

# FACTORS AFFECTING THE LEVEL OF COMMERCIALIZATION AMONG HOUSEHOLDS OWNING CATTLE. A CASE STUDY OF MAKHADO MUNICIPALITY OF VHEMBE DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

Xitshembiso Appointment Minyuku<sup>1</sup>✉, Abenet Belete<sup>1</sup>, Vutomi Arone Baloi<sup>1</sup>

<sup>1</sup>University of Limpopo, South Africa

**Abstract.** This study analyzed the factors affecting the level of commercialization among households owning cattle. The study was conducted at the Makhado Local Municipality of Vhembe District, Limpopo Province, South Africa. The study used a quantitative research design whereby judgemental and stratified random sampling was used to select only households owning cattle and this formed part of the sampling frame. Data were collected from 150 sampled households owning cattle in five villages within the municipality namely, Basani, Dumani, Njhakanjhaka, Shitaci, and Wayeni using a well-structured questionnaire that was administered to the respondents face-to-face. For empirical reasons, the study used two analytical techniques, namely Household Commercialization Index and Multinomial Logistic Regression Model. The empirical results reveal that eight variables were significant in affecting the level of commercialization among households owning cattle. These variables are the marital status of household head, the age of the household head, source of income, the occupation of household, access to market information, distance to the nearest market, membership to farmer organization, and land size. The study recommended that the government should encourage youth participation in agriculture in general and in cattle production in particular, promotion of gender equality in decision-making, encouragement of market orientation in cattle production, and establishment of cattle input support programs (e.g., feed, water, and disease control).

**Keywords:** commercialization, households, Multinomial Logistic Regression

## INTRODUCTION

Agriculture is one of the important activities that contribute positively to the livelihood of most South Africans, especially in rural areas as in many countries in sub-Saharan Africa. The commercialization of agricultural products remains, among others, one of the main drivers of economic growth (Greenwood, 2021). It was reported that cattle commercialization is the second-fastest-growing agricultural sector following the boiler sector, contributing more than 14% of its share of gross domestic product (Blignaut et al., 2020). Furthermore, cattle commercialization at the household level is divided into two subsectors, namely smallholder and subsistence farmers. Smallholder farmers “keep their cattle and sell them during Easter and festive seasons for religious purposes, and also during their cash-strapped seasons. Subsistence farmers do not keep their cattle for economic reasons but household food security purposes. Typically, these two informal subsectors are not keeping records of their animal stocks; the buyer and

✉Xitshembiso Appointment Minyuku, Department of Agricultural Economics and Animal Production, University of Limpopo, Polokwane, South Africa, e-mail: minyukuxitshembiso@gmail.com, <https://orcid.org/0000-0003-2010-6657>

seller enter into a mouth-to-mouth agreement, followed by the exchange of money and cattle without recording the transactions. These informal subsectors are also known to have less knowledge about animal health, disease control, and animal development issues as well as policies regarding animal production in South Africa. Beyond their role in generating food and income, cattle are a valuable asset, serving as a store of wealth, collateral for credit an essential security net during calamitous times for informal sector” (DAFF, 2020).

According to the Department of Agriculture, Forestry and Fisheries (DAFF, 2020), The gross value of beef production increased from approximately \$978 million in 2009/10 to \$2.4 billion in 2017/18. This is an increase of 173% during the said period. In 2018/19, beef gross value experienced a slight decline of 7%. The increase in the past decade was due to the increased consumption of beef. The average gross value of beef produced during this period amounted to approximately \$1.6 billion per annum. This growth in beef production is driven by increased demand for meat as the human population grows rapidly. Furthermore, urbanization, as well as the improvement in the economic status of many households, also play an important role in the increasing demand for beef. Therefore, these contribute to the economic growth of the country.

For this study, the commercialization of household production is defined as a process involving the transformation from production for household subsistence to production for the market (Ngxumeshe et al., 2020). The commercialization of agriculture is one of the best indicators of agricultural development. However, livestock keepers find it difficult to profitably market their livestock produce (McDermott et al., 2010). In addition, some of the residents, especially in rural areas, are poor and need opportunities that can develop their ability and improve their economic development (DAFF, 2018). This is particularly linked to households owning cattle in Makhado Municipality and households are faced with several challenges that restrict them from selling their cattle in the formal cattle market. Furthermore, these households are also not privileged enough to have proper extension services which play an important role in the provision of information about the commercialization of cattle production (Farnworth and Colverson, 2015). However, households sometimes sell their cattle locally, often during dry seasons, school opening calendar months, and festive seasons, and they usually face

lower prices as compared to operating prices offered in the common market such as in auction centers (Boka, 2017). Households which own cattle are said to first fulfill their subsistence objectives before making commercialization a priority (Elum et al., 2017). This statement confirms that households owning cattle participate in cattle commercialization but the level at which they participate is not clearly understood.

Therefore, it is on this basis that this paper strives to analyze factors affecting the level of commercialization among households owning cattle at the Makhado Local Municipality of Vhembe District in the Limpopo Province of South Africa. Identification of such factors could assist policymakers to formulate policies that would increase households’ levels of commercialization in cattle production. The objective of the study is to analyze the determinants for the level of commercialization among households owning cattle in Makhado Municipality.

## MATERIAL AND METHODS

### Study area

The study was conducted in rural communities (Basani, Dumani, Njhakanjhaka, Shitaci, and Wayeni) under the Bungeni tribal authority of the Makhado Local Municipality of Vhembe District in the Limpopo Province South Africa. Limpopo Province comprises of six district municipalities where Vhembe is one of the Provincial District Municipalities. Vhembe District Municipality is predominantly rural, with 95% of its population living in tribal settlements and/or farms and only 5% living in urban areas. The urban population in Vhembe is less than half of that of the Limpopo provincial average of 11% living in urban areas. Makhado Local Municipality is located in the north of Limpopo Province approximately 100 km from the Zimbabwean border along the N1 Route. The municipal area is 8310,586 km<sup>2</sup> (or 831 058, 64 Hectares) in size and has a population of approximately 516 031 people. It is classified as predominantly rural due to the rural populace (Makhado Municipality Integrated Development Plan 2013/14).

The Makhado Local Municipality is a Category B municipality situated within the Vhembe District in the Limpopo Province. It is one of the four municipalities in the district, making up almost a third of its geographical area. The main town/city of the municipality is known as Louis Trichardt (Stats SA, 2011). The study focused on five villages (Basani, Dumani, Njhakanjhaka, Shitaci,

and Wayeni) which form part of the 21 villages in the Bungeni Tribal Authority. The economy of the municipality is generated from the agriculture, mining, and tourism industries. The municipality is reported to have natural resources including minerals such as gold, coal, and magnesium. Agricultural production systems in the municipality are dominated by small-scale farming and subsistence farming and greatly correspond with Traditional Authority areas. It was reported that agriculture declined by -0.7% in Limpopo, by -0.4% in Vhembe, and by -0.4% in Makhado Local Municipality (Makhado..., 2019). The decline in agriculture, especially in the contribution of cattle production, was a result of the official declaration of the foot-and-mouth disease outbreak. The Department of Agriculture, Forestry, and Fisheries (DAFF, 2019) officially declared the outbreak of FMD in the Vhembe district on the 8<sup>th</sup> of January 2019. The declaration of FMD resulted in the suspension of South Africa's FMD free status which was officially granted in May 2018 by the World Organization for Animal Health (OIE). However, to ensure that the outbreak did not spread, cattle keepers were advised to familiarize themselves with the recommended measures to prevent their animals from being infected. The measures were: not moving high-risk animals, only buying animals from a proven source, and insisting on a veterinary attestation/health declaration to accompany any animals that were brought in (Prinsloo, 2019).

### Sampling and sample size

This paper used primary data which was collected through face-to-face interviews using structured questionnaires. The quantitative research design and judgmental sampling were used to select only households owning cattle and this formed part of the sampling frame. The unit of analysis used is the household, which is defined as a group of people that eat from the same pot, with a common source of income (Baloi, 2016). The study also used the stratified random sampling technique. The sample size of 150 was split up into subsamples (stratum). The stratum was arranged according to the villages (Basani 15, Dumani 14, Njhakanjhaka 33, Shitaci 62, and Wayeni 26) based on the probability proportionate to size.

### Analytical techniques

The study adopted a commercialization index using the Household Commercialization Index (HCI) proposed by

Govereh and Nyoro (1999), which was modified to estimate the level of commercialization among households owning cattle in Makhado Municipality. The HCI has been extensively used to categorize the levels of commercialization (Musah et al., 2014; Martey et al., 2012; Muricho et al., 2015). The commercialization index was used to compute the level of commercialization among households owning cattle. The HCI is an estimated single index for market participation considering the gross value of sales and production. The index measures the orientation of households towards market participation which ranges from 0 to 1. The interpretation of the index is that the closer the value of HCI is to one, the greater the intensity of market participation. Therefore, this was later used to categorize the levels of commercialization into very low (proportion of value sold is between 0% and 24%), low (proportion of value sold is between 25% and 49%), medium (proportion of value sold is between 50% and 74%), and high levels (proportion of value sold is between 75% and 100%). The index measures the ratio of the gross value of cattle sales by household (*i*) in the year (*j*) to the gross value of all cattle produced by the same household (*i*) in the same year (*j*), which can also be expressed as follows:

$$HCI_i = \frac{\text{Gross value of cattle sales } ij}{\text{Gross value of all production } ij} \times 100 \quad (1)$$

Where:

$HCI_i$  – is the  $i^{\text{th}}$  household commercialization index for cattle, the numerator is the total value of cattle sold by the  $i^{\text{th}}$  household in the  $j^{\text{th}}$  year ( $j = 2019$  production season), and the denominator is the total value of the output of cattle by the  $i^{\text{th}}$  household in the  $j^{\text{th}}$  year.

The study also used the Multinomial Logit Regression model derived by McFadden (1973). The model was used to identify the relationships between the dependent variable and the set of independent variables. Multinomial Logistic Regression is often considered an important analysis because it does not assume normality, linearity, or homoscedasticity (Starkweather and Moske, 2011). In addition, the model is easily interpretable since the effect of the predictor variable is usually explained in terms of the odds ratio. In this paper, the logit model was used to determine the likelihood of households' participation in four levels of commercialization namely very low, low, medium, and high levels. In this paper, to model which of the four categories

a household falls under in terms of commercialization, three logit models were computed; one comparing low commercialization (LOW COMM) with the reference category high commercialization (HIGH COMM), one comparing medium commercialization (MED COMM) with the reference category high commercialization (HIGH COMM) and lastly, one comparing very low commercialization (VERY LOW COMM) with the reference category high commercialization (HIGH COMM). The model of the level of commercialization among four opinions can, therefore, be represented using three (i.e.,  $j - 1$ ) logit models.

### General models

$$\log \frac{P_r(Y = \text{LOW COMM})}{P_r(Y = \text{HIGH COMM})} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k \quad (2)$$

$$\log \frac{P_r(Y = \text{MED COMM})}{P_r(Y = \text{HIGH COMM})} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k \quad (3)$$

$$\log \frac{P_r(Y = \text{VERY COMM})}{P_r(Y = \text{HIGH COMM})} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k \quad (4)$$

This provided useful information as the effect of the variables ( $X_k$ ) was assessed throughout each logit model (i.e., the effect of  $X_1$  on the choice between LOW COMM and HIGH COMM) and again the effect of  $X_1$  on the choice MED COMM and HIGH COMM and the effect of  $X_1$  between the choice VERY LOW COMM and HIGH COMM and also for the model as a whole (i.e., the effect of  $X_1$  across all response options in the sample). It is also useful to interpret a single parameter for each explanatory variable to derive a single model of the response variable. The final model, chosen to interpret the dependence of the dependent variable on explanatory variables, was specified as follows.

### Model specification

$$\log \frac{P_r(Y = j)}{P_r(Y = j')} = \beta_0 + \beta_1 \text{GHH} + \beta_2 \text{MHH} + \beta_3 \text{AHH} + \beta_4 \text{EHH} + \beta_5 \text{IS} + \beta_6 \text{HHO} + \beta_7 \text{AIM} + \beta_8 \text{HZ} + \beta_9 \text{DNM} + \beta_{10} \text{SRC} + \beta_{11} \text{MFO} + \beta_{12} \text{LS} + \mu_i \quad (4)$$

Where:

Log – the logarithm

$P_r$  – the probability of levels of commercialization  
 $\beta_0$  – the constant term  
 $\beta_i$  – is the estimated coefficient that explains the effect of dependent variables on the log odds when other variables are held constant

$Y = j$  (1, 2, and 3) is the levels of commercialization since the model has four responses

$\mu_i$  – error term

GHH – dummy variable for the gender of the household head (1 = male, 0 = female)

MHH – dummy variable for the marital status of the household head (1 – if the head of household is married, 0 – otherwise)

AHH – age of the household head (years)

EHH – dummy variable for the educational status of the household head (1 – if the household head has formal education, 0 – otherwise); formal education was categorized into primary, secondary, and tertiary education

IS – dummy variable for income source (1 – if any of household members receives a grant or other income source, 0 – otherwise)

HHO – dummy variable for household head occupation (1 – if the household head is employed off-farm, 0 – otherwise)

AMI – dummy variable for access to market information (1 – if the household has access to the market information and 0 – otherwise)

HZ – household size (numbers)

DNM – distance to the nearest market (km)

SRC – dummy variable for the state of the road condition (1 – if the bad state of the road with a lot of potholes, slippery and inaccessible during the wet season, 0 – otherwise)

MFO – dummy variable for membership to the farmer organization (1 – if yes, 0 – otherwise)

LS – land size (ha)

## RESULTS AND DISCUSSION

According to the results presented in Table 1, the average age of sampled households was 54 years old with the younger household head being 28 years old and the older being 89 years old. This implies that there was a lot of variation in the age of household heads (standard deviation is 13.397). This indicates that many household head ages were further away from the average age of 54 years. The average number of people in a household

**Table 1.** Descriptive statistics concerning age, household size, Number of cattle owned, years of keeping cattle, and land size

Variables	Minimum	Maximum	Mean	Std. Deviation
Age of the household	28	89	53.68	13.397
Household size	3	13	7.23	2.617
Number of cattle owned	1	56	14.51	11.594
Years of keeping cattle	3	28	11.51	5.022
Land size (ha)	0.50	15	2.1433	1.343

Source: based on a research survey, 2020.

was about eight (7.23); the larger household had thirteen people. Household sizes were less variable because the standard deviation is small (2.617). This means that many household sizes were concentrated around the mean of 7.23. Furthermore, the average size of land that the households had was 2.14 ha with 15 ha being the maximum land size owned. About two households indicated that they had a land size of about 15 ha. On the other side, the average number of cattle that households owned was about 14 with 56 being the maximum number of cattle owned. The average years for ownership

of cattle was 11 whereas 28 years was the maximum period of cattle ownership. The standard deviation for the number of cattle owned and years of keeping cattle was 11.594 and 5.022. These values are further away from means 14.51 and 11.51, respectively, meaning that the data sets were more variable and were not concentrated around the means. These factors, land, number of cattle owned, and the number of years in keeping cattle are critical for households in deciding on whether or not to participate in the commercialization of cattle production.

**Table 2.** Parameter estimates of the levels of commercialization

Level of commercialization		B	S.E	Wald	Sig.	Exp(B)
1		2	3	4	5	6
Household commercialization is medium	Intercept	-4.511	7.196	0.393	0.531	
	Gender of the household head	0.994	0.917	1.176	0.278	2.703
	Marital status of the household	2.295	0.995	5.326	0.021**	9.929
	Age of the household	-0.128	0.056	5.313	0.021**	0.880
	Educational status of the household	-0.576	0.453	1.622	0.203	0.562
	Source of income	0.010	0.295	0.001	0.974	1.010
	Occupation of household	-0.608	0.341	3.183	0.074*	0.545
	Access to market information	-4.991	4.079	1.498	0.221	0.007
	Household size	0.154	0.211	0.531	0.466	1.166
	Distance to the nearest market (Km)	0.696	0.374	3.470	0.062*	2.007
	State of road condition	0.583	0.631	0.852	0.356	1.791
	Membership to farmer organization	9.231	4.995	3.415	0.065*	10210.105
	Land size (ha)	-0.197	0.146	1.821	0.177	0.821
	Head of household	-0.366	1.047	0.122	0.726	0.693

**Table 2 – cont.**

	1	2	3	4	5	6
Household commercialization is low	Intercept	-8.172	7.376	1.227	0.268	
	Gender of the household head	0.898	0.886	1.026	0.311	2.454
	Marital status of the household	2.242	0.993	5.100	0.024**	9.409
	Age of the household	-0.100	0.054	3.433	0.064*	0.905
	Educational status of the household	-0.257	0.436	0.348	0.555	0.773
	Source of income	-0.177	0.287	0.383	0.536	0.837
	Occupation of household	-0.597	0.330	3.263	0.071*	0.551
	Access to market information	-4.200	4.070	1.065	0.302	0.015
	Household size	0.308	0.204	2.279	0.131	1.361
	Distance to the nearest market (Km)	0.150	0.370	0.165	0.685	1.162
	State of road condition	0.022	0.591	0.001	0.971	1.022
	Membership to farmer organization	10.582	5.070	4.355	0.037**	39418.419
	Land size (ha)	-0.141	0.145	0.937	0.333	0.869
	Head of household	-0.111	0.979	0.013	0.910	0.895
Household commercialization is very low	Intercept	-52.847	27.191	3.777	0.052	
	Gender of the household head	1.688	2.235	0.570	0.450	5.407
	Marital status of the household	2.639	1.262	4.371	0.037**	13.994
	Age of the household	0.021	0.138	0.024	0.878	1.021
	Educational status of the household	-0.026	1.084	0.001	0.981	0.974
	Source of income	-0.686	1.020	0.453	0.501	0.503
	Occupation of household	-0.150	1.190	0.016	0.900	0.861
	Access to market information	0.976	9.558	0.010	0.919	2.653
	Household size	0.044	0.443	0.010	0.921	1.045
	Distance to the nearest market (Km)	1.842	1.339	1.891	0.169	6.307
	State of road condition	-1.659	2.011	0.680	0.409	0.190
	Membership to farmer organization	17.790	0.000	0.	0.	53198131.438
	Land size (ha)	-0.108	0.336	0.104	0.747	0.897
	Head of household	2.943	2.643	1.240	0.266	18.975
Multinomial logistic regression						
Number of observation	150					
Prob>chi <sup>2</sup>	0.000					
-2 Log Likelihood	214.985					
Chi-Square	81.285					
Pseudo R <sup>2</sup>	0.274					
Cox and Snel	0.418					
Nagelkerke	0.486					

\*\*\*, \*\*, \* are significant levels at 1%, 5%, and 10% respectively.  
Source: based on a research survey, 2020.

This section presents the results of econometric analyses aimed at revealing the factors affecting the level of commercialization among households owning cattle. The empirical results were expected to inform the discussion and conclusion regarding improvements in livestock farming systems and to highlight the efforts aimed at improving market access to households owning cattle. In this study, the Multinomial Logistic Model was fitted and the summary of results is presented in Table 2. A positive sign on the variable's coefficient implies that a unit increase in the independent variable will lead to an increase in the level of commercialization and the negative significance implies that a unit increase in the independent variable may lead to a decline in the level of commercialization. It can be observed that the chi-square statistic is 81.285 and the p-value was 0.000, which is less than the level of significance of 0.05. This confirms the adequacy of the model and implies that at least one of the coefficients of the explanatory variables is significant. The strength of the model was also tested using Pseudo R square. The result was (27.4%), which implies that 27.4% of the variation in the levels of commercialization among households owning cattle was explained by the independent variables included in the model. Cox and Snell and Nagelkerke R squares on the other hand indicate that 41.8% and 48.6% of the variation is explained by the explanatory variables fitted in the model. Concerning the selection of the reference group, the high level of commercialization category was chosen as a base category.

From the analysis, it can be concluded that the statistically significant variables influence households' level of commercialization. The results of this paper revealed that there were only five variables found to be statistically significant on the levels of commercialization among households owning cattle. The significant variables were: the marital status of the household head, the age of the household head, the occupation of the household, membership to farmer organization, and distance to the nearest market. The remaining variables were insignificant and these variables were: gender of the household head, educational status of the household head, size of the land, household size, source of income, access to market information, and state of the road condition.

## DISCUSSION OF SIGNIFICANT INDEPENDENT VARIABLES

### Marital status of the household head

The marital status of the household was found to be statistically significant amongst all the categories of levels of commercialization. It was significant when the outcome variable high commercialization was compared with outcome variables low, medium, and very low commercialization. The marital status of the household heads in the study area had an impact on the level of commercialization in the study area. It was observed that married households, particularly women, had a high probability to access extra income from remittances provided by their spouses' labor. The findings are in line with a study by Mafukata (2015), who views extra income as a form of remittances received by married households that might be directed to some on-farm cattle production activities such as access of inputs, especially vaccines and drugs, unlike the unmarried, widowed and the divorced adults. In addition, those married adults might have combined larger income from sources such as government grants, particularly where both spouses receive such income.

### Age of the household

Age is significant on one occasion where it distinguishes pairs of groups. Age was significant when the outcome variable HIGH COMM was compared with the outcome variable MED and LOW COMM. The results indicate that the more units of age, the higher the odds of the household being in the group of medium and low commercialization rather than that of high commercialization. These results are similar to findings by Babigumira et al. (2014) who reported that the older the household, the more labor supply may be affected as older households are expected to find it difficult to cope with the physical nature of the work in agriculture, especially in the physically demanding livestock production subsector. The same study further reported that the majority of households participating in cattle production further require specific learning methodology and older people find it difficult to learn and assimilate new knowledge to market their livestock in mainstream markets to improve their level of commercialization. Furthermore, poor labor supply due to aging in cattle production systems might be constraining for productivity and commercialization like any other livestock-related production that is

more labor-intensive (Meinzen-Dick et al., 2010). However, the age of the household heads also relates to useful experience in livestock production and the household's capacity to make profitable decisions (Bjornlund et al., 2019). These results were in line with Mudzielwana's (2015) finding that older household heads tend to have a reliable reputation and credibility in the homestead, thus they were trusted in decision-making.

### **Occupation of the household head**

The occupation was found to be significant in distinguishing MED and LOW COMM from HIGH COMM. These findings could be related to that of monthly income which was also significant looking at a low level of income. People who were unemployed or did not have a formal job would likely participate in cattle commercialization to generate additional income. The results show that the households who were formally employed and had a stable source of income were less likely to participate in the group of HIGH COMM. It is observed that households who had a stable source of income were able to acquire their livestock as assets as well as allowing a household to acquire some physical assets. Greenberg (2017) also argued that the presence of household opportunities to earn additional income increased the household's interest and ability to invest in livestock, through buying the initial livestock, additional livestock, and maintaining livestock's health. However, according to Janzen and Carter (2019) households without a stable income are more likely to commercialize their livestock to earn additional income as compared to wealthier households who are more likely to keep cattle.

### **Membership of farmer organization**

Households' membership of farmer organizations was found to be significant in distinguishing MED and LOW from HIGH COMM. It was observed that the few households who were members of farmers' organizations were more likely to participate in a high level of cattle commercialization. Households with such support services were more likely to access the market as well as the market information. The findings are in line with Wossen et al. (2017) study, which similarly reported that membership to agricultural organizations has a significant impact on the degree of market access, that is, farmers in cooperatives have better access to markets. Nekhavhambe's (2017) study also reported the importance of membership in farming.

It increases the chances of households participating in agriculture, having a better chance to access training, and increased opportunities to access mainstream markets.

### **Distance to the nearest market**

Distance to the nearest market was found to be significant in distinguishing MED from HIGH COMM. It was observed that the few households who participated in the medium level of commercialization were more likely to participate in a high level of cattle commercialization because they were closer to the market. The results indicate that the distance to the nearest market is positively significant which suggests that if households are located closer to the markets, then the probability of engaging in high-level category increases. The findings are consistent with that of Marine et al. (2016) indicating that proximity to markets is crucial in decision-making for participation in the marketing of the commodity. However, on the other hand, distance to the market is not significant when comparing the low and high levels of commercialization. This implies that participation in the market will decrease with a greater distance to travel to the market. The finding is in line with that of Sehar and Oyekale (2020) who found that the distance to the market limits market access and participation of household farmers in mainstream markets.

## **CONCLUSION**

In conclusion, the overall research intended to address one objective and one hypothesis. The objective was: to analyze the determinants for the level of commercialization among households owning cattle at Makhado Municipality. The hypothesis was: the socio-economic and cultural characteristics do not influence the level of commercialization of cattle by cattle-owning households in the study area.

The results indicated that there were socio-economic and cultural characteristics that influenced the level of commercialization among households owning cattle and these were: the marital status of the household head, the age of the household head, the occupation of the household, access to market information, distance to the nearest market, membership to a farmer organization, land size, and source of income. The findings allowed the rejection of the hypothesis, which stated that the socio-economic and cultural characteristics do not influence



the level of commercialization of cattle on cattle-owning households.

Concerning the objective of the study, the results revealed that there were socio-economic determinants for the level of commercialization, and these were: the marital status of the household head, the age of the household head, the occupation of the household, distance to the nearest market, and membership to a farmer organization. The finding validated the final statement which articulated that the household union, age, occupation, and household membership to a farmer organization are among the variables that influence the level of commercialization among households owning cattle.

## RECOMMENDATIONS

Based on the findings of this study, it has been shown that the majority of households fell within the ambit of old age. Therefore, strategies to increase youth participation should be prioritized in both the private and public sectors if the commercialization of livestock units is to be achieved. The results also present women's involvement in cattle ownership which was found to be low as compared to that of men. Therefore, women must be taken into consideration and must have their roles supported in decision-making and capabilities in livestock ownership, processors, and users of livestock products. The results of this study further indicated that many households were not members of any agricultural organization. Cattle keepers should be encouraged to form cattle owners' organizations for collective marketing. The organizations such as cooperatives, households' farming schemes, and farmers' associations could play an important role in the provision of information and improving access to mainstream livestock markets.

Cattle keepers reported that they faced serious challenges due to a lack of secure grazing land for their livestock, especially during the winter season which is usually associated with a shortage of forage and water. Therefore, policymakers could reduce such challenges through the establishment of cattle input support programs such as feed subsidies, cattle medications, and renovations of the dipping points in the villages. Finally, a deeper analysis should be conducted to explore other factors that could affect the different levels of commercialization among households participating in agricultural activities.

## ACKNOWLEDGMENTS

The authors would like to acknowledge the support from the University of Limpopo. Gratitude is also extended to the Feenix funding platform for their financial support and enumerators for their assistance during data collection which contributed to the success of this study. Furthermore, sincerest thanks and appreciation are extended to the respondents for their patience and responses during the data collection process.

## REFERENCES

- Babigumira, R., Angelsen, A., Buis, M., Bauch, S., Sunderland, T., Wunder, S. (2014). Forest clearing in rural livelihoods: household-level global-comparative evidence. *World Dev.*, 64, 67–79.
- Baloi, V.A. (2016). Community perceptions and attitudes towards integrated wildlife/livestock land-uses: the case of Greater-Giyani rural communities, Limpopo, Province (Doctoral dissertation, University of Limpopo).
- Bjornlund, H., Zuo, A., Wheeler, S.A., Parry, K., Pittock, J., Mdemu, M., Moyo, M. (2019). The dynamics of the relationship between household decision-making and farm household income in small-scale irrigation schemes in southern Africa. *Agric. Water Manag.*, 213, 135–145.
- Blignaut, B., van Heerden, J., Reininghaus, B., Fosgate, G.T., Heath, L. (2020). Characterization of SAT2 foot-and-mouth disease 2013/2014 outbreak viruses at the wildlife–livestock interface in South Africa. *Trans. Emerg. Dis.*, 67(4), 1595–1606.
- Boka, G.T. (2017). Climate change challenges, smallholders' commercialization, and progress out of poverty in Ethiopia. *Work. Paper Ser.*, (253).
- DAFF (Department of Agriculture Forestry and Fisheries) (2018). A Profile of the South African Beef Market Value Chain. Pretoria, South Africa.
- DAFF (Department of Agriculture, Forestry and Fisheries) (2020). A profile of the South African beef market value chain.
- DAFF (Department of Agriculture, Forestry, and Fisheries) (2019). Profile of the South African Cattle Market Value Chain. Retrieved Aug 6<sup>th</sup> 2020 from: <http://www.nda.agric.za/docs/AMCP/cattle2019.pdf>
- Elum, Z.A., Modise, D.M., Marr, A. (2017). Farmer's perception of climate change and responsive strategies in three selected provinces of South Africa. *Clim. Risk Manag.*, 16, 246–257.
- Farnworth, C.R., Colverson, K.E. (2015). Building a gender-transformative extension and advisory facilitation system

- in Sub-Saharan Africa. *J. Gender Agric. Food Sec. (Agri-Gender)*, 1(302-2016-4749), 20–39.
- Govere, J., Jayne, T.S., Nyoro, J. (1999). Smallholder commercialization, interlinked markets and food crop productivity: Cross-country evidence in Eastern and Southern Africa.
- Greenberg, S. (2017). Corporate power in the agro-food system and the consumer food environment in South Africa. *J. Peas. Stud.*, 44(2), 467–496.
- Greenwood, P.L. (2021). An overview of beef production from pasture and feedlot globally, as demand for beef and the need for sustainable practices increase. *Animal*, 100–295.
- Janzen, S.A., Carter, M.R. (2019). After the drought: The impact of microinsurance on consumption smoothing and asset protection. *Am. J. Agric. Econ.*, 101(3), 651–671.
- Mafukata, M.A. (2015). Skills-based constraints and complexities affecting small-scale communal cattle farmer entrepreneurs in Vhembe District. *Int. J. Res. Bus. Social Sci.*, 4(3), 11–27.
- Makhado Final Local Municipality Integrated Development Plan (2019/2020). Makhado Printer.
- Marine, S.C., Martin, D.A., Adalja, A., Mathew, S., Everts, K.L. (2016). Effect of market channel, farm scale, and years in production on mid-Atlantic vegetable producers' knowledge and implementation of Good Agricultural Practices. *Food Control*, 59, 128–138.
- Martey, E., Al-Hassan, R.M., Kuwornu, J.K. (2012). Commercialization of smallholder agriculture in Ghana: A Tobit regression analysis. *Afr. J. Agric. Res.*, 7(14), 2131–2141.
- McDermott, J.J., Staal, S.J., Freeman, H.A., Herrero, M., Van de Steeg, J.A. (2010). Sustaining intensification of smallholder livestock systems in the tropics. *Livest. Sci.*, 130(1–3), 95–109.
- McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. In: P. Zarembka (Ed.), *Frontiers in Econometrics*. New York: Academic Press, pp. 105–142.
- Meinzen-Dick, R., Quisumbing, A., Behrman, J., Biermayr-Jenzano, P., Wilde, V., Noordeloos, M., Ragasa, C., Beintema, N. (2010). *Engendering agricultural research* (No. 973). International Food Policy Research Institute (IFPRI).
- Mudzzielwana, G. (2015). Determinants of cattle ownership and herd size in Vhembe District of Limpopo Province, South Africa (Doctoral dissertation, University of Limpopo).
- Muricho, G.S., Manda, D.K., Sule, F.O. (2015). Determinants of agricultural commercialization and its impacts on welfare among smallholder farmers in Kenya. PhD Theses of the University of Nairobi, Nairobi, 234–266.
- Musah, A.B., Bonsu, O.A.Y., Seini, W. (2014). Market participation of smallholder maize farmers in the upper west region of Ghana. *Afr. J. Agric. Res.*, 9(31), 2427–2435.
- Nekhavhambe, E. (2017). Factors contributing to the transformation of smallholder farming to commercial farming in Mutale Local Municipality of Limpopo Province, South Africa. PhD Thesis.
- Ngxumeshe, A.M., Ratsaka, M., Mtileni, B., Nephawe, K. (2020). Sustainable Application of Livestock Water Footprints in Different Beef Production Systems of South Africa. *Sustainability*, 12(23), 3–4.
- Prinsloo, T. (2019). The animal diseases act: what farmers should know-part 2: control of foot and-mouth disease. *Stockfarm*, 9(7), 72–73.
- Sehar, M., Oyekale, A.S. (2020). Effect of livestock farmers' access to formal markets on marketing inefficiency in Mpumalanga province, South Africa. *Afr. J. Sci. Technol. Innov. Dev.*, 1–9.
- Sotsha, K., Fakudze, B., Khoza, T., Mmbengwa, V., Ngqangweni, S., Lubinga, M.H., Mazibuko, N., Ntshangase, T., Nyhodo, B., Myeki, L., Ngetu, X. (2018). Factors influencing communal livestock farmers' participation into the National Red Meat Development Programme (NRMDP) in South Africa: the case of the Eastern Cape Province. *OIDA Int. J. Sust. Dev.*, 11(1), 73–80.
- Starkweather, J., Moske, A.K. (2011). Multinomial logistic regression. Retrieved Sep 10<sup>th</sup> [http://www.unt.edu/rss/class/Jon/Benchmarks/MLR\\_JDS\\_Aug2011.pdf](http://www.unt.edu/rss/class/Jon/Benchmarks/MLR_JDS_Aug2011.pdf), vol. 29: 2825–2830.
- SSA (Statistics South Africa) (2011). Bungeni. Main Place 90601 from Census 2011.
- Wossen, T., Abdoulaye, T., Alene, A., Haile, M.G., Feleke, S., Olanrewaju, A., Manyong, V. (2017). Impacts of extension access and cooperative membership on technology adoption and household welfare. *J. Rural Stud.*, 54, 223.