Factors Affecting Decision to Participate in Beef Cattle Fattening and Quantity Supplied of Beef Cattle to Market: Case of Degga Woreda of Bunno Bedele Zone Southwest Ethiopia

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ABSTRACT: This study aims at Factors Affecting Decision to Participate in Beef Cattle Fattening and Quantity Supplied of Beef Cattle to Market: Case of Degga woreda, Bunno Bedele zone in Southwest Ethiopia. With the Specific objectives to identify the factors affecting decision to participate in beef cattle fattening and quantity supplied of beef cattle to market. Both primary and secondary data were used. Primary data was collected from randomly selected 118 producer's household heads, 7 butcheries, 13 hotel and restaurant owners, 2 smaller traders and 6 larger traders. Secondary data was collected form related studies and district administration and Livestock Resource and Fishery Development offices. Data was analysized using inferential statistics, Heckman two-stage selectivity model, SPSS 22 and STATA 13software were used for data analyzing. The Heckman's two step sample selection model result shows that participation decision in beef cattle fattening being significantly and negatively affected by family size, distance from farmland to provide feed and total size of farmland owned and positively affected by level of education the sample household head attained, grazing land, access to credit service, non farm income and total cattle owned. Moreover, the beef cattle supply has affected negatively by household's income (from Crop production), distance to veterinary clinic centre and walking hour to nearest market. While frequency of extension service, household's income (from beef cattle selling), adding value on beef cattle and total size of farmland owned have affected positively. Therefore, policy aiming at increasing access to credit service, veterinary service, level of household education, developing and improving infrastructure, intensive land use, product upgrading by farmers, investment in abattoirs and beef cooling, strong beef cattle value chain relationship between and among the various actors in the value chain are crucial, and cooperative development are recommended to accelerate the chain's development.

***Key words**: Value Chain Analysis, Beef cattle, Actors, Heckman two Stage Model.*

1. INTRODUCTION

The livestock sector plays a major role in the national economy and it is the source of income and employment for the rural population (Joseph Hain, *et.al*. 2015). The recent livestock population of Ethiopia estimates that the country has about 57.83 million heads of cattle, 28.04 million sheep, 28.61 million goats and 60.51 million poultry (CSA, 2016). Particularly highland mixed crop-livestock farming system of Ethiopia support 2/3 of the livestock population and hold about 95% of the cropped area. Primarily, livestock provide draft power, food, income, transportation, alternative energy sources (dung cake for fuel and biogas), social prestige and status in communities. Livestock production creates income opportunities for landless poor who provide fodder, collect water to feed and engage in value addition and marketing (Future Agriculture, 2014).

Formally, Ethiopia exports about 680,000 Livestock annually (NBE, 2012/13). This is significantly higher than the annual official exports of 141,941 head of live animals in 2011 (Trade Bulletin, 2011)

In Ethiopia, recent studies estimated that annual illegal flow of livestock through boundaries reaches as high as 575,000 cattle 1,150.000 Shoats& 126,500 Camel (Solomon et *al.*2010 & LMD Research, 2013). This being the potential for export, the actual performance has remained very low, leaving most (55 to 85%) of the projected livestock off take for the unofficial cross-border export and the domestic market. These become barriers to understand and analyse the full range of activities required to bring a product (e.g. live animals, meat, milk, eggs, leather, fibre, manure) to final consumers passing through the different phases of production, marketing, processing and delivery to the consumers. It creates barriers to identify a market-focused collaboration among different stakeholders who produce and market value-added products (Workneh, A., 2006 and Malede B. and Yilkal M., 2013).

Beef Cattle production in Ethiopia is an integral part of the mixed farming, agro-pastoral and pastoral systems. In both rural and urban areas, smallholder cattle fattening is emerging as an important source of income. In rural Ethiopia beef cattle fattening is based on locally available feed resources. According to ILRI, (2010) and MOA, (1997b) beef Cattle fattening practices in Ethiopia is categorized in to three major fattening systems: traditional system, by product based system and the Hararghe fattening system.

Marketing of livestock and livestock products is an important activity all over Ethiopia. The primary reason for selling livestock in the highlands of Ethiopia is the generation of income to meet unforeseen expenses (Jabbar, M.A. and A. Gezahegn, 2003). According to Sintayehu *et al.* (2013) and ACDI/VOCA, (2006b), livestock marketing in Ethiopia follows a four system: bush' markets, primary assembly markets, secondary markets and terminal markets through which animals go into the secondary hands of small traders and large traders, final buyers which include butchers, meat-processing factories fattening farms or live animal exporters. This makes the chain unnecessarily long with increased transaction costs and without significant value added activities (Negassa *et al.*, 2011).

Beef cattle production and marketing systems in the oromia region crop-livestock mixed farming system are characterized by long marketing chains featuring great distances, numerous phases of weight gain and feeding regimes, many levels of formal and informal traders and transactions, a multitude of steps and exporting processing, and a variety of employment-creating services and inputs (Abate, 2012, Duressa et al., 2014; Feyissa *et al.*, 2014).

Generally,the Oromia region has a huge number of Cattle population. Of which with the resent estimate the cattle constitutes about 23.34 million, of this Illu Aba Bora & Bunno Bedele Zone together has about 1.18 million (CSA,2015/16). But the recent cattle population of Bunno Bedele zone is estimated about 0.8 million and among this Degga district accounts 0.06 million (BBZLFDO, 2016). Mixed farming is the dominant farming system in Bunno Bedele Zone in general and in Degga woreda in particular.

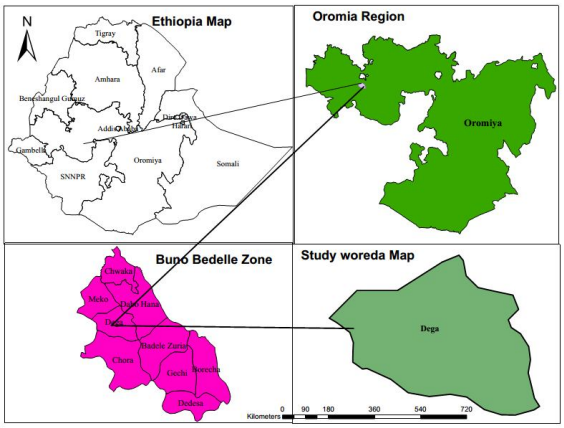
Therefore, interventions targeting improvement of the traditional beef sector are crucial for the development of the livestock sub-sector. This in turn needs identification of root causes for the slow development of the beef sector and specification of leverage points that could be used as entry points to bring about the desired developments in the sector and to answer: What are the factors affecting decision to participate in fattening and quantity supplied of beef cattle to market in the study area? This study is initiated with the purpose to assess the factors affecting decision to participation and supply of beef cattle to market that could be used as points of entry for research, policy and development interventions to revitalize the beef cattle sector of the study area.2. Research Methodology

2.1. Description of Study Area

This study was carried out in Degga woreda Bunno Bedele Zone, Oromia Region, southwestern part of

Ethiopia. It is located at 76^0 96' E and 41^0 68'N, 68 km West of Bedele town the capital of Bunno Bedele Zone and 548 km west of Addis Ababa. The Woreda is bounded by Alige Sachi woreda, Illu Aba Bora Zone in the west, Bedele woreda in the east, Mako Woreda in the north and Cora woreda in the south. The altitude of the area ranges between 1600 and 2300 m.a.s.l. Average annual rainfall of the study area is 2000mm, with mean annual temperatures ranging from 18^0c to 20^0c. Based on agro-climatic zones, the *Woreda* can be divided into three broad climatic zones, namely highland (23.5%), mid-high land (65%) and lowland (11.5%) areas of the total land areas of the *Woreda*. The total area of Degga woreda is 46,202 ha. According to the Administrative information Desk of the woreda (2015), the population size of Degga woreda is 58,246. Out of this 28,874 are males and 29,372 are females. Administratively, the *Woreda* is divided into 17 *kebeles* of which 16 are rural *kebeles* and one is urban *kebeles.*

Fig1. Location Map of the study area



Source: Depicted from map of the country by using GIS.

More than 85% of the economy of the Woreda is based on agriculture which means rain fed agriculture and also animal rising is a predominant activity which called crop-livestock mixed farming system. The major crops in the woreda were maize, Teff, Sorghum, barley, wheat, pea, bean, Coffee and other. In Degga woreda there are 58,816 cattle, 23,381 sheep, 14,285 goats, 22,464 poultry, 2,147 horse, 2,564 donkey, 996 mules, & 65,710 beehives. The major feed resources include: Communal & private grazing, Crop residues, improved forages (like Elephant grass, Sasbania) , local industrial by-product(Atela) and others. The beef cattle fattening practice in the woreda is the early additional income fetch traditional business oriented and helps house hold livelihood improvement.

2.2. Research Design

2.2.1. Data type, source of data and method of data collection

Quantitative and qualitative data type and primary and secondary source of data were used for this study. Primary data were collected from sample beef cattle value chain actors such as, producers, traders, butcheries and hotel and restaurant owners. In order to supplement the data obtained from the formal survey, information were also be collected through focus group discussion, key informant interview and consultation of secondary information.

Both informal and formal surveys were employed for this study. Informal survey has been first undertaken to get some insights about the study areas. In that survey, semi-structured interview were used to collect information from experts at the zonal/wereda agricultural office, development agents, and other concerned bodies so as to get directions for selecting samples and developing the structured questionnaire for the subsequent formal survey. The formal survey then was followed among the selected sample households using a pre-tested structured interview questionnaire made on six livestock owners.

2.2.2. Sampling procedure and sample size determination

A three stage sampling procedure was used to select farm household heads for beef cattle fattening participation. Degga wereda was selected because it was the main wereda for actual beef cattle production and there are less logistical problems associated with conducting the research in this area due to its proximity to the university and researcher. After selecting Degga woreda purposively, the first stage was, selecting the six representative Kebeles among the 17 Kebeles were selected using stratified

random sampling technique. One from high land out of three kebeles, three from mid-highland out of nine kebeles and two from lowland out of five kebeles found in different agro ecology of the woreda. The second stage was selection of a sampling frame (list of the target population), from which the sample will be drawn. There were 2896 livestock owners' in the six kebeles. Those were 439, 528, 453, 589, 603 and 284 from Dima Jila, Homi Kersa, Haro Dogi, Sotallo Addo, Senaga Harawe, and Homi Dabena respectively. The third stage was selecting the sample household from the lists of sampling frame population. Accordingly, 118 household respondents were selected using simple random sampling technique and hence, 18, 21, 18, 24, 25, & 12 from Dima Jila, Homi Kersa, Haro Dogi, Sotallo Addo, Senaga Harawe, and Homi Dabena respectively selected using population proportional to sample size-sampling techniques. The determination of sample size has been resolved using Yamane (1967:886), simplified formula to calculate the sample size with the desired confidence level of 95% and margin of errors at 9%.

To obtain sample size of 118 from total household numbers six kebeles 2896 by using Yamane's formula sample size were obtained as follows

$n = \frac{N}{1+N(e)^2}$ *Where ,n= sample size for research use,* N=*total number of livestock owners of six kebeles and e = margin of error at 9%*

$n = \frac{2896}{1+2896(0.09)^2} = 118$

2.3. Method of Data Analysis

Depending on the nature of the objectives mentioned, this study has been used the following analytical tool to analyze the data. Econometric analysis of participation decision in beef cattle fattening and quantity of marketed supply of beef cattle Heckman's two-stage estimation was the recommended econometric model for decisions made to participate in beef cattle fattening practices and the quantity of beef cattle supplied to the market. This model also allows the farmer to choose whether to participate in beef cattle fattening practices and if so, to choose the level of participation/quantity of beef cattle supplied. Thus, a Heckman (1979) two-stage procedure is used in which the inverse Mill's Ratio is calculated from probit estimation of decision to participate and introduced into the quantity of marketed supply equation. Ideally, the OLS is applicable to determine factors that affect the level of participation. However, some households may prefer not to participate in beef cattle fattening practices in favor of others, whereas others may be excluded because of households' resource limitations. If OLS regression is estimated while excluding the non-participating from analysis, a sample selectivity bias is introduced into the model. Such a problem can be overcome by following two-step procedure, as suggested by Heckman (1979).

In this study, therefore, the Heckman's two-stage selectivity model was used to investigate the factors that influence the probability of being participated in beef cattle fattening practices and the amount of marketed supply of beef cattle. The first step of Heckman procedure establishes the probability of participation decision in the beef cattle fattening practices and marketing. For the individual producer, the decision to participate or not to participate in beef cattle fattening practices could be formulated as binary choice model that could be analyzed using the probit equation below. The empirical specification of the probit model to be estimated by maximum likelihood estimation is defined as (Greene, 2012):

$Yi = \beta ixi + ui$…… (i=1, 2, 3…n)

Where;

Y_i-is a dummy variable estimating beef cattle fattening participation probability that is Yi=1, if $Y_i>0$, otherwise, Yi=0, $Y_i<0$.

xi-are variables affecting Participation decision to participate in beef cattle fattening practice

β*i*-is unknown parameters to be estimated,

ui- is the random disturbance term for the selection equation

Second, the selection model parameters are consistently estimated by using OLS over **n** observations for Y_i by including an estimate of the inverse Mills Ratio, denoting, as an additional regressor in the equation below. The model (Greene, 2012) is:

$Z_i = \beta_0 + \beta i xi + \mu\lambda_i + \varepsilon_i \ldots$ (i= 1, 2, 3…n)

Where,

z_i: is the quantity of supply of beef cattle to the market by sample households

x_i: are the explanatory variables determining quantity supplied of beef cattle

β_i: is unknown parameter to be estimated in the quantity supplied function

β_0: Is an intercept term

λ_j: the Inverse Mill's Ratio derived from the first stage

μ: is a parameter that shows the impact of production participation on the quantity supply and

ε_i: is an error term.

Before taking the selected variable into the model, it is imperative to check whether or not different econometric model assumptions do hold. It is imperative to check for the existence of multicollinearity among the continuous variables and verified the degree of association among discrete variables. Variance Inflating Factors (VIF (x_j) technique was employed to detect the problem of multicollinearity among continuous variables. Large VIF are indicators of multicollinearity and those explanatory variables with VIF >10 were excluded from the regression analysis.

$$\mathbf{VIF\ (x_j) = (1\text{-}R^2_j)^{-1}}$$

Where, R^2 is the coefficient of multiple determinations when the variable X_j is regressed on other explanatory variables. Similarly, there might also be an interaction between two qualitative variables, which can lead to the problem of high association. To detect the problem, the contingency coefficients were computed from the survey data, and contingency coefficient greater than 0.75 is an indication of existence of multicollinearity among qualitative variables.

$$CC = \sqrt{\frac{x^2}{N - x^2}}$$

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

3. RESULTS AND DISSCUTION

3.1. Factors affecting farmer's decision to participate in beef cattle fattening and quantity supplied of beef cattle to market.

Under this econometrics part result of Heckman two step sample selection model is discussed. Here, the likelihood function is significant (Wald $\chi 2$= 884.36 with P<0.0000) showing strong explanatory powers. Similarly, the coefficient of the Mill's ratio is found to be significant (P<0.017) which indicate presence of self-selection and hence justifying the appropriateness of using Heckman's two-stage model. In addition, malticollinearity and econometric test are made for the independent variables using VIF and coefficient of contingency. The result has shown that there is only one (Access to market information) independent variable that was omitted from analysis due to high malticollinearity problem among or between the variables.

3.1.1. Factors affecting farmers decision to participate in beef cattle fattening

Probit model estimation of the factors affecting the participation decision of the beef cattle producers and the values of marginal effects which were evaluated in first-stage Heckman selection at the means of all other independent variables are shown in table 1. The probit model estimation gave a Pseudo-R^2 of **0.6092** which implied that the variables included in the model were able to explain about 60.92 percent of the probability of farm households' decisions to participate or not to participate in beef cattle fattening value addition activities. The Log-likelihood Ratio (LR) was also found to be significant at the 1% level (Table 1). This means that all the explanatory variables included in the model jointly influenced farmers' probability of participating in beef cattle fattening. Given the above mentioned goodness of fit measures, it was concluded that the probit model employed was reliable and appropriate.

Out of the 11 variables expected to affect probability of participation decision of the sample household, eight variables were found to significantly explain the probability of participation decision in the beef cattle fattening. Family size,

distance from farmland to provide feed, and size of farm land have negatively and significantly affected on decision to participate in beef cattle fattening. Whereas, size of grazing land, access to credit service, non farm income, highest level of education the sample household head attained and total cattle owned have positively and significantly affected decision in beef cattle fattening participation of the sample households. However the coefficients of the independent variables, household income from crop, family dependence ratio and age of the sample household were found to be insignificant.

Table 1: Probit estimations result of farmers' decision to participate in beef cattle fattening (first-stage).

Variables	Coef.	dy/dx	Std. Err.	Z	P>|z|
Number of cattle own (TLU)	.2164596	.0055644***	.0817074	2.65	0.008***
Distance to feed source (hour)	-.1302811	-.003349***	.0379627	-3.43	0.001***
Size farm land own (hact)	-.6169599	-.01586**	.2889997	-2.13	0.033**
Size of grazing land (hact)	1.691347	.0434788*	.9397914	1.80	0.072*
Dependence ratio	.6928229	.0178101	.4902076	1.41	0.158
Access to credit service	.1531675	.0039374**	.0799261	1.92	0.055**
Age of the hhh (year)	.0491882	.0012645	.0415899	1.18	0.237
Nonfarm income (ETB)	.000095	2.44e-06*	.0000566	1.68	0.093*
Family size	-.2674807	-.006876**	.1284346	-2.08	0.037**
House hold level of education	.1986342	.0051062*	.1197418	1.66	0.097*
Income from crop selling (ETB)	.0001382	3.55e-06	.000113	1.22	0.221

Source; survey result of 2016

*** ** & * shows the 1%, 5% and 10% level of significance respectively.

Number of obs. =118 Log pseudo likelihood = -25.269945**, LR chi2 (10) =** 78.77

Prob > chi2 = 0.0000 Pseudo R2 = 0.6092

The TLU of cattle owned by a household was positively associated with the probability of beef cattle fattening participation decision of beef cattle producers significant at 1% level of significance. So the result shows that, the probability of decision to participate in beef cattle fattening increases by 0.6% for each number of cattle owned. This is in line with Aasfaw and Jabbar (2008) also found that TLU of livestock ownership affected positively and significantly sales of livestock affected supply.

Distance from Farmland to provide feed is an explanatory variable that was hypothesized to affect the participation decision of beef cattle producers negatively and significantly affecting at 1% level of significance. However, addition of one more hour on distance of crop residue from beef cattle decreases participation of the sample producers in beef cattle fattening on decision participation by 0.34%. This is contradicts with Gezehagn G. (2015) found out in his study, addition of one more kilometer on distance of crop residue from beef cattle increases participation of the sample producers in beef cattle markets by 0.75% that is significant at 10% probability level. This is due to the reason of being far from crop residue make producers to purchase additional inputs like "*Atala*" to use instead of crop residue and store for the feed for drought period to feed their beef cattle. In general, more follow up and care is made to the beef cattle by giving them nearly available feed materials and keeps the crop residue found at distance for drought period. So it is better to reduce the availability of feed sources at distance by producing/developing improved animal forages in/around the farming areas. This can improve the availability as well as the quality of feed for the livestock.

Size of farm land owned by the producers is expected to affect the probability of participation decision in beef cattle production positively as it is hypothesized. But the result found to affect negatively and significantly at 5% level probability. Addition of one hectare of land owned by the producers to which the participation decision in beef cattle fattening decreases on decision participation by 1.6%.

This is because of those farmers in the study area having large cultivated areas and allocated all the lands for crop production assume to get enough farm income rather than producing beef cattle as other income source, this could decrease the probability of decision to participate in beef cattle production. So, it needs attention to diversify the income source of farmers to overcome the impact of weather condition on crop production faller. Integration of crop livestock production can reduce this problem to have alternative income source rather than participating on a single enterprise.

Size of grazing land owned by the producers is found to affect the probability of participation decision in beef cattle fattening positively and significantly at 10% level of probability. As a result, addition of one hectare of land owned by the producers to which the participation decision in beef cattle fattening increases the probability of participation in beef cattle production by an amount of 4.4%. This is because of those having a separate grazing land owned to produce feed for their beef cattle have a direct impact on decision to participate livestock production in general and beef cattle production particularly. This is same what in line with the study by Maia A. Call & Pamela Jagger (2016), on social capital, collective action, and communal grazing lands in Uganda argued that for every unit increase in the variation of cattle ownership, the odds of a community having a grazing land increase by 32% ($p<0.1$).Likewise, the odds of a community having grazing land increases by 61% ($p<0.1$) with every unit increase in asset variation. The result contrary to the study by Godfrey Kalemera (2010) size for grazing area owned by the household was significant (1%) and negatively affected the farmer‘s sales rate. An increase in the size of grazing area owned by the household by 1 hectare led to a decrease in the cattle keepers‘45 sales rate by 5%.

Access to credit service is found to affect the probability of participation decision in beef cattle fattening positively and significantly at 5% level as expected. As the result shows accessibility of credit services improved increases the probability of participation decision in beef cattle production increases by 0.4%. This is in line with the study by Zeller and Sharma (2001) and Heidhues and Schrieder (1994), credit adds to the financial resource of the household, for food and input procurement. In the present study, it is expected that households with better access to credit will be more likely to participate in the beef cattle production and value addition activities.

The sample households’ non farm income found to affect the probability of participation decision in beef cattle fattening positively and significantly at 10% level of significance. The result reveals that addition of one more ETB on income of beef cattle producer’s increases the probability of participation decision in beef cattle fattening by an amount of ($2.44x10^{-4}$) %.This is in line with the study by Otieno et al. (2012) found a positive relationship between non farm income and profit efficiency and argue that this suggests that there is considerable re-investment of nonfarm earnings into farm production. Ehui et al. (2009) found that non-farm income increased participation in marketing of live animals in Ethiopia.

Family size of the farm household heads is hypothesized to affect house hold decision to participate in beef cattle fattening positively. But the model result shows that family size is negatively and significantly affecting at less than 5% level of significance. As a result, marginal effect of household size increases probability of the producer’s decision to participate in beef cattle fattening decreases by 0.7%. Discussions during FGD reveal that, in the study areas the household sizes were larger and more likely was the household to come under pressure to make more land available for residential houses and that may lead to negative relationship with an indicator depicting the tendency towards decision to participate in beef cattle fattening due to lack of feed source(grazing land), financial problem for starting the production, etc . According to Makhura (2001), one of the causes of the negative response could be the need to negotiate or consult other household members when producing beef cattle. Tshediso (2013) also reported larger household sizes are associated with a negative food security status as larger household sizes require increase

food expenditure and competition for limited resources.

The educational status of the household head is positively and significantly affecting at less than 10% level of significance. As a result, the marginal effect of household level of education increases probability of the producers decision to participate in beef cattle fattening increases by 0.5%. This reveals that education has positive marginal effect on beef cattle fattening participation decision this is due to that, educated household heads have better probability to understand the profitable agribusinesses and also manage well and hence positive marginal effect. This is in line with the study of (Fakoya *et al*., 2007) found that formal education enhances the information acquisition and adjustment abilities of the farmer, thereby improving the quality of decision making.

3.1.2. Factors affecting amount of beef cattle supplied to the markets

This section shows OLS estimation result of Heckman two stage model. The second-stage Heckman selection estimation results for the value of marketed supply of beef cattle in the study areas are indicated in Table 8. The model chi-square tests are employing an appropriate degree of freedom which implies that the overall goodness of fit for the Heckman selection model is statistically significant at less than 1%. The result indicates that the independent variables included in the Heckman selection model regression give details on the value of marketed supply of beef cattle in the study areas. It incorporate inverse Mills ratio. Inverse Mills ratio (lambda=0.017) is found to affect decision to participate in beef cattle fattening and amount of beef cattle supply to markets at less than 5% level significance. This shows that there is no sample selection bias and the presence of unobservable beef cattle fatteners conditions and hence affect the likelihood of decision to participate in beef cattle fattening and hence the value of marketed supply of beef cattle in the study areas. This implies covariates that condition the amount of beef cattle sold operate conditional on the probability to participate in beef cattle production. Remarkably, out of ten explanatory variables seven of the explanatory variables and constant term have significantly explained the quantity supply of beef cattle to markets. These variables are total size of farmland owned, household's income [from Crop production and beef cattle selling], adding a value on beef cattle before selling, distance from the nearest public veterinary clinic centre, walking hour to nearest market and frequency of extension service contact. Whereas the rest three independent variables were insignificant. The constant term as estimated shows amount of beef cattle supply could be 0.98TLU which is significant at 1% probability level, when other determinants are under assumption of ceteris paribus.

Table.2 Results of second-stage Heckman model for the amount of marketed supply of beef cattle.

Variables	. Coef.	Std. Err	Z	P>|z|
Age of the household (Year)	.00254	.0045201	0.56	0.575
Sex of the household	.12629	.2361032	0.53	0.593
Size of farmland (ha)	.05009**	.0221786	2.26	0.024**
Fattening (value adding) on beef cattle	.57758***	.149265	3.87	0.000***
Household income from beef cattle selling (ETB)	.00016***	6.74e-06	23.31	0.000***
Frequency of extension service contact (Per 2 wk)	.27128***	.0479912	5.65	0.000***
Distance from the nearest public veterinary clinic (Km)	-.16987**	.0827932	-2.05	0.040**
Household income from crop selling(ETB)	-.00002**	6.62e-06	-2.49	0.013**
Walking hour to nearest market (hour)	-.1848***	.0685015	-2.70	0.007***
Household income from nonfarm (ETB)	-5.96e-06	4.45e-06	-1.34	0.181
_cons	.97817***	.3243785	3.02	0.003***

Source: own survey estimation result, 2016

Note: ***, ** and * means significant at 1%, 5% and 10% probability levels respectively

Size of farm land owned by the producers is found to affect the quantity supply of beef cattle to markets positively and significant at 5% level of significance as it is hypothesized. As a result, addition of one hectare of land owned by the producers to which the beef cattle are supplied increases total number of the beef cattle supply to markets by an amount of 0.05 TLU. According to study by Jayne et al., (2010) found that farmers with larger land holdings are more likely to invest in technologies that increase agricultural productivity and income. The more land owned the more could be the feed for the beef cattle so the probability of production of beef cattle and its revenue is high.

Adding more value on beef cattle during beef cattle fattening has expected to have positive and significant impact at 1% level significance. As the result reveals that addition of one more value on their beef cattle supplied to market increases the quantity supply of beef cattle to markets by an amount of 0.58TLU. This is because of more fattened beef cattle have got a premium price in the market at the study area and as the demand of fattened beef cattle increases the quantity supply would be increases. The result idea is same what agreed with the Agness Mzyece (2010), on cowpeas, in particular, value addition if any is very insignificant and hence small scale farmers do not profit much from selling it. Value addition activities would therefore prompt farmers to choose more rewarding marketing channels over those that they would use for their primary produce.

Household income obtained from off farm activities' (selling of beef cattle) has expected to have positive and significant impact at 1% level of significance. And income from off farm (beef cattle selling) found to affect the quantity supply of beef cattle to markets positively. Therefore, addition of one more birr on income of beef cattle producers increases the quantity supply of beef cattle to markets by an amount of $1.6x10^{-4}$ TLU. So that, Sale of animals in general and sales of beef cattle in particular is a vital income source for beef cattle producers.

Availability of beef cattle production extension services was positively and significant at 1% level of significance. So the result shows that, addition of one contact day extension service to beef cattle producers and suppliers increases total number of beef cattle supply to the market by an amount of 0.27TLU. This result is in agreement with the finding of Amelaku *et al*. (2012) reported that the probability of adopting dairy technology increases by 43% for at least a onetime visit by the extension service per year. This implies that farmers that have access to extension services could get good information about the technologies that result in a high probability of adoption.

Distance from the nearest public veterinary clinic centre is found to affect on quantity supply of beef cattle to market negatively and significantly at 5% level of significance. As a result, addition of one more kilometer on distance of beef cattle producers veterinary cervices clinic centre decreases the quantity supply of beef cattle to markets by an amount of 0.17TLU. This exposed the producers in study area for the existence of higher prices, illegal and expired veterinary drugs in the market and the available veterinary clinics lacks assistant technicians. Also impact of traditional veterinary ways (for example, heating the infected beef cattle body part by fire) of treating beef cattle makes the beef part wounded and reduces the interest of beef cattle owner to participating in intensive feeding of beef cattle own. Moreover, majority of the beef cattle drugs used for the beef cattle are expired and illegally enters from neighboring woredas. Beef cattle producers purchase these animal drugs from private animal clinics, markets and smaller shops because of less existence of legal private and government veterinary access providing clinics (FGD). This is in line with study by Sanjay Kumar, *et.al*, (2011) in their study indicates that an increase in the veterinary livestock units owned by a farmer would significantly reduce the stated willingness to pay value by `2.83. Notably, even when a farmer's locality was away from the public veterinary centre, the WTP value was found to increase for such offer. That is, an every additional kilometer travel to reach the centre would also increase the stated true willingness to pay amount by `0.49.

Household income obtained from on farm activities' (crop production). This has expected to have positive and significant impact on quantity supply of beef cattle to markets. But the sampled household income from farm found to affect the quantity supply of beef cattle to markets negatively and significant at 5% level significance. Therefore, addition of one more birr on income of beef cattle producers from crop production decreases the quantity supply of beef cattle to markets by an amount of $2x10^{-5}$ TLU. This is because of those farmers in the study area having large cultivated areas and allocated all the lands to crop production assume to get enough farm income rather than producing beef cattle as other income source, this could decrease the quantity supply of beef cattle to market. This is in line with the study (Mary L. et.al, 2015) found that, the share of crop and livestock income moves in opposite directions as the herd size increases. Households with smaller head sizes tend to depend on crop production income. However, the share of livestock income moves in the same direction with household income, suggesting that livestock production has greater effects on rural poverty reduction.

Walking time to the nearest market centre is expected to have negative and significant affect at 5% level. The result identifies addition of one more hour to which producers spend to reach the nearest market decreases the quantity supply of beef cattle to markets by an amount of 0.19TLU. Long distances increase transaction costs which in effect reduce the prices offered for a given class of animal This is in line with the study by Sirak.T. Bahta & Siegfried Bauer (2007) found that distance to the preferred marketing channel is negatively and significantly related to the probability of selling livestock. Hence, the partial effect of a unit increase in distance on the conditional probability of selling livestock is -0.02488. This means that with each unit increase (1km) in distance the probability to sell will reduce by 0.02488. Thus, this finding suggests that households which are closer to market outlets are more likely to sell their livestock than those households living further away. Isabella and Steve, (2007) distance to the specific market destination was one of the elements that condition prices observed at that location.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1. Summary and Conclusion

This study is aimed at analyzing beef cattle value chain in Degga district of Bunno Bedele zone Oromia Region, Ethiopia. Specific objectives of the study are to assess beef cattle production system in the study area, to identify share of value addition among beef cattle value chain actors in the study area, to identify the factors affecting decision to participate in fattening and quantity supplied of beef cattle to market. Both primary and secondary data sources were used to analyze the value chain. Primary data was collected from randomly with probability population to size sampled 118 producers, 7 butcheries, 13 hotel and restaurant owners, 2 small traders and 6 larger traders of the beef cattle value chain actors. Secondary data was collected form respective studies and district administrations office. The analysis is made using econometric model using SPSS 22 and STATA 13 software.

Production participation decision and marketed quantity of beef cattle are found to be important elements in the beef cattle value chain analysis. Therefore, in identifying factors that affect both participation decision in production and supplied quantity of beef cattle, Heckman two stage sample selection model was used.

The probit model analysis indicated that participation decision of sample producers in beef cattle production is significantly affected by family size, size of grazing land, size of farm land, house hold level of education, cattle size, distance from farm land to provide crop residue, non farm income and access to credit services. Therefore, family size, distance from farmland to provide feed and size of farm land are negatively statistically significant affect and, educational status, access to credit services, size of grazing land, non farm income and total cattle owned of the household head are positively statistically significant affect level of participation in the study area.

The OLS result indicated that, the supplied quantity of beef cattle in to markets is also affected by size of farm land own, household income from (farm & off farm), Adding value on beef cattle supplied, distance from the nearest public veterinary clinic centre, walking hour to nearest market and contacted number/frequency of extension service were statistically significantly affected. Therefore, size of farm land, household income obtained from selling of beef cattle, adding value to beef cattle and frequency of contacted by extension agent service providers are positively statistically significant affect and household income obtained from on farm activities', distance from the nearest veterinary clinic centre and walking hour to nearest market are negatively statistically significant affect the quantity supply of beef cattle to market in the study area.

5.2. Recommendation

Therefore, depending on the result of the findings and conclusion made the recommendations below has been given for future beef cattle improvement and the sector development in the study area.

- Participation decision in beef cattle production is affected by distance from farmland from which crop residues is provided. So, it could be better to introduce alternative feed sources(developing improved forages) to be obtained near the beef cattle production area and create awareness about how to use available feed resources intensively.
- Farm cash income can be improved by directing policy towards measures that will reduce cost of inputs and increase farmers knowledge and technical skills. Such measures may include giving attention to integrated farming system, provision of inputs and enlightenment campaigns in form of trainings, workshops and seminars.
- Beef Cattle marketing and market related issues are a crucial problem in the study area. Lack of fair selling price, broker interference, and market monopoly by single merchant was significantly reduced farmers benefit 'once the trader come in the community and asked me to sell my fattened animal with the price he gave me no body purchase me the animal more than the price he fixed so, I'm enforced to sell at what price merchants fixed earlier' farmers said. So promotion of livestock marketing study will solve the problem and bringing all actors along value chain will improve the market access for optimum benefit of each actors.
- Quantity supply of beef cattle is significantly & negatively affected by distance from the nearest public veterinary clinic centre. This realistic result is may be due to no veterinary clinic found near at their beef farm (in the radius of 5km), illegal and expired animal drugs entrance in to the district by responsible agents or experts should be in place. Work of creating awareness about the negative impact of traditional way of curing beef cattle and find possibilities either for legal, formal governmental or private veterinary service giving clinics should be done in order to fill the gap. Government veterinary service center should have to be available near to their living area and full filled by the necessary materials, drugs, equipments and veterinary assistant technicians to serve the community accordingly. So, one of the major constraints of the beef cattle related to disease/parasites (Annelid) could also be reduced or eliminated.
- If the above recommended comments are applied especially to highland part of the country, the quantity supply of beef cattle to the domestic as well as export market will be improved. This will be achieved through vertical and horizontal integration among and between chain actors.

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