing styles at Oklahoma wheat producers showed that men tend to sell grain more frequently than women (men trade more than women) and women tend store.

Education status of household head (EDUCHHD): This is a dummy variable with a value of one if a household head is literate and zero otherwise. Those household heads who have formal education determines the readiness to accept new ideas and innovations, and hence promote to get supply, demand and price information and this enhances farmers' willingness to participate and increase value of sale. Holloway et al. (1999) found significant and positive effect of education and visits by an extension agent on quantity of milk marketed in Ethiopian highlands. Therefore, education status was hypothesized as it influences household cattle market participation and value of cattle marketed positively.

Credit Access (CREDITA): This is a dummy variable with a value of one if a household head is accessed to credit zero otherwise. Study by Black and Knutson, (1985) in Texas survey showed credit users showing better production and market participation among cooperative members. Access to credit would enhance the financial capacity of the cattle keeper to purchase necessary inputs for the production of cattle. Therefore, it is hypothesized that access to credit to have positive influence on cattle market participation and value of cattle marketed.

Market information (MAINFO): It is a dummy variable with a value of one if a household head is accessed to market information and zero otherwise. Farmers marketing decisions are based on market price information, and poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. Therefore, it is hypothesized that market information is positively related to cattle market participation and value of cattle marketed. In his study of household food marketing behavior, Goetz (1992) found that better information, significantly raises the probability of market participation for potential selling households Access to information, provided through mass media or from extension agents, reduces risk perceptions of farmers (Siziba *et al*, 2011).

Access to Market (AMKT): It is a dummy variable with a value of one if a household head has access to market and zero otherwise. It was hypothesize that access to market is positively related to cattle market participations and value of cattle marketed.

Distance to the market (DTMK): It is a continuous variable measured in kilo meters which households spend time to reach the nearest market. If the household is located in a village or distant from the market, he is poorly accessible to the market. The closer to the market the lesser would be the transportation cost and time spent. A similar study was conducted by Holloway et al (1999) milk-market development in the Ethiopian highlands. His result indicates that distance-to market causes market surplus to decline. A study conducted by Embaye, *et al.,* (2010) on butter supply chain in the case of Atsbi wenberta and Alamata woredas reveals that distance to market was negatively related to market participation decision. Therefore, it was hypothesized that this variables negatively related to cattle market participation and value of cattle marketed.

Total grazing land size (TGLS): It is a continuous variable. This is a total size of grazing land owned by a household measured in *timad.* It is among the variables that could influence both participation and value of cattle marketed. If a household owns more grazing land, the probability of allocating land for cattle would increase. Hence it expected to positively influence cattle market participation decisions and value of cattle marketed.

Total cattle owned (TCOW): It is continuous variable measured in number. This variable is expected to influence market participation and value of cattle marketed. The number of cattle kept is expected to have positive relation to market participation and marketable surplus. As the cattle owned increases, the probability to participate in market and value of cattle marketed will increase. Therefore this variable was expected to influence market participation and value of cattle marketed positively.

Other Tropical livestock Unit owned (**OTLU**): Is a continuous independent variable indicating total livestock holding of the household in (TLU), which excludes cattle. This shows that cattle keeper have an alternative source of income rather than selling cattle and this variable was expected to influence market participation and value of cattle marketed negatively.

Income from non-farm activity (NFRMINC): It is continuous variable measured in Ethiopian Birr (ETB). The variable represents income originating from different sources other than cattle production obtained by household head. This income might strengthen their farming business or might made reluctant to keep cattle in favor of other farming activities. However, getting income from non-farming activities may be used to purchase inputs for cattle. Thus, this variable was assumed to have direct or inverse relationship with market participation and value of cattle marketed.

Lagged price (last year price) (LAG_PR): This is a continuous variable that measured annual average price of cattle in the reference market in 2010/11 i.e. the one year lagged price of cattle. When cattle price is high in the market in the previous year, cattle keepers would be interested to produce and supply more. The study of Goetz (1992) on household marketing behavior in Sub-Saharan Africa found a significant positive relationship between grain price and the probability of quantities sold. Therefore average lagged price was expected to have positive relation with cattle market participation and value of marketed.

Access to Extension service (ACCEXT): This variable is measured as a dummy variable taking a value of one if the household has access to cattle production extension service and zero otherwise. According to Holloway *et al*., (2000) access to extension service widens the household's knowledge with regard to the use of improved honey production technologies and has positive impact on honey market participation decision and value of honey marketed. Therefore access to extension service was assumed to have direct relation with cattle market participation and value of cattle marketed.

Transaction costs (TC). This is a continuous variable that measured in Ethiopian Birr (ETB). In general, households with lower transaction costs will be more likely to participate in markets, sell more, and increase value of cattle marketed as they are more likely to recover their production and marketing costs. Therefore it was

expected to influence cattle market participation decisions and value of cattle marketed negatively.

Farmer training (FTRAIN): This variable is measured as a dummy variable taking a value of one if the household has access to training service and zero otherwise. It refers to transferring knowledge and skills of cattle production, marketing, record keeping and general entrepreneurship to households. According to Coetzee *et al.,* (2004) training received by small-scale cattle farmers considered as improves their knowledge and understanding of livestock production and marketing, and thus was affect the level of off-take. Hence it was hypothesized that it influences cattle market participations and value of cattle marketed positively.

Mortality (MORT): This is a continuous variable that is measured in number. Mortality translates into small herds from which fewer animals would be available for sales. The higher the rate of mortality the lower was the participation of cattle farmers in the cattle markets. It was hypothesized that mortality influence market participation and value of cattle marketed.

Births (BIRTH): This is a continuous variable that measured in number. Births refer to the natural increase of cattle. Changes taking place in the herd through births directly determine the availability of a marketable surplus. It was hypothesized that as more calves are born, the bigger the herd size will be and more marketable surplus will be available. Therefore it influences market participations decisions and value of cattle marketed positively.

Table 1: Description of the dependent and independent variables used in the model.

Variable	Description	Type	Value
Dependent Variable			
PARTCIPAT	Participation on cattle supply	Dummy	0=no and 1=yes
VALCSALSD	Value cattle sold in birr	Continuous	
Independent Variables			
SEX -/+	Sex of household head	Dummy	0=male and 1=female
AGHD -/+	Age of house hold head	Continuous	
EDUCHHD(+)	Education status of house hold head	Dummy	0=illiterate and 1=literate
YCFM(+)	Years' in cattle farming	Continuous	Number of years
FRMSYS(+/-)	Farming system	Dummy	0=only livestock and 1=crop and livestock
CREDITA(+)	Credit Access	Dummy	0=no and 1=yes
ACCEXT(+)	Access to cattle production extension service	Dummy	0=no and 1=yes
MKINFO(+)	Market information access	Dummy	0=no and 1=yes
ACTMK(+)	Access to market	Dummy	0=no and 1=yes
TC(-)	Transaction cost	Continuous	Value in birr
TGLS(+)	Total grazing land size	Continuous	Size in timad
TCOW(+)	Total cattle owned	Continuous	Number of cattle
OTLU(-)	Tropical livestock unit owned	Continuous	Number of livestock in TLU
DAMK(-)	Distance from market	Continuous	Distance in km
NFRMINC(+/-)	Income from non-farm activity	Continuous	Number of cattle
LAGPR(+)	Lagged price (last year price)	Continuous	Value in birr
FTRAIN(+)	Farmer training	Dummy	0-no and 1-yes
BIRTH(+)	New born cattle	Continuous	Number of cattle
MORTA(-)	Mortality of cattle	Continuous	Number of cattle

Source: own computation, 2011/12

3. Result and Discussion

3.1 Socio-Demographic characteristics of sample households and traders

In this part of the thesis, socio demographic characteristics of households (sex, age, education status, marital status etc), socio economic characteristics(annual income of farming, annual income of non farming, resource ownership), access to market, extension, credit, veterinary, training, grazing land and information access, farming and non-farming experience and traders' demographic characteristics,(sex, age, educational status and marital status) of traders, capital (physical, social and financial) requirement, relationship with seller of cattle are discussed one after the other.

3.1.2. Socio-demographic characteristic of sample households

Household characteristics, namely sex, age, religion, marital status, education, are believed to influence production and marketing decision of cattle keeper in different aspects. The number of sample households handled during the survey were 150.The results of the study revealed that the average age of total sample

households was about 43.3 years. Mean age of cattle market participants were 42.9 years while that of non participants were 43.5 years. Thus there is statistically significant difference at 10% significance level between the two groups with regards to age of household head. In the case of sex of the household head 93.3 and 6.7% non participants were male and female headed households, respectively whereas 97.8 and 2.2% of cattle market participants were male and female headed households, respectively. With regard to education status of the two groups 73.3% cattle market participants and 51.4% non participants were literate. On the other hand 48.8 and 26.7% non-participants and cattle market participants were illiterate, respectively. Education statuses of the households were significant at less than 1% level between two groups.

Table 2: Demographic characteristic of sample households

Descriptions	Participants (N=45)	Non participants (N=105)	Total (N=150)	t/X^2
Sex				
Male	44(97.8)	98(93.3)	142(94.7)	
Female	1(2.2)	7(6.7)	8(5.3)	
Age (HHH) mean	44.15	42.57	43.3	-0.533*
Educational status				
Illiterate	12(26.7)	51(48.8)	63(42)	6.205***
Literate (read and write)	33(73.3)	54(51.2)	87(58)	
Education level(mean)	2.914	2.61		0.008***
Religion				
Orthodox	26(57.8)	47(44.7)	73(48.7)	5.648
Protestant	18(40)	44(42)	62(41.3)	
Muslim	1(2.2)	4(3.8)	5(3.3)	
Catholic	0(0)	10(9.5)	10(6.7)	
Marital Status				
Married	44(97.8)	98(93.3)	142(94.7)	1.431
Divorced	0(0)	2(1.9)	2(1.3)	
Widow	1(2.2)	5(4.8)	6(4)	

Source: Survey result, 2011/12 N= Sample Size

Concerning the religious of the sample household as indicated in (Table 2), about 57.8% of cattle market participant were Orthodox, about 40% were protestants and the remaining 2.2 % were Muslim, while 44.7%, 42%, 9.5% and 3.8% of non participants were belong to orthodox, protestant, catholic and Muslim, respectively.

3.1.2. Socio economic characteristics of sample households

The socioeconomic characteristics of households considered type of houses, land holding, livestock holding and off-farm income as shown in (Table 3). Rural income generating activities encompass agricultural production (mainly crops and animal husbandry), agricultural and non-agricultural wage employment, non-farm enterprises, transfers and non-labor income sources. Cattle keepers of the study area practice various livelihood and income generating activities in addition to crop production and animal husbandry, handicraft, petty trading and daily labor. Crop production plays a major role in income generation in the area and cereals such as barley and maize, pulse crops such as bean and pea, root and tuber are the major crops grown. Specially, the area is known for root and tuber production nationally. The study showed that mean annual farming income (from both cattle and crop sale) of the whole sample household for the year 2011/12 was Birr 7216.9 per household. The annual income obtained by cattle market participants which was 9699.8 ETB was greater than non participants obtained an amount of 6152.9 ETB. Annual income of the households was significant at less than 1% significant level between the two groups.

The study result also shows that non-farming is the next major source of income for 22.7% of the total sample households. The entire sample household have annual average of non-farming income of Birr 3533 per household. The figures in the (Table3) shows that the average annual non-farming income (Birr 3625 per household) of non participants higher than cattle market participants (Birr 3315 per household). This income was obtained from trade of different agricultural products as well as other works like causal work. Analysis of the t-test revealed that there is no significant difference on the mean of non-farm income between two groups.

Table3: Experience and income of sample households

Description	Participants (N=45)	Non participants (N= 105)	Total (N= 150)	t-value
Years of experience in farming(mean)	20.5 (5.03)	21.3 (6.98)	21.04 (6.45)	0.711*
Annual farming income(mean)	9699.8 (3249.5)	6152.9 (2417.7)	7216.9 (3139.7)	-7.395***
Years of experience in non farming(mean)	6.4 (2.06)	8.3 (4.08)	7.73 (3.67)	1.385**
Annual non farm income(mean)	3315 (1802)	3625 (1853)	3533 (1816)	0.448

N=sample size, ***, ** and *significantly at less than 1% ,5% and 10 %significance level, Figures in parenthesis indicates standard deviations

Source: Survey result, 2011/12

The level of cattle keeping experience is taken to be the number of years that an individual was continuously engaged in cattle production activity. The average years of experience for the entire sample household was about 21.04 years, the minimum and maximum years of experience being 6 and 42 years, respectively. The survey result indicates that non-participants (21.3 years) had more farming experience than cattle market participant which have a mean of (20.04 years) and the independent sample t-test revealed that there was difference at less than 10% level of significance on the years of cattle farming experience between the two groups. The sample households also had a mean of 7.73 years on non-farming experience. Non-participants have an average experience of 8.3years on non farm work where as participants have an average of 6.4year. Regarding the ownership of resource of the sampled household Table 4 show that about 86.7 and 67.6% of cattle market participants and non participant household had corrugated iron sheet roofed house, respectively. While 32.4% of non participant and 13.3% of cattle market participants had no corrugated iron sheet roofed house. Concerning household iron sheet roofed house there is a significant difference at less than 1% level between two groups.

Table 4: Resource owned by sample households

Description	Participants (N=45)	Percent	Non participants (N=105)	Percent	t/x^2 value
Types of house					
Corrugated					
Yes	39	86.7	71	67.6	5.84***
No	6	13.3	34	32.4	
Grass roof					
Yes	25	55.6	67	63.8	0.905
No	20	44.4	38	36.2	
TLU					
Yes	45	100	105	100	
TLU(mean)	4.5(1.12		3.7(1.3)		8.127
Bee colony					
Yes	5	11.1	9	8.6	0.240
No	40	88.9	96	91.4	

N=sample size

Source: Survey result, 2011/12

The finding of the study affirmed that the entire total sampled household had livestock. Cattle market participants had an average of 4.5TLU and non participants had 3.7 TLU. The average TLU that was obtained from the survey has no statistically significant difference between the cattle market participants and non participants.

3.2 Determinants of Cattle Market Participation

The Heckman's procedure results for both outcome and selection variables are presented and discussed in the next subsection. Moreover, it is important to check multi co-linearity problem before running the model for both the continuous as well as the dummy variables. The usual measure of multi co-linearity among variables is Variance Inflation Factor (VIF). The values of variance inflation factor for the variables were in the ranges of 1.21 and 3.62. To check the multi co-linearity problem STATA 12 was employed and the VIF result shows that multi colinearity was not a problem among the hypothesized variables.

3.2.1. Determinants of farmers' cattle marketing participations.

The hypothetical underpinnings of why farm households participate in agricultural markets can be found in trade

theories. According to the theories farmers are essentially driven to enter into trade or markets so that they can enjoy a diverse consumption bundle. They can exploit welfare gains from trading by concentrating in the production of goods they have comparative advantage, and exchange for those they have no comparative advantage, mostly manufactures (Siziba *et al*, 2011).

Table 5, Presents the first step of the selection model that is the results obtained from the probit model which analyses those factors that determine the farmers' decision to participate cattle supply to the market. This model also helps to calculate the Inverse mills ratio that is used in correcting the selectivity bias and incorporates the effect of participation decision in to the supply function. According to the results of the probit model (Table 5), the most important factors that determine the producers' decision to participate in the cattle market were identified and presented in Table 36. Two independent variables namely total number of cattle owned and access to all weather road has been found to be highly significant at (<1%) in the participation decision. Three variables namely age of household head, access to grazing land for keeping cattle and transaction cost affect producers participation decision at (<5%) level of significance. Lagged prices of cattle influence producers market participations at (<10%) significance level. The Probit model estimation indicates that six variables being significant factors affecting the household market participation decision. These significant variables increased the chance of household selling of cattle to the market positively or negatively. More over majority of significant variables had the expected signs.

Age of household (AGE): influence the producers' market participation decision negatively. This is mainly due to the fact that aged households are believed to be wise in resource use than young household. In addition to this aged household could not move from one market place to other like energetic young households. Tshiunza, et al. 2001 found that younger farmers tended to produce and sale more cooking banana for market than older farmers. According to the marginal effects computed, as age of household increased by one unit, the probability of cattle producers to participate in cattle marketing will reduce by 1.82 percent

Total to grazing land size (TGLS): As expected influenced producers' market participation decision positively at less than 5% significant level. This is mainly due to the fact that as farmer owns more grazing land; the probability of allocating land for cattle will increase. According to marginal effects computed as size of grazing land owned by household increase by one timad (0.25ha) the probability of the cattle keeper participation in cattle marketing increase by 21.1 percents.

Total cattle owned (TCOW): As it was hypothesized; this variable affects the market participation positively. The number of cattle a household owned highly influences producers' decision in favor of participating on cattle market at less than 1% significant level. Heierli and Gass (2001) who argue that acquisition and ownership of productive assets (e.g. cattle) can pave the way for a family to participate in economic activities According to the marginal effects computed, as number of cattle owned by household increased by one unit, the probability of producers to participation in cattle marketing will increase by 16.5 percent.

Access to market (ACMKT): As it was hypothesized this variables affect the market participation positively. Access to market highly influence cattle keeper to participate in cattle market at less than 1% significant level. According to the marginal effects computed, cattle keeper who has access of cattle market has a probability to participate in cattle marketing by 23.76 percent than cattle keepers who have no market access.

Table 5: Probit model with marginal effects

Variable	Marginal effect	P- value
AGE	-0.0182	0.0499**
DUCHHD	-0.0761	0.3748
MRS	-0.0631	0.4902
YCFM	0.0088	0.3920
NFRMINC	0.0000	0.8327
TGLS	0.2111	0.0478**
BIRTH	0.0001	0.1577
TCOW	0.1653	0.0004***
TLUNICT	-0.0662	0.5131
AGEXT	-0.0832	0.4961
ACR	0.0628	0.4995
TRCO	-0.0164	0.0229**
ACMIN	-0.0114	0.9009
AMKT	0.2376	0.0114***
DMKT	0.0157	0.2445
ATR	0.1113	0.2420
NMORT	-0.0001	0.1496
LAGP	0.0000	.0949*

Source: Own computations, 2011/12
Dep. var. = PARCATLM Mean= .3000000000, S.D. =.4597927750
Model size: Observations = 150, Parameters = 19, Deg.Fr. =131
Fit: R-squared= 0 .549026 Adjusted R-squared = .48706
Model test: F [18, 131] = 8.86, Prob value = .00000
Diagnostic: Log-L = -36.0662, Restricted (b=0) Log-L = -95.7922

Lagged price (LAGPR): as it was hypothesized; this variable affects producer market participation positively at 10% significant level. This is due to the fact that when price of cattle increases in the market in the previous year, farmers would be optimistic to produce more cattle in the market and enhance their market participation.

3.3. Determinants of value of cattle marketed

According to Heckman (1979) a sample selection bias refers to the problems where the dependent variable is only observed for a restricted and non random sample. Ordinary least square estimation hence leads to both biased and inconsistent estimates of the parameters. To overcome the problem Heckman suggested adding inverse mills ratio (sometimes referred as hazard rate) as a regressor in to the model which enables the parameter estimates become unbiased and inconsistent. The effect of participation decision also on the value of cattle marketed is indicated on the parameter estimates of the IMR which is obtained from the probit mode in the first step of the Heckman two step procedures. Table 6 summarizes the result of the ordinary least square estimation corrected for the selection bias (second step in Heckman's selection model).Average annual price of cattle, access to credit for cattle keeping, total number of cattle owned access to market information's number of new born and selectivity bias correction (LAMBDA) are found to affect the value (in birr) of the volume of cattle supplied to the market positively at higher statistical level of significance.

Total number of cattle owned(TCOW): As expected, the results show that an increase in the number of cattle owned by an individual farmer influence the value obtained from the sale of cattle significantly at(<1%). An increase in the number of cattle by one unit has been increased the value obtained from cattle marketed by 670.98 ETB.

Lagged price of cattle (LAGPR): The average lagged price of cattle influence the value obtained from the sale of cattle significantly at (<1%) and positively. An increase in the average lagged price of cattle by one birr in the previous year increase the value obtained from the value of cattle marketed by 0.85ETB.

Birth (BIRTH): As expected, the results show that an increase in number of new born affect the value obtained from the sale of cattle positively at (<1%) significant level. An increase in the number of new born by one unit has been increased the value obtained from cattle sale by 0.85 ETB

Access to market information (ACMIN): As expected market information affect the value obtained from cattle sale positively significantly at (<1%). The value obtained from the sale of cattle for sample respondents who had pertinent and reliable market information has shown an increase by about 763.48ETB than those who do not had market information.

Table 6: OLS estimate of value of cattle marketed

Variable	Coefficient	Std.Err	t-ratio	p-value
AGE	5.318110655	31.005879	0.035	0.8669
EDUS	111.4656702	289.93181	0.422	0.7055
MRS	-259.9092456	296.54490	-0.876	0.3824
EYF	-4.230957021	35.915149	-0.118	0.9064
NFRMINC	-0.1363412653	0.79369350E-01	-1.718	0.0882*
TGLS	684.1648031	326.37520	2.096	0.0380**
BIRTH	0.8493851928	0.31043782	2.736	0.0071***
TCOW	670.9779956	127.28709	5.271	0.0000
TLUNIC	-92.02420047	386.13782	-0.238	0.8120
AGEXT	129.1216745	371.86339	0.347	0.7290
ACR	823.0908870	312.85185	2.631	0.0095***
TRCO	-56.56390548	25.410011	-2.226	0.0277**
ACMIN	763.4775380	312.85039	2.440	0.0160***
AMCK	-150.7791442	333.69687	-0.452	0.6521
DAWRD	-67.42819259	48.342758	-1.395	0.1655
ATR	-236.4492481	306.84394	-0.771	0.4424
AVT	140.4410311	356.25720	0.394	0.6941
MORT	-.6324200111E-01	0.22441401	-0.282	0.7785
LAGP	0.8558580491	0.81539497E-01	10.496	0.0000***
IMR/Lambda	572.4588418	249.95460	2.290	0.0236**

Source: Own computations, 2011/12
Dep. var. = VC MARTD Mean= 7011.733333 , S.D. = 4781.492529
Model size: Observations = 150, Parameters = 20, Deg.Fr. =130
Fit: R-squared= .911987, Adjusted R-squared = .89912
Model test: F [19, 130] = 70.90, Prob value = .00000
Diagnostic: Log-L = -1300.9449, Restricted (b=0) Log-L = -1483.2153

Access to credit (ACRD): as expected credit use by the sample respondents significantly (<1%) and positively affects the value obtained from the supply of cattle to market. The value obtained from cattle marketed for sample respondents who access credit has shown an increase by about 823.09ETB than those who do not had access to credit.

Inverse mills ratio (LAMBDA): The p-value of this variable is 0.0236 as presented in Table 39. This implies that the correction for selectivity bias is highly significant at 5% level of significance. The coefficient of this variable is interpreted as an observation is being a participant in cattle market and the value obtained from cattle marketed and marketing increases by 572.46 ETB.

Off-farm income (OINCOME): As expected off-farm income indicates a negative estimated coefficient but not significant. This implies that the more farmers engage in off-farm activities, thus does not increase the sales capacity (Table 6). The off-farm income may be used as a good cash injection for cattle farmers. This means that farmers have good income support to survive from both production and business risks and not sale cattle.

4. Conclusion and Recommendation

The data were collected from 150 cattle keepers. The households are from two potential Woredas of Wolaita zone namely Sodo Zuriya and Damot Gale. The analysis was made using descriptive statistics and econometric model. All the sampled household heads were cattle keeper. Market participation decision and value of cattle marketed are found to be important elements in the study of cattle market participation. Therefore, Heckman's two stage procedure was used to identify factors influencing market participation decision of cattle and value of cattle marketed in the study area. The main findings of this research are summarized as follows. From 150-interviewed cattle keeper households, 94.7% were male-headed and the rest 5.3 % were female-headed households. The average age of the sampled respondents was 43.2 years. The overall educational status of the sampled households was 42 % illiterate, 58% literate. Detailed educational status of the sampled households was composed of 42% illiterate, 4% adult educations, 36.7% primary school and 16.3% secondary school level. A number of factors may have affected market participation decision and value of cattle marketed in the country. In the case of the study area, the identified factors are total number of cattle owned, access to grazing land, age of household, access to market and lagged price were the main positive determinants of market participation decision for a household. For the value of cattle marketed, access to credit, total number of cattle owned, average lagged price of cattle, access to market information and number of new born calves affected significantly and positively value of cattle marketed.

Results from Heckman's two stage shows among eighteen explanatory variables hypothesized to affect cattle market participation decision age of the household head, number of cattle owned, access to grazing land, access to market and lagged price as significant. Access to credit, total number of cattle owned, lagged price of cattle, access to market information and number of new born calves were also found to be significant variables influence the value of cattle marketed. The findings suggests that, effective market information service has to be established to provide accurate and timely market information to cattle keeper on current supply, demand and prices of cattle at national and regional levels.

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