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Article

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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

Factors influencing the intensity of market participation of smallholder livestock producers in southwest Ethiopia

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Abstract: Livestock market participation is an important way to improve the livelihoods and income of the smallholder farmers in Southwest Ethiopia. Although it plays an important role, livestock producers do not fully participate in the livestock market. The purpose of this study was to investigate the factors that influence the intensity of livestock market participation in Southwest Ethiopia. To analyze the result, descriptive statistics and Poisson regression analysis were used. The results showed that 65.4% of the respondents have participated in livestock markets whereas 34.6% were not market participants. The Poisson regression result showed that experience in livestock production, education status, market access, access to grazing land, livestock owned and extension contact frequency affect positively while distance to a nearby market affects negatively and significantly on the

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ABOUT THE AUTHOR

Yaregal Tilahun (Corresponding author) obtained his undergraduate degree in Agricultural Economics from Jimma University, completed his Master's degree in Agricultural Economics at Haramaya University, and achieved Assistant Professorship at Mizan-Tepi University. For the past five years, he has been serving as a lecturer in Agro-economics at Mizan-Tepi University. His primary research interests revolve around regional development, development economics, and international trade. Specifically, he focuses on conducting research in market chain analysis, value chain analysis, climate change, gender gap, climate change, women empowerment, food economics, food security, willingness to pay, and green economy development. Additionally, he collaborates on research projects such as analyzing the value chain of enset, identifying production and marketing constraints in livestock, tea, spices, coffee, honey, and crops in Southwest Ethiopia.

PUBLIC INTEREST STATEMENT

Livestock market participation is a crucial avenue for enhancing smallholder farmers' livelihoods in Southwest Ethiopia, yet a significant portion of producers remain detached. This study investigates the determinants of livestock market engagement, revealing that 65.4% participate while 34.6% do not. Factors such as livestock production experience, education, improved market access, grazing land availability, livestock ownership, and extension contact frequency positively influence market participation intensity. Conversely, proximity to markets negatively impacts engagement. The study highlights the barriers of inadequate market access, long distances, and outdated information. Recommendations include augmenting farmer education through adult programs, enhancing rural infrastructure for updated market data and transportation, expanding training centers, and refining consultation services. By comprehensively addressing these factors, stakeholders can effectively bolster smallholder farmers' market participation, amplifying their economic prospects and contributing to regional development in Southwest Ethiopia.

intensity of livestock market participation. Based on the result of the study; lack of market access, long market distance, and lack of updated market information are the factors influencing livestock producers to engage in livestock market participation. Finally, this study suggests boosting farmer education through adult education and developing rural infrastructure (updated market information, road, and market and transport access), increase in farmers' training centers, improves consultation and training service could enhance the intensity of livestock market participation.

Subjects: Agriculture & Environmental Sciences; Environmental Management; Environment & Gender; Environment & Economics; Environmental Economics; Economics

Keywords: livestock; intensity; Poisson regression; market participation; Southwest Ethiopia

1. Introduction

The Ethiopian economy is heavily reliant on agriculture as a key source of food security, jobs and revenue because of the population's widespread appeal. Agriculture contributed 20.6% to poverty reduction, 37.2% to GDP and 78% to export income, and 75% to employment opportunities WB (2017). Besides this, it is vital for reducing food insecurity and raising the income of 12 million farmers in the country. The country is categorized as a low-income country by the World Bank and ranks 173rd out of 189 countries on the development index scale (UNDP, 2021; World Bank, 2021).

In Africa, Ethiopia is the biggest livestock producer country, which accounts for 65 million cattle, 40 million sheep, 51 million goats, 8 million camels, and 49 million chickens in 2020 (CSA, 2020). Livestock is a vital basis of proteins, agricultural production power, conveyance, foreign exports, compost for farmland and household consumption, economic disaster protection, and wealth creation (Gebremedhin et al., 2016; Shapiro et al., 2017). In 2017, the sector provided up to 40% of agricultural gross domestic product (GDP), over 20% of total GDP, and 20% of national foreign currency earnings (World Bank, 2017). According to recent figures, indigenous, mixed, and exotic breeds account for 97.8%, 1.9%, and 0.3% of the total livestock, respectively (CSA, 2020).

Livestock production is dominated by agro-pastoralists, pastoralists, and small-scale mixed crop-livestock farmers (Girma & Abebaw, 2012; Vall, 2019). Agro-pastoral and pastoral livestock production are the second most dominant systems in Ethiopia and they are mainly in eastern and southern parts of the country in Afar, Somali, Southern Oromia and South Omo in SNNPR (Brief, 2016; Romha et al., 2018; Yami et al., 2015). In the highland mixed farming systems, livestock and crop production complement each other where crop productions heavily rely on animal draught power (Chipasha et al., 2017; Lubungu et al., 2012). These production systems can be categorized as extensive livestock management systems with low-input and low-output (Kgosikoma & Malope, 2016; Lubungu et al., 2012; Mafukata, 2015).

Several studies using data from different households have tried to understand the factors influencing producer decisions to participate in livestock markets (Kgosikoma & Malope, 2016; Lubungu, 2013; Zuwarimwe & Mbaai, 2015). The market participation of smallholder livestock producers is characterized by a low level of market participation. Based on the result of several experts, lack of market access, long market distance, and lack of updated market information are the factors influencing livestock producers to engage in livestock market participation (Lubungu et al., 2012; Zuwarimwe & Mbaai, 2015), and poor road infrastructure that results in high transport costs (Mafukata, 2015; Nwafor et al., 2020). Identifying the causes of smallholder farmers' livestock marketing behavior is important to close the information disparity about why poverty persists even among livestock-owning households (Fakade, 2016).

Affirming the importance of market information for smallholder farmers, studies revealed that the delivery of adequate market information would improve output efficiency (Carletto et al., 2017; Nwafor et al., 2020), and also contributes significantly to market participation (Okello et al., 2014; Tessema et al., 2019). Conversely, lack of adequate and updated market information would decrease personal advantages and increase injurious decisions and is a disincentive factor for farmers in market participation (Chipasha et al., 2017; Nwafor et al., 2020; Sigei et al., 2014). In the livestock business, especially among rural smallholder farmers in developing countries, a lack of market information is seen as a major concern (Dlamini & Huang, 2019; Ndoro et al., 2013; Sehar, 2018). As a result, farmers were subjected to an informal marketing system in which they were paid a reduced marketing price without regard for the product's supply and demand (Mbitsemunda & Karangwa, 2017; Ogutu & Qaim, 2019; Sehar, 2018).

The marketing of livestock is a complicated system because many factors intervene in the process of the sale. Lack of infrastructure, lack of experience, occurrences of disease, lack of market access, transportation, funds and limited market information access lead to high marketing cost which reduces access to formal markets and limits the opportunities to develop a successful market strategy (Katikati, 2017; Musemwa & Mushunje, 2011; Nkhori, 2006; Okewu & Iheanacho, 2015; Sehar, 2018). Small-scale livestock farmers refuse to engage in livestock markets as they have misgivings in the prices offered at different marketing channels (Ogutu & Qaim, 2019; Ortmann & King, 2010; Shiimi, 2009, 2009; Tessema et al., 2019; Zuwarimwe & Mbaai, 2015).

Unfortunately, little research has been done to determine the main causes of the poor market involvement of smallholder farmers, particularly those in Southwest Ethiopia and Ethiopia in general. This research fills a knowledge vacuum and helps to provide data that policymakers can use to promote increased market involvement of smallholder livestock producers in Southwest Ethiopia. Therefore, the main objective of this study was to assess market participation level of smallholder farmers in livestock products and thereby identify the key factors influencing their participation intensities in livestock markets in the context of Southwest Ethiopia which may help provide evidence for the government and development practitioners to make an informed decision.

2. Research methods

2.1. Description of the study area

The study took place in the South Nation Nationality and Peoples (SNNP) region's southwestern part, specifically in the four zones of Bench Sheko, West Omo, Kaffa, and Shaka in Ethiopia. Bench-Maji (including Bench-Shako and West-Omo) zone is found at a distance of about 565 kilometers from Addis Ababa and 832 kilometers from Hawassa. Agro-ecologically, altitude assortments from 500–3,000 m.a.s.l. The zone is found at 34°45'-36°10' east and 5°40'-7°40' north. The annual average temperature ranges from 15.1°C to 27.5°C, while the annual rainfall ranges from 400 to 2,000 mm. Kaffa zone is found at a distance of about 460 km from Addis Ababa and 690 km from the regional capital. The zone found at Latitude: **7**°10'46.78", Longitude: 36°2'52.44". The estimated terrain elevation above sea level is 1795 meters. The annual average temperature range from 14.1°C to 26.5°C, while the annual rainfall range from 400 to 2,000 mm. Shaka Zone is located at 7°24'-7°52' north latitude and 35°13'-35°35' east longitude, at a distance of 700 km from Addis Ababa. It shields about 2175.25 kilometers square, of which 47% is covered by forests. The altitude ranges of the zone fall between 900–2700 masl. and the extent of rainfall becomes high rainfall with an annual average of 1800 to 2200 mm and the annual mean temperature ranges between 15.1°C to 27.5°C. The rain-fed production system is most dominant and practiced by a majority of the farmers.

In the study areas, households were involved in various activities, such as crop production, livestock rearing, off-farm work, and non-farm activities. However, the primary focus was on crop

production and animal husbandry for both personal consumption and sale. The predominant food crops in this zone comprised maize, taro, and enset, while cash crops included fruits like bananas, pineapples, and oranges, as well as spices like coriander and ginger. Additionally, honey and cattle served as significant local sources of income. Based on the findings from the Bureau of Planning and Economic Development in 2020, the study area was home to a substantial number of livestock populations, with approximately 7.5 million cattle, 2.4 million sheep, 2.2 million goats, 6.9 million equines, and 5 million chickens.

2.2. Type, source, and method of data collection

A mixed pragmatic approach was used in this study to gather qualitative and quantitative data from both primary and secondary sources. The qualitative data included the socio-economic features of the sampled livestock producer households. The number of livestock reared, price of livestock, grazing land in hectares, and livestock number were collected in form of quantitative data type. To collect the primary data, a semi-structured questionnaire was employed and pretested on some respondents to add the excluded inquiries and reduce the poor proxy inquiries. Besides, sampled respondents, key informants, and focus group discussions were employed to gather additional information on livestock production and marketing aspects with their related constraints. To support the result obtained from primary data; data from published and unpublished documents, zonal and district agricultural offices, annual reports, survey reports, agricultural and industry offices, and from websites were employed.

2.3. Sample size determination

A three-stage sampling procedure was used to draw livestock producing smallholder farmers. In the 1st stage from four zones (Kaffa, Shaka, Bench Sheko, and West Omo), 23 woreda were selected purposively due to the catchment area of the Southern Nation Nationality and Peoples Region (SNNP) special support office. In the 2nd stage, depending on the production potential of livestock producers' 69 *kebeles* from 23 *woredas* were selected purposively. In the 3rd stage, about 396 sampled households' were selected randomly for each livestock using probability proportionate size. The number of sample households was determined by using the formula given by Yamane (1967). Accordingly, the required sample size, a confidence interval of 95% with a level of precision equal to 5% is used to obtain a sample size required which represents a true population. The sample size was mathematically calculated as follows:

$$n = \frac{N}{1+N(e)^2} = \frac{41285}{1+41285(0.05)^2} = \mathbf{396}$$

Where N is the total household population of the sampled respondents, n is the sample size and e is the error term (Table 1).

2.4. Methods of data analysis

Using the appropriate statistical software (SPSS and STATA), the data collected were analyzed; descriptive and econometric analysis was used for analyzing the data. Descriptive statistics like

Table 1. The proportion of sampled respondents from the total population

No.	Zones	Total number of livestock producers	Number of sampled households
1	Bench-Shako	8,913	85
2	Kaffa	16,865	162
3	Shaka	4,847	47
4	West-Omo	10,660	102
	Total	41,285	396

Source: Woreda's statistical report, 2020; Own computation, 2020

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Table 2. Summary of independent variables used in the econometric model with the expected sign

Variables	Coding	Measurement	Expected sign
Sex of household head	1 = male, 0 = female	Dummy	±ve
Experience in livestock production	Year	Continuous	+ve
Family size	Number	Continuous	−ve
Education level	Year	Continuous	+ve
Distance to the nearest market	Kilometers	Continuous	−ve
Number of livestock reared	Number	Continuous	+ve
Livestock holding	Number (TLU)	Continuous	−ve
Access to market	1=yes, 0=no	Continuous	+ve
Frequency of extension contact	Number	Continuous	+ve
Amount of credit taken	Birr	Continuous	+ve
Access to information	1=have access, 0=no	Dummy	+ve
Access to veterinary service	1=have access, 0=no	Dummy	+ve
Access to grazing land	1=have access, 0=no	Dummy	+ve

mean, percentage, frequency, and standard deviation were used to analyze the socio-demographic characteristics of the sampled livestock production and marketing.

The factors influencing the level of livestock market participation were analyzed empirically using the Poisson regression. The intensity of livestock sold in the market, which is counted and measured in volume, was used to determine the intensity of livestock market participation (Abate et al., 2021; Lijalem, 2019; Sibhatu et al., 2015). Thus, the Poisson regression analysis is appropriate for analyzing such data, counted data (Coxe et al., 2009; Gardner et al., 1995; Osgood, 2000; Simonoff, 2003; Yau et al., 2003). The model might be examined using the counter likelihood method to address the troublesome expectations connected to over-scattering, which resulted in entirely smoothed random effects and overstated t-statistics in the final result and is consistent under this condition (Abate et al., 2021; Varma et al., 2020). Therefore, Poisson maximum likelihood estimation (QMLE) was used to estimate the regression coefficients (See Table 2).

$$\Pr(Y = y) = \frac{e^{(-\mu)\mu^{y}}}{y}, = 0, 1, 2, \ldots n$$

Where Y is the number of livestock sold in the market, μ is intensity or rate parameter.

The distribution is stated as $p\ (\mu)$. The model's dispersion implies equi-dispersion, which means that for a particular covariate pattern, the mean and variance of the outcome are identical (Hardin & Hilbe, 2015). That is, mean $E(Y) = \mu$ and variance $V(Y) = \mu$ (Abate et al., 2021; Varma et al., 2020).

The standard approach of the Poisson regression is to use the exponential mean parameterization.

$$\mu_i = Exp(X * \beta), i = 1, 2, 3 \ldots N$$

Where $\mu_i$the expected number of livestock sold, x_i is the numeral value of independent variables and β is the coefficients unknown to be estimated. The specified equations (two and three), and the hypothesis that the observations y_i/x_i are independent and most estimators are a maximum likelihood. Consequently, the log-likelihood function for the Poisson regression function is:

$$lnL(\beta) = \sum_{i=1}^{N} y_i X_i \beta - exp^{X_i\beta - lny_i}$$

2.5. Variables used in poisson regression model

3. Results and discussion

3.1. Demographic and socio-economic characteristics of Livestock producers

The variables used in the Poisson regression analysis are given in the following table (Table 3). The descriptive analysis showed that the intensity of livestock market participants and non-participants were 259 (65.4%) and 137 (34.6%) respectively. This indicated that almost more of the sampled livestock producer respondents were participants in livestock markets. As the survey result indicated, 89.64% of the sample households were male-headed whereas the remaining 10.36% of them were female-headed households. The result indicated that male-headed households were participating more in livestock marketing than their counterparts. Among market participants, male-headed and female-headed producers constitute 78% and 22% respectively. Out of non-participants, 93.4% were male-headed while the remaining 6.6% were female-headed households. The finding of Abate et al. (2021) found that male headed-producers were participating in the livestock market than their counterparts.

Table 3. Demographic and socioeconomic characteristic of households

Variables Dummy (X^2-test)	Participants (259)	Non-participants (137)	Total (N = 396)	X^2-test
Sex (Male)	77.99	93.43	89.64	2.07
Market access (Yes)	41.31	35.03	39.14	3.95**
Access to veterinary service (Yes)	23.55	15.32	20.71	6.93***
Availability of feed (Yes)	39.76	35.76	38.38	13.64***
Grazing land (Yes)	34.36	22.63	30.3	21.92***
Access to market information (Yes)	48.26	39.42	45.2	10.79**
Cooperatives membership	.561	.358	*0.418*	*4.936****
Continuous variables (t-test)				
Experience	46.961	41.394	44.183	0.562
Family size	5.834	4.857	5.346	−2.095**
Education level	4.531	3.853	4.192	1.146
Distance to nearest market	3.047	3.918	3.483	−1.093***
Livestock holding (TLU)	3.274	2.635	2.954	−3.551*
Extension contact	2.074	1.852	1.961	4.147**
Distance to extension service	1.873	2.792	2.067	−8.754***

Note: *** and ** are significant at 1% and 5% significance level

Source: Survey results, 2020

The results in Table 3 show that 41.3%, 23.6%, 39.8%, 34.4% and 48.3% of the sampled livestock market participants had access to market, veterinary service, availability of feed, grazing land, and market information, respectively. Out of non-participants, 35%, 15.3%, 35.8%, 22.6% and 39.4% of the sampled livestock producers can get access to market, veterinary service, availability of feed, grazing land, and market information, respectively. Among from a total of 396 sample respondents, only 39.14%, 20.7%, 38.4%, 30.3% and 45.2% of the sampled livestock producers were access to market, veterinary service, availability of feed, grazing land, and market information, respectively.

Regarding cooperative membership, 42% of sample households were members of cooperatives. From this 56% of households were members of cooperatives from participants whereas 35% of households were members from non-participants (Table 3). The result found that there was a significant distinction between the two groups in membership to cooperatives at a 1% significance level. The finding of Abate et al. (2014), Tarekegn et al. (2017) and Zhang et al. (2020) also are in agreement with this finding that shows there is a positive and statistical significance between livestock market participants and non-participants in membership to the cooperative.

The mean average market distance to the nearby market for the sampled households was 3.48 kilometers. The mean distance from the nearest market for livestock market participants was 3.04 kilometers while it was 3.92 kilometers for non-participants (Table 3). T-test result shows that the distinction between the two was statistically significant on livestock market participants and non-participants in distance from the nearest at 1% significance level. The result indicated that, the closer distance the household resided from the market the higher would be market participation of that household than the one who resided far away. The outcome is in line with the finding of Yihdego et al. (2015), Tura et al. (2016) and Lutta et al. (2021) found that there is a significant relationship between market participants and non-participants in distance to the nearest market.

For the variable livestock holding (TLU), a t-test was performed, and the mean value for participants was 3.274 TLU, while for non-participants, it was 2.635 TLU. The overall mean for the total sample ($N = 396$) was 2.954 TLU. The t-test value of 3.274 indicates that there is a statistically significant difference in livestock holding between participants and non-participants. Specifically, participants had higher livestock holdings compared to non-participants. The negative chi-square (X2-test) value of −3.551* supports this conclusion and indicates a significant association between participation status and livestock holding.

Regarding the variable extension contact, the t-test compares the means of participants (2.074) and non-participants (1.852) in terms of their frequency of contact with extension services. The overall mean for the total sample ($N = 396$) was 1.961. The t-test value of 4.147** suggests that there is a statistically significant difference in extension contact between participants and non-participants. Participants had a higher frequency of extension contact compared to non-participants. The positive chi-square (X2-test) value of 4.147** confirms this finding and indicates a significant association between participation status and extension contact.

The average family size of the sample livestock producer was 4.58 (almost five members). The mean family size of livestock market participants was 5.8 while it was 4.9 for non-participants. The result revealed that there was a statistical distinction between livestock market participants and non-participants in family size at a 5% significance level (Table 3). The result by Abate et al. (2021) found similar findings in northern part of Ethiopia that households who have more family size were more livestock participate than their counterparts. Finally, the sampled livestock producers traveled 2.1 kilometers to arrive at the extension service center. The average travel time taken among participants and non-participants to arrive at extension service was 1.8 and 2.7 kilometers, respectively.

3.2. Econometric analysis

The result in (Table 4) summarizes the parameter estimates of the Poisson regression analysis used to analyze the determinants of the intensity of livestock market participation. The dependent

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Table 4. Estimation results of the Poisson model for intensity of livestock market participation

Variables	Cofficent	Std. Dev.	IRR	Std. Err.
Sex (male)	−.2086	.01843	.0852	.1638
Family size	−0741***	.0639	.7504	.0036
Experience	.5047*	.0831	1.0638	.0107
Education status	.0943**	.0403	1.5043	.1203
Access to market	.3209**	.1083	2.0671	.1193
Access to grazing land	.4106***	.2074	1.9503	.1065
Amount of credit taken	.1849	.0861	1.5726	.1271
Distance to nearest market	−.1274***	.1049	1.8201	.06835
Feed availablity	.4015	.1273	2.0753	.2062
Types of breed	.1047	.0731	.5083	.0482
Access to veterinary service	.0794	.0069	1.0633	.3025
Livestock owned	.4523***	.0402	1.1085	.1092
Cooperative membership	.1154	.0936	1.0582	.1703
Frequency of extension contact	.2091***	.1153	2.0684	.0481
Amount of credit taken	.1374	.0621	1.4025	.1154
Log-likelihood	−346.439			
LR Chi^2 (15)	963.15			
Prob > Chi^2	0.0000			
Pseudo R^2	.6186			

Note: *, ** and *** are significant at 10%, 5%, and 1% significance level

Source: Survey results, 2020

variable in the model was the intensity of livestock market participation and the independent variables were sex, livestock production experience, education status, family size, market access, access to grazing land, credit, distance to the nearest market, feed availability, market information, breed type, access to veterinary service, livestock owned and membership to cooperative (Table 4).

3.2.1. Experience

Experience in livestock production was positively and significantly associated with the intensity of livestock market participation at a 10% significance level. The incidence rate ratio of the result indicated that if the experience of livestock production was increased by 1 year, the rate of livestock sold by the household would increase by 1.0638, keeping other variables constant. This outcome is corresponding to the finding of Egbetokun and Omonona (2012), Kyaw et al. (2018), Dlamini and Huang (2019), Dlamini and Huang (2019), Kibona et al. (2021) who found that there is a positive correlation between farming experience and livestock market engagement. To increase the inquiry for potential consumers, farming experience examines the influence of social networks and relationships acquired over time (Kgosikoma & Malope, 2016) and experienced farmers are efficient in the production of marketable surplus, thus increasing participation in cattle marketing (Abate et al., 2021; Kibona et al., 2021). Moreover, experienced farmers are efficient in the production of market supply, thus increasing the intensity of agricultural market participation (Dlamini & Huang, 2019).

3.2.2. Education level

As expected, at a 5% significance level, the household head's educational level had a positive and significant connection with the quantity of livestock sold in the market. This suggests that when the household head's educational degree rises by one year, the number of cattle sold rises by a factor of 1.5053, ceteris paribus. This demonstrates that education improves farmers' skills and knowledge capacity, resulting in improved production and marketing procedures (Dlamini & Huang, 2019), as a result, the anxiety of predicted market risk is reduced, to get more profit (Abate et al., 2021). This confirms the finding of (Abate et al., 2021; Dlamini & Huang, 2019; Kiwanuka & Machethe, 2016; Lutta et al., 2021; Mazengia, 2016; Tufa et al., 2014) that states educated household heads can have better market networking and bargaining power and good managerial skill of enterprises and their tendency to accept different agricultural technologies is high so that they can supply more surpluses for the market.

3.2.3. Market access

As prior expected, the intensity of livestock sale in the market has a favorable and significant link with the availability of market access at a 5% significant level. This showed that households who have market access are probable to increase a rate of 2.067 times higher for the number of livestock sold associated with farmers who have no market access, ceteris paribus. The result revealed that the lower transaction costs could improve livestock farmers' market participation and raise their market gain. The finding is in agreement with the findings of Negassa and Jabbar (2008), Balirwa et al. (2016), Kibona et al. (2021) who found that the availability of livestock market access had a direct and significant effect on the level of livestock market participation.

3.2.4. Access to grazing land

At a 1% significance level, the accessibility of grazing land had a significant influence on the extent of livestock market participation. This indicated that the households who have more on grazing land are expected to supply livestock to the market at a rate of 1.9503 times that of their counterparts. Hence, the feeding system in the area was mainly depending on the natural pasture and private grazing land. Farmers that believe there is sufficient grazing land and feeding supplies are motivated to raise larger animals to improve market participation intensity. The result is in line with the finding of Dlamini and Huang (2019, Abate et al. (2021) and Kibona et al. (2021) revealed that there is a positive effect of grazing land on livestock market participation and supply.

3.2.5. Distance to nearest market

The total number of livestock offered in the market would decrease by 1.8201 if the distance between the household's home residence and the nearest market increased by 1 km, ceteris paribus. The longer the distance of the market, is more costly and time-consuming to travel with livestock forcing smallholder farmers to hold more livestock particularly which is common in rural areas where infrastructure and transportation facility is poorly developed. Alternatively, as the distance from the nearest market increases, transport costs increase and this discourages smallholder farmers and their probability of participation in a market decreases. This is consistent with the result of Uchezuba et al. (2009), Sebatta et al. (2014), Tura et al. (2016), Mbitsemunda and Karangwa (2017), Lutta et al. (2021), Madzorera et al. (2021) who realized a negative connection between distance to the nearby market and market participation and level of participation of agricultural products.

3.2.6. Extension contact frequency

As it was hypothesized, a result of the finding indicated that extension contact was positively and significantly related to the intensity of livestock supplied to the market at a 1% significance level. From the result as other explanatory variables being constant, an increase in the frequency of extension contact by one day per month resulted in an increase in livestock market participation by 2.0684. The finding is in line with Alene et al. (2008) and Dlamini and Huang (2019) revealed that obtaining additional consultation from public and/or private extension and medical reflect a higher level of market participation.

4. Conclusion and Policy Implication

Livestock market participation is an important way to improve the livelihoods and income of the smallholder farmers in Southwest Ethiopia. This is true only if smallholder farmers grow their livestock using updated market information and engage in livestock markets. The results showed that 259 (65.4%) of the respondents have participated in livestock markets whereas 137 (34.6%) were not market participants. According to the findings of this study, more farmers participated in the market to protect their financial conditions, however, the intensity of sales was low. As a result, the concerned bodies should increase the intensity of livestock market involvement by boosting smallholder farmers' transition from subsistence to market-oriented production through the development of appropriate policies.

The Poisson regression model result showed that livestock production experience, education status, market access, access to grazing land, livestock owned, and extension contact frequency affect positively while the distance to nearby market negatively and significantly affected the intensity of livestock market participation at the household level. To improve the market participation by smallholder livestock producers, a proactive extension system with market access is needed. This suggests that there is a need to devise policy and program interventions prioritizing livestock production and consumption that mainly strengthen and promote efforts of the key stakeholders towards improving feed availability. The policy goals should be to improve smallholder producers' human capital development, marketing infrastructure, and information flows. Extension services must also work together to give training and awareness to livestock producers in commercial farming, pricing, and animal marketing. So, more smallholder livestock producers will be able to engage in livestock markets if these issues are addressed.

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References

Abate, D., Addis, Y., & González-Redondo, P. (2021). Factors affecting the intensity of market participation of smallholder sheep producers in northern Ethiopia: Poisson regression approach. *Cogent Food & Agriculture*, *7*(1), 1874154. https://doi.org/10.1080/23311932.2021.1874154

Abate, G. T., Francesconi, G. N., & Getnet, K. (2014). Impact of Agricultural cooperatives on smallholders' technical efficiency: Empirical evidence from Ethiopia. *Annals of Public & Cooperative Economics*, *85*(2), 257–286. https://doi.org/10.1111/apce.12035

Alene, A. D., Manyong, V. M., Omanya, G., Mignouna, H. D., Bokanga, M., & Odhiambo, G. (2008). Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, *33*(4), 318–328. https://doi.org/10.1016/j.foodpol.2007.12.001

Balirwa, E. K., Nalunkuuma, J., & Sserunkuuma, D. (2016). Determinants of smallholder dairy farmers' volume of milk sales in Uganda's agro-ecological zones. *International Journal of Applied and Pure Science and Agriculture*, *2*, 97–109.

Brief, M. (2016). Feed the future innovation lab for livestock systems. *Management*.

Carletto, C., Corral, P., & Guelfi, A. (2017). Agricultural commercialization and nutrition revisited: Empirical evidence from three African countries. *Food Policy*, *67*, 106–118. https://doi.org/10.1016/j.foodpol.2016.09.020

Chipasha, H., Ariyawardana, A., & Mortlock, M. Y. (2017). Smallholder goat farmers' market participation in Choma district, Zambia. *African Journal of Food Agriculture Nutrition & Development*, *17*(1), 11691–11708. https://doi.org/10.18697/ajfand.77.16175

Coxe, S., West, S. G., & Aiken, L. S. (2009). The analysis of count data: A gentle introduction to Poisson regression and its alternatives. *Journal of Personality Assessment*, *91*(2), 121–136. https://doi.org/10.1080/00223890802634175

CSA. 2020. Agricultural sample survey 2019/20 [2012 E. C.]. Volume II report on livestock and livestock characteristics (private peasant holdings). Central statistical Agency

Dlamini, S. I., & Huang, W. C. (2019). A double hurdle estimation of sales decisions by smallholder beef cattle farmers in Eswatini. *Sustainability*, *11*(19), 5185. https://doi.org/10.3390/su11195185

Egbetokun, O. A., & Omonona, B. T. (2012). Determinants of farmers' participation in food market in Ogun State. *Global Journal of Science Frontier Research Agriculture and Veterinary Sciences*, *12*(9), 24–30.

Fakade, S. (2016). *Potential of Jozini smallholder cattle farmers to progress from subsistence to commercial cattle farming for enhanced rural livelihoods* (Doctoral dissertation).

Gardner, W., Mulvey, E. P., & Shaw, E. C. (1995). Regression analyses of counts and rates: Poisson, overdispersed Poisson, and negative binomial models. *Psychological Bulletin*, *118*(3), 392–404. https://doi.org/10.1037/0033-2909.118.3.392

Gebremedhin, B., Tesema, E., Tegegne, A., Hoekstra, D., & Nicola, S. 2016.Value chain opportunities for women and young people in livestock production in Ethiopia: Lessons learned. Lives Working Paper. No. 24. International Livestock Research Institute (ILRI). Nairobi. https://cgspace.cgiar.org/bitstream/handle/10568/78636/LIVES_wp_24.pdf?

Girma, M., & Abebaw, D. (2012). *Patterns and determinants of livestock farmers' choice of marketing channels: Micro-level evidence. Ethiopian Economics Association or Ethiopian Economics Policy Research Institute* (No. 1, pp. 1–55). Working Paper.

Hardin, J. W., & Hilbe, J. M. (2015). Regression models for count data from truncated distributions. *The Stata Journal*, *15*(1), 226–246. https://doi.org/10.1177/1536867x1501500114

Katikati, A. (2017). *Assessment of production practices of emerging cattle farmers in the selected districts of the Eastern Cape Province, South Africa* (Doctoral dissertation, Central University of Technology, Free State).

Kgosikoma, K., & Malope, P. (2016). Determinants of market participation and the institutional constraints: Case study of Kweneng West, Botswana. *Journal of Agricultural Extension & Rural Development*, *8*(9), 178–186. https://doi.org/10.5897/JAERD2016.0780

Kibona, C. A., Yuejie, Z., & Clegg, S. (2021). Factors that influence market participation among traditional beef cattle farmers in the Meatu district of Simiyu region, Tanzania. *PLoS ONE*, *16*(4), e0248576. https://doi.org/10.1371/journal.pone.0248576

Kiwanuka, R. N., & Machethe, C. (2016). Determinants of smallholder farmers' participation in Zambian dairy sector's interlocked contractual arrangements. *Journal of Sustainable Development*, *9*(2), 230–245. https://doi.org/10.5539/jsd.v9n2p230

Kyaw, N. N., Ahn, S., & Lee, S. H. (2018). Analysis of the factors influencing market participation among smallholder rice farmers in magway region, central dry zone of Myanmar. *Sustainability*, *10*(12), 4441. https://doi.org/10.3390/su10124441

Lijalem, B. B. T. (2019). *Farmers market participation decision and intensity of participation in butter and cheese marketing: The case of Loma Woreda*.

Lubungu, M. (2013). Welfare effects of smallholder farmers' participation in livestock markets in Zambia.

Lubungu, M., Chapoto, A., & Tembo, G. (2012). *Smallholder farmers participation in livestock markets: The case of Zambian farmers* (No. 1093-2016-87989).

Lutta, A. I., Wasonga, O. V., Robinson, L. W., Nyangito, M. M., & Sircely, J. (2021). Determinants of livestock market participation among pastoral communities of Tana River County, Kenya. *Environment Development and Sustainability*, *23*(5), 7393–7411. https://doi.org/10.1007/s10668-020-00922-8

Madzorera, I., Blakstad, M. M., Bellows, A. L., Canavan, C. R., Mosha, D., Bromage, S., & Fawzi, W. W. (2021). Food crop diversity, women's income-earning activities, and distance to markets in relation to maternal dietary quality in Tanzania. *The Journal of Nutrition*, *151*(1), 186–196. https://doi.org/10.1093/jn/nxaa329

Mafukata, M. A. (2015). Factors having the most significance on the choice and selection of marketing channels amongst communal cattle farmers in Vhembe district, Limpopo Province. *Journal of Human Ecology*, *49*(1–2), 77–87. https://doi.org/10.1080/09709274.2015.11906826

Mazengia, Y. (2016). Smallholders commercialization of maize production in Guangua district, northwestern Ethiopia. *World Scientific News*, *58*, 65–83.

Mbitsemunda, J. P. K., & Karangwa, A. (2017). Analysis of factors influencing market participation of smallholder bean farmers in Nyanza district of Southern Province, Rwanda. *Journal of Agricultural Science*, *9*(11), 99–111. https://doi.org/10.5539/jas.v9n11p99

Musemwa, L., & Mushunje, A. (2011). Marketing challenges and opportunities faced by the Nguni cattle project beneficiaries in the Eastern Cape Province of South Africa. In *Institutional constraints to small farmer development in Southern Africa* (pp. 121–135). Wageningen Academic Publishers.

Ndoro, J. T., Hitayezu, P., Mudhara, M., & Chimonyo, M. (2013). Livelihood factors influencing market participation and supply volumes decisions among smallholder cattle farmers in the Okhahlamba local Municipality, South Africa: Implications for agricultural extension programming. No. 309-2016-5274.

Negassa, A., & Jabbar, M. (2008). *Livestock ownership, commercial off-take rates and their determinants in Ethiopia*. ILRI (aka ILCA and ILRAD).

Nkhori, P. A. (2006). *The impact of transaction costs on the choice of cattle markets in Mahalapye district, Botswana* (Doctoral dissertation, University of Pretoria).

Nwafor, C. U., Ogundeji, A. A., & van der Westhuizen, C. (2020). Adoption of ICT-based information sources and market participation among smallholder livestock farmers in South Africa. *Agriculture*, *10*(2), 44. https://doi.org/10.3390/agriculture10020044

Ogutu, S. O., & Qaim, M. (2019). Commercialization of the small farm sector and multidimensional poverty. *World Development*, *114*, 281–293. https://doi.org/10.1016/j.worlddev.2018.10.012

Okello, J. J., Kirui, O., Gitonga, Z. M., Njiraini, G. W., & Nzuma, J. M. (2014). Determinants of awareness and use ICT-based market information services in developing-country agriculture: The case of smallholder farmers in Kenya. *Quarterly Journal of International Agriculture*.

Okewu, J., & Iheanacho, A. C. (2015). Profitability of goat marketing in Benue State, Nigeria: A study of selected local government areas. *International Academic Journal of Educational Research*, *10*(2), 54–74.

Ortmann, G. F., & King, R. P. (2010). Research on agri-food supply chains in Southern Africa involving small-scale farmers: Current status and future

possibilities. *Agrekon*, *49*(4), 397–417. https://doi.org/10.1080/03031853.2010.526428

Osgood, D. W. (2000). Poisson-based regression analysis of aggregate crime rates. *Journal of Quantitative Criminology*, *16*(1), 21–43. https://doi.org/10.1023/A:1007521427059

Romha, G., Gebru, G., Asefa, A., & Mamo, G. (2018). Epidemiology of mycobacterium bovis and mycobacterium tuberculosis in animals: Transmission dynamics and control challenges of zoonotic TB in Ethiopia. *Preventive Veterinary Medicine*, *158*, 1–17. https://doi.org/10.1016/j.prevetmed.2018.06.012

Sebatta, C., Mugisha, J., Katungi, E., Kashaaru, A., & Kyomugisha, H. (2014). Smallholder farmers' decision and level of participation in the potato market in Uganda. *Modern Economy*, *2014*(8), 895–906. https://doi.org/10.4236/me.2014.58082

Sehar, M. (2018). *Factors influencing market access and livestock marketing inefficiency in Mpumalanga Province, South Africa*. Master of Science thesis. University of South Africa, 1–93.

Shapiro, B. I., Gebru, G., Desta, S., Negassa, A., Nigussie, K., Aboset, G., & Mechale, H. 2017. Ethiopia livestock sector analysis. ILRI project report. International Livestock Research Institute (ILRI).

Shiimi, T. (2009). *Transaction costs and cattle farmers' choice of marketing channel in North-Central Namibia* (Doctoral dissertation, University of the Free State).

Sibhatu, K. T., Krishna, V. V., & Qaim, M. (2015). Production diversity and dietary diversity in smallholder farm households. *Proceedings of the National Academy of Sciences*, *112*(34), 10657–10662. https://doi.org/10.1073/pnas.1510982112

Sigei, G., Bett, H., & Kibet, L. (2014). *Determinants of market participation among small-scale pineapple farmers in Kericho County*.

Simonoff, J. S. (2003). *Analyzing categorical data* (Vol. 496). Springer New York. https://doi.org/10.1007/978-0-387-21727-7

Tarekegn, K., Haji, J., & Tegegne, B. (2017). Determinants of honey producer market outlet choice in Chena district, southern Ethiopia: A multivariate probit regression analysis. *Agricultural and Food Economics*, *5*(1), 1–14. https://doi.org/10.1186/s40100-017-0090-0

Tessema, W. K., Ingenbleek, P. T., & van Trijp, H. C. (2019). Refining the smallholder market integration framework: A qualitative study of Ethiopian pastoralists. *NJAS-Wageningen Journal of Life Sciences*, *88*(1), 45–56. https://doi.org/10.1016/j.njas.2018.12.001

Tufa, A., Bekele, A., & Zemedu, L. (2014). Determinants of smallholder commercialization of horticultural crops in Gemechis district, West Hararghe zone, Ethiopia. *African Journal of Agricultural Research*, *9*(3), 310–319. https://doi.org/10.5897/AJAR2013.6935

Tura, E. G., Goshub, D., Demise, T., & Kenead, T. (2016). *Determinants of market participation and intensity of marketed surplus of teff producers in Bacho and Dawo districts of Oromia State, Ethiopia*. Agricultural Economics.

Uchezuba, I. D., Moshabele, E., & Digopo, D. (2009). Logistical estimation of the probability of mainstream market participation among small-scale livestock farmers: A case study of the northern cape province. *Agrekon*, *48*(2), 171–183. https://doi.org/10.1080/03031853.2009.9523822

UNDP, 2021. Human Development report 2020. United Nations. http://hdr.undp.org/sites/default/files/hdr2020.pdf

Vall, E. (2019). Uterus transplantation: A game-changing infertility treatment. *Acta Obstetricia Et Gynecologica Scandinavica*, *98*(9). https://doi.org/10.1111/aogs.13642

Varma, S., Bhatnagar, A., Santra, S., & Soni, A. (2020). Drivers of Indian FDI to Africa–an initial exploratory analysis. *Transnational Corporations Review*, *12*(3), 304–318. https://doi.org/10.1080/19186444.2020.1803186

World Bank. (2017). *International Development Association: Project appraisal document on a proposed credit in the Amount of SDR 121.1 million (US$ 170 million equivalent) to the Federal Democratic Republic of Ethiopia for a livestock and Fisheries sector Development project (project appraisal document no. PAD2396)*.

World Bank, (2021). World Bank country and lending groups. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

Yami, A., Gizachew, L., & Assefa, G. (2015). Proceedings: Pasture and Rangeland Research and Development in Ethiopia.

Yau, K. K., Wang, K., & Lee, A. H. (2003). Zero-inflated negative binomial mixed regression modeling of over-dispersed count data with extra zeros. *Biometrical Journal: Journal of Mathematical Methods in Biosciences*, *45*(4), 437–452. https://doi.org/10.1002/bimj.200390024

Yemana, T. (1967). *Statistics, an introductory analysis* (2nd ed.). Harper and Row.

Yihdego, A. G., Gebru, A. A., & Gelaye, M. T. (2015). The impact of small-scale irrigation on income of rural farm households: Evidence from Ahferom Woreda in Tigray, Ethiopia. *International Journal of Business and Economics Research*, *4*(4), 217–228. https://doi.org/10.11648/j.ijber.20150404.14

Zhang, S., Sun, Z., Ma, W., & Valentinov, V. (2020). The effect of cooperative membership on agricultural technology adoption in Sichuan, China. *China Economic Review*, *62*, 101334. https://doi.org/10.1016/j.chieco.2019.101334

Zuwarimwe, J., & Mbaai, S. M. (2015). Factors influencing smallholder farmers decisions to participate in livestock markets in Namibia. *Journal of Development and Agricultural Economics*, *7*(7), 253–260. https://doi.org/10.5897/JDAE2014.0562