

Determinants of Livestock Production Development of Smallholder Farmers': The Case of Bedele District, Bunno Bedele Zone, Western Ethiopia

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Abstract

Livestock production is undertaken both in highland and lowland of Ethiopia. The study assessed determinants of livestock production development through identifying the constraints and opportunity to production developments. The study adopted a cross sectional survey design. The district was randomly selected from zones. To undertake the assessment three kebele were selected for the same cases from these districts. Using proportionate sampling technique a total of 99 respondents was selected from the kebele where by ten were female headed and 89 were male headed households. Descriptive statistics like mean and percentage was used to describe the socio-economic data of respondents. Some opportunities available for livestock production development in the study area are availability of water, supply of improved breed, feed availability, credit services, veterinary supply and mixed crop-livestock production system. Econometric model a multiple linear regression analysis has been carried out to find the factors influence livestock production development of smallholder farmers'. The results of the multiple linear regression model showed that from a total of ten explanatory variables were included in the model, of which education level, extension services, availability of market information, availability of grazing land, Artificial insemination and veterinary service were found to be statistically significant to livestock production development. The multiple linear regression result show that livestock production development in the study area is determined by availability of grazing land, extension services, artificial insemination and veterinary service, availability of market information education level at 1%, and 5% significant level respectively.

Keywords: Determinants, Smallholder farmers, Livestock Production development, multiple linear regression models

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Introduction

Agriculture sector is plays a vital role in in the economy in the country, agriculture accounts for 40.2% of GDP, 80% of employment and 70% of export earnings (UNDP, 2015). It has a substantial contribution to Ethiopian economy in terms of generating employment opportunity, product contribution, market contribution, factor contribution, balance of payment contribution, welfare contribution and environmental contribution. Moreover, the country does have huge potential for agricultural development in general and livestock subsector in particular (World Bank, 2009).

Ethiopia is home to Africa's largest livestock population, and it is the continent's top livestock producer and exporter. Although domestic demand for animal products in Ethiopia is increasing driven by the urban middle and upper-classes export potential is the key force encouraging expansion and intensification of livestock production (MacDonald M., *et al.*, 2011). According to the results of CSA(2016) reveal that the recent livestock population of Ethiopia estimates that the country has about 57.83 million cattle, 28.89 million sheep, 29.70 million goats, 2.08 million horses, 7.88 million donkeys, 60.51 million poultry, 5.92 million beehive, 0.41 million mules and about 1.23 million camels. They are an important component of nearly all farming systems in Ethiopia and provide draught power, milk, meat, manure, hides, skins and other products (Funk C., *et al.* 2012).

According to the results of a base line survey report by CSA (2010) despite the country has huge potential to produce livestock there are a chronic challenges of livestock production development in most part of the country. As different studies highlighted that livestock production and the productivity is proportionally lowered by various livestock management problems, prevalence of major endemic diseases, poor feeding and high stocking rate on grazing lands, lack of support services such as extension services, veterinary services, insufficient data to plan improved services and inadequate information on how to improve animal breeding, marketing, and processing (Kedija *et al.*, 2008). In the Ethiopian context,

Brahmi and Thakur (2011) reported that lack of awareness, illiteracy, poor economic statues, lack of faith in government programs, lack of disease prevention program, village politics and subsidy culture affect the peoples participation to a large extent livestock production.

Mtero *et al.*, (2012) reported that currently number of livestock production found to be decline in rural areas. According to study by Lakew Desta *et al.*, (2000) reported that inadequate feed both in quantity and quality,

widespread diseases and poor health, poor genetic potential for production traits and inadequate or inappropriate livestock policies with respect to credit, extension, marketing and infrastructure have been listed as major factor affecting the development of the livestock sub-sector in most highland parts of the country. In addition, not enough information is available on the determinant factors and opportunities of livestock production development in Bedele district in particular where livestock are considerably important to the livelihood for growing population. This study mainly concerned to identification of determinant factors influencing development of livestock production among smallholder farmers in the study area.

Since smallholder farmers' are rearing and consuming livestock domestically. Therefore, the government through its research organizations supply different Agricultural technology to the community and others has deliberately developed artificial insemination technology, provided extension services up to community levels throughout the entire country, removed disease problem on livestock production. Despite those mentioned efforts done by the government, livestock production development has remained low to the extent of trailing in the study area. Identification of determinant factor affecting livestock production development is preconditions for designing suitable livestock production development strategies in the future improvement of the livestock production in the study area and elsewhere in the Ethiopia.

Objective of the study

The study generally aimed at assessing determinants and opportunity to livestock production development of smallholder farmers' using the multiple linear regression models through measuring elasticity of different inputs used in the production livestock.

Materials and Methods

The study was conducted in Bedele district of Bunno Bedele Zone, Oromia Regional state during 2018/19. It is bordered by the Sigmo woreda, jimma Zone on the south western, Chora woreda in the northwest, Arjo woreda in the northern, and by the Gechi i in the east.

The woreda is located in the south western part of Ethiopia. It has a total area of 2,210.16 km² with 41 rural and 2 unban kebele total 43 kebeles. The woreda has a total population of 152,675 people out of which 75,698 and 71,977 are male and female respectively and 14270 household heads out of which 12856 male and 1414 female house hold head. Furthermore, 94.8% of the population lives in rural area and 5.2% lives in urban area. The population density of the study area is 534.3 persons per kilometer square. Mixed farming (crop production and livestock rearing) is the predominant sources of livelihood for the majority of the population in the area.

Geographically, the woreda falls between 36° 0' 0'' up to 28° 80' 0''N latitude and 20°79'E longitude. The woreda receives an average annual rainfall ranging from about 887 up to 1,194mm, altitude 1500 up to 2100 and temperature 18 up to 30 Centigrade. The landscape includes valley, high forests and plain divided by valleys. The woreda has 45% arable land or cultivable land (57% was under annual crops), 4.7% pasture land, 35%, and 12% is considered swampy and degraded or otherwise unusable land respectively. Maize is an important food crop and Coffee is as important cash crop for this woreda; over 3000 hectares are planted with this crop CSA (2007).

Research Design

The main aim of this research was to identify determinants of livestock production development in Bedele district. Secondly to look at the opportunities that exists to develop this livestock production. The survey research method was used to determine above-mentioned objectives in study area. The survey was administered to a selected sample of farmers in Bedele district. The survey instrument used was a questionnaire with both semi-structured questions.

Sampling techniques and Sample size determination

Two stage sampling procedure was employed. In the first stage, Bedele district was randomly selected supposing similar livestock production development potential in the zonal as information obtained from zonally agricultural office. In the second stage, a total of 3kebeles was randomly selected from the complete list of total kebeles of the district based on probability proportionate to total kebeles of study area. A total of 99 representative farm household was randomly selected based on probability proportionate to the population of the respective kebele.

The simplified formula provided by Yamane (1967) was used to determine the required sample size at 95% confidence level, degree of variability = 0.5 and level of precision = 10% are recommended in order to get a sample size which is represent a true population.

$$n = \frac{N}{1+N(e)^2} = \frac{14270}{1+14270(0.1)^2} = 99$$

Where: n = is the sample size of livestock rearing households, N = is the total households head in the district (N = 14270) and e = 0.1 is the level of precision defined to determine the required sample size at 95% confidence level.

Dependent variable of the model

Number of livestock owned by sampled household head: It is continuous dependent variable that is measured in tropical livestock unit (TLU).

Method of Data Analysis

Both descriptive statistic and econometric model was used to analyze the collected data. Multiple linear regression models were used to identify factors influencing livestock production development of smallholder farmers. It is a general statistical technique through which one can analyze the relationship between a dependent variable and a set of independent variables.

$$y = \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \beta_4\chi_4 + \dots + ui$$

Where

Y= Number of livestock owned by sampled household head in TLU

X1= Age of respondent measured in year

X2=Education level of respondents measured in number of year spend in schooling

X3=availability of veterinary services (0= no veterinary services, 1= if there is available veterinary services)

X4= availability of disease and pest (0= occurs of disease and pest, 1= if no disease & pest)

X5=Availability of infrastructure (0= if no infrastructure, 1= if there is infrastructure)

X6=Availability of Artificial Insemination (0= if there is no artificial insemination, 1=if there)

X7=Availability of grazing land (0= if there is no grazing land, 1= if there grazing land)

X8=availability of extension services (0= if there is no extension services, 1= otherwise)

X9=Availability of market information (0= if there is no market information, 1= otherwise)

X10= Capital household head have for livestock production in birr

Result and Discussion

In this study, the majority of survey respondents 90 percent of them keep livestock and these include cattle, ruminants/shoats such as goats and sheep, and equines, and donkeys. Survey results indicate that farmers in the study area have 511TLU, 28.75TLU, 78.75TLU, 127TLU, 4.03TLU, 25.6TLU, and 57.4TLU of cow, calf, heifer, oxen, sheep, goat, and donkey respectively in the study area.

Table1: Description of total livestock production owned sampled respondents

Livestock type	Number	TLU
Cow	511	511
Calf	115	28.75
Heifer	105	78.75
Oxen	127	127
Sheep	197	25.6
Goat	31	4.03
Donkey	82	57.4
Poultry	76	23.4

Sources: Own survey (2019)

According to the survey results show that there are a major opportunities identified to livestock production in the study area. Out of 99 respondents in the study area 27.27%, reported availability of veterinary supply, and 25.25% of them reported availability of water, 22.22% of respondents reported that availability of mixed crop system, 13.13% of respondents report that supply of credit service, and 12.12% of feed availability were the major opportunities for livestock production development in study area.

Table2: Description of opportunities of livestock production development

Opportunity to livestock production	Respondents		Rank
	Number	Percent	
Availability of water	25	25.25	2 nd
Availability of feeding resources	12	12.12	5 th
Availability of veterinary supply	27	27.27	1 st
Availability of mixed crop system	22	22.22	3 rd
Availability of credit services	13	13.13	4 th
Supply of improved breed	11	11.11	6 th

Sources: Own survey (2019)

Determinants of livestock production development

Before fitting this model, the problem of multicollinearity among independent variables was checked by using contingency coefficient (CC). The term Multicollinearity is due to Ragnar Frisch, originally it meant the existence of a perfect or exact linear relationship among some or all explanatory variables of multiple linear regression model. The problem of multicollinearity was not serious among variables because of CC value are less than 0.5. The coefficient of determination (R²) values is 0.7966. It means that about 79.66% of the variation in the dependent variable is explained by the independent variables, indicating relatively high explanatory power (goodness of fit) of the model. Out of these 10 explanatory variables, only 6 variables are found to be significantly affecting household livestock production development. Those variables which are considered as important determinants of livestock development as per the analysis result are (Education, Extension service, grazing land, veterinary service, market information and artificial insemination) are statistically significant at different significance level. Discussions on the statistically significant independent variables are as under:-

Availability of artificial insemination: availability of artificial insemination significantly determines livestock production development of households. As the artificial insemination performed the livestock production development of households increased by 0.24 percent. The study supported by the finding of Ramesh Ch. *et al.*, (2008): livestock sector composition and factors affecting its growth in Ethiopia.

Availability of grazing land: presence of grazing land is positively determining livestock production development of household heads. Other factors being constant as availability of grazing land increases by one unit of hectare, livestock production development increases by 2.572 units. This is true as farmers have more grazing land and more likely to produce livestock and sufficient grazing resources will be initiate farmers to have more number of livestock. The study supported by study done by Zander *et al.* (2012:4) farmers mentioned land availability as the major constraint to livestock development. Land availability determines the amount of feed the livestock get therefore it is very important in livestock development. Mucuthi and Munei (no date: 2) also indicated that the lack of water and grazing land were amongst one of the hindering factors in livestock development.

Availability of veterinary service: As availability of veterinary service increases, livestock production development of smallholder farmer increase by 0.074percent. The implication of the analysis result is that veterinary service is an input for the health of livestock production, hence increases number of livestock production. The study supported by the finding of Belay *et al.* (2013:4) in Ethiopia lack of veterinary services has led to farmers using traditional medicines and these were reported to be functioning poorly.

Education level of household head: education level negatively and significantly determines livestock production development of smallholder farmers in the study area. As education level of the farmers increase, livestock number household head owned decrease by 0.074 percent. This is true as education level of farm household increase more focus on quality rather than quantity.

Availability of extension services: the estimated coefficient of this variable supports the proposed hypothesis and it is significant. Other being constant one unit increase in extension contact household livestock production development increases by 2.522units. This is true by expanding and encouraging the household participation rate for the use of extension program is still important for the livestock production enhancement since the extension user households are more productive than non-user. A study supported by the FAO (1999:28) revealed that government extension services have generally failed to provide information to individual farmers as they saw the task to be too large. Mureithi and Mukiria (2015:4) mentioned that farmers ranked extension advice for government, training, and veterinary services as one of the problems they are facing; only 5% of farmers mentioned that they had access to government veterinary services and most of them relied on private veterinary services.

Marketing information: As household access to market information is increases, livestock production of smallholder farmer increase by 0.034percent. The study supported by Zander *et al.* (2013:13) mentioned that marketing is one of the issues that most seriously impede livestock development in Africa. Marketing should play an important role in the process of transforming small-scale farmers into commercial producers; according to Coetzee *et al.* (2005:4) the market is the institution that should provide the necessary incentives for farmers to increase their income.

Table 3: Econometric parameters estimation results of multiple linear regression models

Variables	Coefficient	Probability
Constant	2.8541	0.0023
EduHH	-0.074	0.075
Veterinary services	0.0743	0.074
Disease and pest	0.247	0.249
Infrastructure	1.5696	0.736
Artificial insemination	0.2374	0.000
Capital	0.2125	0.337
Age HH	0.2383	0.690
Grazing land	2.572	0.000
Extension services	2.522	0.000
Market information	0.034	0.036
Important Statistics:		
Number of observation = 99		
R-squared = 0.7966		0.0000
Adjusted R-squared = 0.7655		

Sources: Own survey data (2019)

Conclusion

The opportunities and determinants of the livestock production development of smallholder farmers in rural areas of Bedele are many and varied. Major factors that contributed to development of livestock production are artificial insemination, Spread of extension services, education level, expansion of veterinary facilities, market information and availability of grazing land in the study area. The opportunities are availability of water, supply of improved breed, feed availability, credit services, veterinary supply and mixed crop-livestock production system.

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