

An Analysis of Market Participation Determinants among Smallholder Goat Farmers in Gwanda District, Zimbabwe

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ABSTRACT

Small ruminants, such as goats, have significant income potential if marketed effectively. However, the market participation of smallholder farmers in most Sub-Saharan African countries remains very low, despite the potential benefits. In developing countries, particularly in rural communities, poverty and poor living standards are prevalent, indicating low income and limited income sources. Therefore, enhancing market participation is crucial. This study analyses the determinants of market participation among smallholder goat farmers in Gwanda District, Zimbabwe, using primary data. A multistage sampling technique was employed to select a sample of 100 smallholder goat farmers in Gwanda District, and data were collected using questionnaires. Binary logistic regression analysis was used to identify the factors influencing goat market participation. The results revealed that most smallholder farmers producing goats were market participants. Significant factors affecting market participation included gender, marital status, household size, the number of goats owned at the beginning of the year, price, marketing experience, and the number of available markets. To enhance market participation, the study recommends that rural development projects targeting smallholder farmers should consider focusing on improving the productivity of goat enterprises so as to increase goat herd sizes, advocate for lucrative supply prices of goats, train farmers on marketing to enrich their experience, as well as linking farmers to buyers both local and in the diaspora. Future research should investigate the factors affecting the frequency of marketing and the constraints faced by smallholder goat farmers in market participation.

Keywords: Market Participation; Goats; Binary Logistic Regression; Smallholder Farmers; Multistage Sampling

INTRODUCTION

In Africa, livestock production is a significant practice done by most smallholder farmers in their farming systems (Jera and Ajayi, 2008). These livestock include goats, which are highly produced in places such as Gwanda in Zimbabwe. According to Gwaze et al (2009), goat population in the world is around 746 million and 96% of these goats are in developing countries. Assa et al (2014) estimated that in Africa there are 144.7 million goats. The number of goats in Zimbabwe is estimated to be between 3 and 4 million (FAO, 2024). According to the Financial Gazette (2017), smallholder farmers own 97% of goats in Zimbabwe. The majority breeds of goats in Southern Africa include the Mashona, Matebele, Tswana, Nguni and the Landim though there is no clear distinction between these breeds (Gwaze et al, 2009).

Marketing is an important activity with potentially high-income returns for smallholder farmers (Mmbando et al, 2015). As a way of poverty reduction, smallholder goat farmers should take advantage of the opportunity to generate high income by participating in marketing. However, traditionally it is believed that most livestock producers in Africa are subsistence oriented, thus, produce for own consumption (Anteneh, 1989). Similarly, poorly functioning markets pose as a significant challenge to Zimbabwean farmers (Setoboli et al, 2024).

These and other factors affect participation in markets by smallholder goat farmers. According to Bahta and Bauer (2007), the situation on livestock marketing requires an in-depth investigation as it has not changed much. Therefore, the main objective of this study is to identify the determinants of market participation in smallholder goat farmers as this might help in the identification of the means and steps for increasing smallholder goat farmers' market participation.

High poverty and poor living standards are signs of low income and limited income sources observed in developing countries especially in the rural communities. Improvement of livelihoods in these areas requires an increase in income. Most Zimbabwean smallholder farmers are engaged in goat production from which they derive products such as meat, milk, skins, fiber and manure (Singh et al, 2011). Marketing is an important activity essential for income generation for smallholder farmers (Mmbando et al, 2015). According to Sigei et al (2013), marketing motivates smallholder farmers to commercialize and this leads to an increase in production. Kyeyamwa et al (2008) states that there is a projected global increase in the consumption of meat and other products from livestock and this sets a potential escape for smallholder farmers from poverty. Small ruminants such as goats thus have a great income potential if released to the markets. However, market participation of smallholder farmers in most Sub-Saharan African countries is very low (Mmbando et al, 2015). According to Oladeji and Oyesola (2008), farmers sell their animals when they are short of money. Whereas, smallholder farmers should participate in goat marketing as it generates income. According Randela et al (2008), identification of factors that affect market participation among smallholder producers is required for the identification of ways of increasing market participation of these producers. Balint and Wobst (2006) go on to point out that some light is shed on further steps to be taken by the government, commodity organizations and other role players for promoting the rural economy through the addressing of commercial orientation determinants. Therefore, this study attempts to identify the determinants of market participation in smallholder goat farmers.

LITERATURE REVIEW

Theory

The current study follows the utility theory as outlined by Peter C. Fishburn in 1968. According to Fishburn (1968), utility theory is concerned with people's decisions, choices, preferences, and judgments regarding preference, value, worth, goodness, and similar concepts. Preferences are based on individual judgments. The utility theory relies on certain fundamental elements. Firstly, there is the preference indifference relation, denoted by the symbol \preceq , which means 'is not preferred to.' Secondly, there are decision alternatives within a given set X , consisting of options x , y , z , etc., from which an individual can choose. The preference indifference relation (\preceq) is used in a binary relation on X , where one chooses between two alternatives, such as x and y . The following relations between x and y in X can be true:

1. $x \preceq y$ (x is not preferred to y)
2. $y \preceq x$ (y is not preferred to x).

A relation of a strict preference would use the sign; $<$ where $x < y$ means that y is preferred to x . When there is indifference in preference, the sign; \sim is used where $x \sim y$ implies that x is indifferent to y . When defined according to \preceq , the following relations hold:

$x < y$ implies that $x \preceq y$ and not $y \preceq x$

$x \sim y$ implies that $x \preceq y$ and $y \preceq x$.

When the alternatives x and y are incomparable, the following relation would hold:

not $x \preceq y$ and not $y \preceq x$

Fishburn (1968) further defines a utility theory as a set of assumptions about X and the relations of \preceq on X , and the theorems that one can derive from the assumptions. According to Wanyioke et al (2015) in a study of small ruminant market participation, market participation is the selling of goats and sheep, ignoring purchases by the farmer. Similarly, in the present study, market participation is a condition where a farmer sold at least one goat in the year 2017. Market participation is a binary relation where a farmer can either choose to be a market participant by selling goats or a non-market participant by not selling. Following the utility theory, an assumption can be made that market participation is set X with two elements x and y where x is participating in goat markets and y is not participating in goat markets by selling goats. Using the indifference preference relation (\preceq), the following conditions of preference would hold for individual goat farmers:

1. $x \preceq y$ (participating in goat markets is not preferred to not participating in goat markets)
2. $y \preceq x$ (not participating in goat markets is not preferred to participating in goat markets).

The present study addresses the problem that most smallholder farmers do not participate in markets. Market participation by smallholder farmers in Sub-Saharan Africa is very low (Mmbando et al, 2015). This implies that most farmers in the region fall into condition (i) above while the ideal is (ii) above. The decision to participate in goat markets by the smallholder farmers depends on the judgments of preferability, value, worth and goodness as stated in the theory. These are influenced by several factors such as age, education, flock size and group membership (Ayieko et al, 2015). According to Adepoju et al (2015), these factors include farming experience, distance to market, age, marital status, credit access and education. Taking distance to markets as an example, a long distance would disadvantage the farmer to participate in markets by subjecting them to huge costs as compared to farmers close to the market. Hence, such a factor can hinder or encourage the farmer to market. Therefore, in the case of a hindrance, the farmer is likely not to participate in marketing and the opposite is true.

Empirical Studies on Market Participation

This review examines existing studies on the determinants of market participation among smallholder farmers, focusing on various crops and livestock across different regions. By analyzing the findings of these studies, this review aims to identify common trends, highlight discrepancies in results, and uncover gaps in the current knowledge base, particularly regarding smallholder goat farmers in Zimbabwe.

Mmbando et al. (2015) conducted a study using the probit model on cross-sectional household-level data from 700 randomly selected smallholder farmers in Tanzania to identify determinants of market participation in maize and pigeon pea markets. The results indicated that several factors significantly influence market participation, including gender, distance to markets, access to market information, price, education level, farm size, fixed transaction costs, membership in farmer associations, household size (as a measure of labor force), and location. On the contrary, age, access to credit, and access to extension services were found not to be significant.

Similarly, Amao and Egbetokun (2017) employed the probit model to analyze data from 70 randomly sampled leafy vegetable farmers in Nigeria to identify factors influencing market participation. The results indicated that significant factors affecting market participation included gender, farm size, experience in farming, land ownership, and group marketing. In contrast to the findings of Mmbando et al. (2015), educational status, household size, and membership in farmers' associations were not significant in this study. Additionally, age, marital status, access to credit, and ownership of transport equipment were also found not to be significant.

Adepoju et al. (2015) investigated the determinants of market participation among pineapple farmers in Nigeria. Their results indicated that significant factors affecting market participation included experience in farming, age, distance to market, access to credit, secondary education, and marital status of the household head. In contrast to the findings from Amao and Egbetokun (2017) and Mmbando et al. (2015), age, access to credit, and marital status were not found to be significant in this study. Furthermore, household size, access to market information, gender, and membership in farmers' associations were also not significant in influencing market participation according to

Adepoju et al. (2015), despite being significant factors in the other studies mentioned. Adepoju et al. collected data from a sample of 120 pineapple farmers using a multistage sampling technique and employed the Ordinary Least Squares (OLS) method for data analysis. However, Peng (2002) critiques the use of OLS in such studies, noting that it is inappropriate for addressing questions with a dichotomous dependent variable—such as market participation—due to its statistical assumptions.

Randela et al. (2008) analyzed data from a sample of 177 small-scale cotton-farming households using a logistic regression model. They discovered that factors affecting market participation included age, access to market information, distance to market, land size, dependency ratio (used as a proxy for household size), ownership of livestock, region (location), ownership of transport equipment, the ability to speak or understand English, and being a beneficiary of a trust. In contrast, access to loans was not found to be a significant factor.

Randela et al. used the dependency ratio as a proxy for household size and replaced education level with the ability to speak or understand English—an approach not commonly found in other studies. Similarly, Tarekegn and Yosefe (2017) conducted research in Ethiopia on poultry market participation, finding that education level, distance to market, and household size were significant factors influencing market participation, aligning with Randela et al.'s findings. Additional significant factors identified by Tarekegn and Yosefe included the number of extension visits, number of poultry owned, breed type, and family size. They employed the probit model to analyze data from a sample of 150 poultry producers selected using multistage sampling.

In Madagascar, Okoye et al. (2016) selected 240 cassava farmers using a multistage randomized technique and analyzed their data using descriptive statistics and a probit model to study the effect of transaction costs on smallholder cassava farmers' market participation. The results indicated that factors affecting market participation included membership in cooperatives, community characteristics, farming experience, distance to market, and the condition of the road to the nearest town. Okoye et al. (2016) highlighted that the condition of the road is significant because it influences farmers' access to multiple markets, thereby enhancing their opportunities for selling cassava.

Ayieko et al. (2015) conducted a study on market participation decisions among indigenous chicken producers in Kenya, discovering that factors such as education level, age, region, group membership, flock size, and processing significantly influence market participation. This analysis was based on data from 130 households selected using multistage sampling and analyzed with the probit model. Similarly, Wanyoike et al. (2015) employed the probit model to analyze data from a random sample of 144 households in a study on livestock grading and market participation in Northern Somalia. Significant factors influencing market participation among small ruminant producers included age and the number of goats and sheep owned, while gender of the household head, knowledge of the grading system, level of education of the household head, and marital status were found not to be significant.

In goat marketing, Chipasha et al. (2017) conducted a study in Zambia focusing on smallholder goat farmers' market participation. Data were collected from a sample of 110 farmers and analyzed using descriptive statistics and non-parametric statistical techniques. Yatchew (1998) notes that non-parametric techniques are theoretically more complex compared to linear and non-linear parametric modeling methods. The study identified age, distance to markets, gender, education level, family size, and access to market information as significant factors affecting market participation.

Insights from the Literature Review

The review explored various studies examining the determinants of market participation among smallholder farmers across different contexts, including Tanzania, Nigeria, Ethiopia, Madagascar, Kenya, and Zambia. While significant progress has been made in understanding the factors influencing market participation, several gaps remain. Notably, there is a dearth of research specifically focusing on smallholder goat farmers in Zimbabwe, which presents an opportunity for further investigation. Additionally, much of the existing

literature relies heavily on probit models, limiting the exploration of alternative methodologies such as logistic regression that may provide different insights.

The choice of logistic regression for the present study is justified due to its suitability for analyzing binary outcomes, such as whether or not a farmer participates in the market. Logistic regression allows for the estimation of the probability of participation while accommodating non-linear relationships between independent variables and the dependent variable. This method also handles cases where the dependent variable is dichotomous effectively, making it an appropriate choice for this analysis. The selected variables used for analysis – age, gender, household size, education level, employment status, price of goats, distance to markets, production costs, access to market information, number of goats owned, and experience in goat production – are grounded in the existing literature and reflect critical socio-economic factors that influence market participation. These variables were chosen based on their demonstrated relevance in previous studies and their potential impact on the decision-making processes of smallholder farmers. By focusing on these factors within the context of Gwanda district smallholder farmers, this study aims to contribute valuable insights into enhancing market participation and improving livelihoods in this under-researched area.

RESEARCH METHODS

Study Area

This study was conducted in Gwanda District, located in the Matabeleland South province of Zimbabwe, between the Bulawayo and Beitbridge areas. The district's coordinates are 21°30'0"S and 29°30'0"E, with an elevation of 668 meters above sea level. Gwanda District covers a total area of 14,015.31 km² (Gwanda RDC, n.d.). It falls within Agro-ecological Zone 5, characterized by low rainfall, typically less than 500 mm per year, making it too dry for sustainable crop production (Rukuni and Eicher, 1994). The primary sources of income for farmers in this area are cattle and goat production (FAO, 2000). According to Kindness et al. (1999), a significant proportion of goats in Zimbabwe are found in the dry regions, specifically Regions 4 and 5. Gwanda experiences high temperatures and erratic rainfall patterns, common features of Natural Region 5. As of the 2022 census, Gwanda District has a population of 151,691, with 124,548 individuals (31,473 households) residing in rural areas (ZimStat, 2022).

Sampling procedure

The target population for this study consisted of smallholder farmers who owned goats, with the household serving as the sampling unit. Gwanda District is divided into 24 wards, each containing several villages. The study employed a multi-stage sampling method. In the first stage, two wards were purposively selected based on goat populations and accessibility, as some wards were located in areas with poor transport systems. Wards 15 and 18 were chosen for their accessibility and large goat populations. In the second stage, two villages were selected from each ward based on similar criteria. Selonga and Tibeli villages were chosen from Ward 15, while Buvuma and Sukwe villages were selected from Ward 18.

The sampling frames for each village were obtained from the veterinary officer of the respective wards, consisting of a list of all households that owned goats. According to these frames, Selonga village had 284 households with goats, Tibeli had 262, Sukwe had 130, and Buvuma had 111 implying that the total household population was 751. In the third stage, simple random sampling (using the hat method) was employed to select households for the study. According to the sample size calculator (Calculator.net), the sample size required for the study was 117 given a confidence level of 95%, margin of error of 5%, and the population proportion of 90% since almost all households were into goat farming. From each village's sampling frame, 25 households were randomly chosen, resulting in a total sample of 100 households for the study. The sample was limited to 100 due to insufficient funding and limited time, however, the difference is not much. According to Strube (1991) the probability that a smaller sample size affects inference erroneously is very low. Therefore, the conclusions of this study accurately reflect the conditions of the study area and can be generalized.

Data Collection

This study primarily relied on primary data collected in Gwanda District. Questionnaires served as the main data collection tool during the sample survey, targeting one hundred smallholder goat farmer households in Selonga, Tibeli, Buvuma, and Sukwe villages within Wards 15 and 18. The collected data encompassed farmers' socio-economic and demographic information, assets and livestock ownership, goat production practices, marketing of goats, and production costs. To analyze this data, binary logistic regression was employed to determine the coefficients, relationships, and significance of various factors influencing market participation in Gwanda District.

Binary Logistic Regression

The binary logit model was used for analyzing the factors affecting market participation in the current study. The dependent variable was market participation where a farmer was either a market participant or not with the following codes:

1 = Non-market participant

2 = Market participant

The explanatory variables used for analysis were sixteen, informed by the literature review and the main characteristics of the study location. They included age, gender, marital status, household size, level of formal education, employment status, price of goats, distance to the market, number of available markets, access to market information, experience in goat marketing, experience in goat production, agricultural training, size of farm land owned, number of goats owned at beginning of 2017 and total costs of goat production in 2017. Table 1 indicates the justification for including each of these variables in the model. The model assumed was as follows:

$$\text{logit}(Y) = \ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_{16} X_{16} + u,$$

$$p = \frac{e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n}}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n}},$$

where Y is the outcome of interest, which was market participation (where 1 = non-market participation and 2 = market participation). p is the probability of the household to participate in marketing of goats, the β 's represent the explanatory variables, β_0 is the Y intercept and the other

TABLE 1: JUSTIFICATION OF VARIABLES

X	Variable	Explanation
X ₁	Age	It is of expectation that younger farmers are progressive, more receptive to newer and better ideas and have a better understanding of benefits of commercialization in agriculture as compared to the elderly (Randela et al, 2008)
X ₂	Gender (female-1, male-2)	Male headed households are more likely to participate than female headed households as the female headed households are usually resource constrained and have less productive assets access (Mmbando et al, 2015)
X ₃	Marital status (single-1, married-2, divorced-3, widowed-4)	Married household heads usually have pressure in terms of cash need from their spouses as a result they sell goats to get the money, thereby increasing market participation.
X ₄	Household size	The household members represent labor resources of the household (Randela et al, 2008). Availability of more labor improves production, which then promotes market participation.

X ₅	Level of formal education (none-1, primary-2, secondary-3, tertiary-4)	Level of education indicates the information processing ability of the household leading to better understanding of information which helps in marketing (Randela et al, 2008)
X ₆	Employment status (formally employed-1, selfemployed-2, unemployed-3)	Formally employed farmers work part time. Part time farm producers are likely to be time poor and have pressure when it comes to regular supply of produce (Kingwell, 2011).
X ₇	Price of goats	When the market price of a commodity increases, its supply increases as well (Law of supply)
X ₈	Distance to the preferred market	Farmers with households far from the markets have market access costs that restrict them to participate in goat markets (Mmbando et al, 2015)
X ₉	Number of available markets	Availability of many markets gives the farmer a choice range such that if he/she is not affected to an extent of failing to sell goats by actions of a single or a few markets
X ₁₀	Access to market information (yes-1, no-2)	Lack of market information puts farmers at a disadvantage when making the decisions to market their goats as they won't have up to date information (Chipasha et al, 2017)
X ₁₁	Experience in goat marketing	Improves the marketing skills of a farmer and helps him/her to be able to get greater benefits from marketing and thereby promoting market participation.
X ₁₂	Experience in goat production	Experience boosts the farmer's knowledge on goat management resulting in increased productivity thereby promoting market participation.
X ₁₃	Agricultural training (yes-1, no-2)	Training improves the productivity of the farmer's enterprise as it trains the farmer good management skills.
X ₁₄	Size of farm land owned	Affects crop yields that can be used as supplement feeds for goats
X ₁₅	Number of goats owned at beginning of 2017	Farmers with fewer animals might give more priority to increasing their stocks before selling the stock and thus resulting in not participating in marketing (Wanyoike et al, 2015)
X ₁₆	Goat production costs	Increase in costs of production reduces the farmer's affordability and thus the ability to purchase vaccines and feeds which leads to deaths if a disease/hunger attacks the goats

β 's are the partial logistic regression coefficients (Peng et al, 2002). u is the random error term. In addition, the X 's are as shown in table 1.

RESULTS

Marketing of goats in Gwanda District

The results on table 2 show that the 63 of the 100 households sampled were market participants. The average length of experience in goat marketing was nine years for the aggregate study sample, ten years for the market participants and six years for the non-market participants and, there was a significant difference between the two at 5% level. The average price of goats was \$40 for the market participants compared to \$35 for the non-market participants, with an aggregate average of \$38 for the study sample. The t-test indicates that there was a significant difference between market participants and non-market participants at 5% in terms of goat prices.

The average number of goats sold for the aggregate study sample was three, and five for the market participants. All households interviewed (100%), both market participant and non-market participant households had access to at least one goat market. The types of goat markets that were accessible for the households interviewed included the local butcheries (72%), local people (59%), NGOs (9%), ward shows (19%), local churches (7%) and local schools (7%). Amongst these markets, most of the households (44%) preferred the local butcheries as a market for their goats, and these were comprised of 41% of the market

participants and 49% of the non-market participants. The chi-square test shows that there was a significant difference in the preference of markets between market participants and non-market participants at 5% level. Pertaining to access to market information, 47% of the study sample had access to market information, about 57% of the market participants and about 30% of the non-market participants.

Furthermore, the results show that of the 100 households interviewed, 17% obtained goat market information through communal leaders where 27% of market participants obtained market information compared 0% of non-market participants. The households who accessed market information through butcheries composed about 30% of the market participants and about 11% of the non-market participants. The chi-square test indicates that there was a significant difference between market participants and non-market participants pertaining to butcheries as a source of market information at 5% level.

TABLE 2: MARKETING OF GOATS AMONG HOUSEHOLDS IN GWANDA DISTRICT, ZIMBABWE 2018

Characteristics	Participants	Non-participants	Total	t-value
Number of households	n=63	n=37	N=100	
Experience in marketing of goats (years) (Mean, SD)	10 (10)	6 (9)	9 (10)	-2.051*
Average price of goats in US\$ (SD)	40 (9)	35 (6)	38 (8)	-2.955*
Distance to the preferred market in km (Mean, SD)	1.7 (3.6)	1.4 (1.8)	1.6 (3)	-0.533
Number of goats sold in 2017 (Mean, SD)	5 (6)	0 (0)	3 (5)	-6.275*
				Chi square
Access to goat markets (%)	100	100	100	-
Types of markets available for selling goats:				
1. Local butcheries (%)	76	65	72	1.483
2. Local individuals (%)	60	57	59	0.122
3. NGOs (%)	14	0	9	5.808*
4. Ward shows (%)	29	3	19	11.476*
5. Local churches (%)	11	0	7	4.421*
6. Local schools (%)	11	0	7	4.421*
Preferred market				
1. Local butcheries (%)	41	49	44	10.903*
2. Local individuals (%)	30	49	37	
3. NGOs (%)	13	0	8	
4. Ward shows (%)	13	3	9	
5. Local churches (%)	3	0	2	
6. Local schools (%)	0	0	0	
Access to market information (%)	57.1	29.7	47	7.032*
Sources of market information:				
1. Neighbors (%)	22.2	8.1	17	3.291
2. Cell phones (%)	9.5	2.7	7	1.666
3. Communal leaders (%)	27	0	17	12.029*
4. Extension officers (%)	11.1	2.7	8	2.239
5. Butcheries (%)	28.6	10.8	22	4.285*
6. The ward shows (%)	4.8	8.1	6	0.463
7. The radio (%)	3.2	0	2	1.199
8. Workshops/NGOs (%)	9.5	0	6	3.749
*-Significant				
Source: Smallholder goat marketing survey (2018)				

Binary Logistic Regression Results

TABLE 3: DETERMINANTS OF MARKET PARTICIPATION AMONG SMALLHOLDER GOAT FARMERS IN GWANDA DISTRICT, ZIMBABWE 2018

Factors	Coefficient (β)	Exp (β)	Significance
Age	-.023	.977	.365
Gender	3.332	27.997	.006***
Marital status			.071*
Single	1.469	4.346	.194
Married	3.407	30.188	.009***
Divorced	.317	1.373	.876
Household size	.311	1.365	.013**
Education			.851
None	1.678	5.353	.384
Primary	1.100	3.004	.472
Secondary	1.160	3.189	.445
Employment status			.969
Formally employed	-.198	.821	.818
Self employed	-.122	.885	.880
Agricultural training	.514	1.671	.451
Goats owned at beginning of 2017	.046	1.047	.093*
Goat production experience	.001	1.001	.977
Goat marketing experience	.087	1.090	.047**
Price	.104	1.109	.023**
Number of markets	1.811	6.114	.001***
Distance to preferred market	.013	1.013	.912
Production costs	.001	1.001	.938
Access to market information	.360	1.433	.606
Size of land owned	-.092	.912	.590
Constant	-12.740	.000	.002
Note: Cox & Snell R square: 0.395; Sample size (N): 100 ***-Significant at 1%, **-Significant at 5%, *-Significant at 10% Source: Smallholder goat marketing survey (2018)			

The results of the logistic regression analysis used to determine the factors that affect market participation in table 3 showed that of the sixteen independent variables used, only seven were significant. Gender, number of markets available and being married were significant at 1% level. The variables significant at 5% were household size, goat marketing experience and the price of goats. The number of goats owned at the beginning of the year 2017 was significant at 10% level. Variables such as age, education, employment status, agricultural training, goat production experience, distance to the preferred market, production costs, access to market information and size of land owned were not statistically significant at 10% level.

The signs of the β 's (coefficients) indicate that the seven β significant variables have a positive relationship to market participation. The estimated model of the binary logistic regression according to the results becomes;

$$Y = \hat{\beta}_0 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3 + \hat{\beta}_4 X_4 + \hat{\beta}_7 X_7 + \hat{\beta}_9 X_9 + \hat{\beta}_{11} X_{11} + \hat{\beta}_{15} X_{15}$$

By substituting the values of the β 's, the model becomes;

$$Y = -12.7 + 3.3X_2 + 3.4X_3 + 0.31X_4 + 0.104X_7 + 1.8X_9 + 0.087X_{11} + 0.046X_{15}$$

The values of the odds ratio, $\text{Exp}(\beta)$ gives the number of times in which the likelihood of market participation increases or decreases when a variable changes. As an example, a unit increase in the number of males increases the likelihood of market participation by about 28 times. Cox and Snell Pseudo R square was 0.359 indicating that the independent variables in the model explain about 36% of the changes in the dependent variable, market participation.

DISCUSSION

Market participants had more experience in goat marketing than non-market participants. This might have been the reason for the difference in prices of goats reported. Market participants reported higher goat prices than non-market participants. All the goat farmers surveyed in Gwanda District had access to markets. Goat markets included local butcherries, local individuals, NGOs, ward shows, local churches and local schools. Local butcherries were the most accessible and preferred market for both the market participants and non-market participants. However, non-market participants preferred local individual market in a similar way. Most farmers preferred local butcherries because they paid immediately in cash during sale and provided their own transport. Local individual market was preferred over other markets, except for butcherries, as farmers could negotiate for better prices and obtain higher returns. Local individual market was preferred to the other markets (excluding local butcherries) because they offered higher prices since farmers in this market had a better price determination power during negotiations. Market information was largely accessible to market participants compared to the non-market participants. The sources of market information in Gwanda District for smallholder goat farmers included neighbors, local butcherries, communal leaders, cell phones, extension officers, radios, ward shows and workshops usually done by NGOs. More market participants accessed market information via these sources than the non-market participants did.

The logistic regression was used to determine the factors affecting market participation and to test the hypothesis that socioeconomic factors such as age, gender and education, market side factors such as distance to markets and access to market information, and production side factors such as number of goats owned and experience affect market participation. The results showed that gender, marital status, household size, goats owned at the beginning of the year 2017, goat marketing experience, goat price and the number of markets available were significant which means that they are the factors affecting market participation among smallholder goat farmers in Gwanda District. Gender, marital status, household size, goats owned at the beginning of the year 2017, goat marketing experience, goat price and the number of markets available had a positive effect on market participation.

Gender had a strong positive effect on market participation according to the results of the study. A positive effect implies that males participate more in goat markets than women do and increasing the number of male-headed households keeping goats increases the likelihood of market participation. This was consistent with the findings of Kekana and Maponya (2017), and Mmbando et al (2015) where results showed that gender positively influenced market participation. One of the reasons why males participate more than women in goat markets is that female households have limited production capabilities because they lack productive assets compared to male-headed households (Mmbando et al, 2015). According to Mulema et al (2016) women lack capital and this affects their participation in marketing compared to males. Furthermore, Waithanji et al (2015) states that women tend to be confined at or near home because of their reproductive role and as a result fail to access distant favorable markets. Therefore, male-headed households are more likely to participate in marketing than females. However, Waithanji et al (2015) study of goat ownership and marketing in Kenya observed that women were more likely to be involved in sale of small stock than males and this differs to the results of the current study. This could be attributed to the fact that in some cultures males tend to focus on the production of large stock leaving women in charge of small stock. Therefore, even when women become

the head of the households they still focus on small stock, as they would be more experienced in them. Okoye et al (2016) in a cassava market participation study states that women are more likely to sell their cassava as they face lower transaction costs because of their credibility and their bargaining skills that are better than that of men.

The household size had a moderate positive effect on market participation implying that larger households were more likely to participate in goat markets than smaller households were. Increasing the household size of households would increase the likelihood of market participation. The results were similar with the findings of Gani and Adeoti (2011) in a study of market participation and rural poverty in Nigeria where results showed that there was a positive relationship between market participation and the household size. According to Gani and Adeoti (2011), the household size cashes in on family labor which is useful for agricultural purposes. Key informants during the study indicated that farmers used the income from goat sales for payment of children's school fees and covering up expenses that rose from time to time, therefore, larger households would sell more goats as they are more likely to meet such expenses. However, Uchuezu et al (2009), Marennya et al (2017) and Balint and Wobst (2006) found that household size had a negative effect on market participation which differs to the results of the current study. According to Balint and Wobst (2006), the larger the number of the household members the more the consumption of produce resulting in lack of marketable surplus causing the household to fail to participate in marketing.

The number of goats owned at the beginning of the year 2017 had a weak positive relationship to market participation. A positive relationship between market participation and the number of goats owned at the beginning of the year 2017 was consistent with the expectations where a positive relationship was expected. This implies that farmers with a larger stock of goats at the beginning of the year are more likely to participate in goat marketing as compared to those with smaller stocks of goats in Gwanda District. Increasing the number of goats owned by a household would increase the likelihood of participating in goat markets. A larger beginning stock relates to more goats being available for marketing during the year and this promotes market participation. A positive relationship between market participation and number of animals was also found by Ayieko et al (2015) and Wanyoike et al (2015) studies. Gani and Adeoti (2011) study showed that market participation and size of output had a positive relationship. Ayieko et al (2015) in a study of indigenous chicken determined that farmers with more chicken were likely to participate in marketing because they were sure of a continuous supply of the animals. Farmers with low stocks would not be sure that if they sell animals they are going to recover or replace the sold animals. Wanyoike et al (2015) further states that in households with smaller stocks, production is largely for stock building rather than for sale. Therefore, marketing priority will be associated with farmers that have larger stocks as compared to those with less thereby resulting in a positive relationship between the number of goats owned and market participation.

The results indicate that the price of goats had a moderate positive effect on market participation implying that higher prices increase the likelihood of market participation. Farmers which get higher prices when selling goats are more likely to participate in goat marketing. This is consistent with the expectation and the law of supply which points out that price is positively related to supply because higher prices attract more farmers than lower prices. When goat prices increase, most farmers would sell their goats so as to get the high revenue per sale and as a result, market participation increases as well. Balint and Wobst (2006) found that price had a positive effect on market participation of milk producers in a study of market participation. Price helps farmers to decide whether it is feasible or not to sell their produce, lower prices might be less than the costs incurred during marketing and thereby result in a loss to the farmer (Balint and Wobst, 2006). In this case the farmers would rather consume or keep their goats.

Goat marketing experience had a moderate positive effect on market participation. This means that farmers with more experience are likely to participate in goat marketing therefore, increasing the number of years of experience in goat marketing increases the likelihood of market participation of a household. This is because more experienced farmers would make better decisions to sell their produce because they are more likely to have knowledge of the location of markets, prices and the standards required (Selowa et al, 2015). Therefore, experience in marketing would improve the farmer's negotiation skills and the knowledge of the opportunities.

The number of goat markets available for the households indicate the choice range the households had for them to market their goats. In Gwanda District, the markets available for goat marketing included local butcheries, local individuals, NGOs, ward shows, local churches and local schools. As expected, there was a strong positive relationship between market participation and the number of markets available implying that increasing the markets available for goats selling by households increases the likelihood of market participation. This is because when a farmer does not like a certain market, they can go to a different market to sell their goats.

Furthermore, the results show that there is a strong positive relationship between market participation and being married. Married households are more likely to participate in goat marketing and an increase in the number of married households would increase the likelihood of market participation among goat farmers. The results are similar to the findings of Adepoju et al (2015) who found that marital status has a strong positive effect to market participation in a study of market participation among pineapple farmers in Nigeria.

The distance to the preferred market was not a significant factor affecting market participation. However, the findings of Adepoju et al (2015) and Gani and Adeoti (2011), showed that distance to the market was significant and had a negative effect on market participation. This is because long distances restrict farmers to participate in markets by imposing costs on them (Mmbando et al, 2015). Age of the household head was also not significant in affecting market participation contrary to the findings of Adepoju et al (2015), Wanyoike et al (2015) and Balint and Worbst (2006) where age was significant and had a negative effect to market participation. According Randela et al (2008) younger farmers have better understanding of the benefits of commercialization than the elderly hence they participate more in markets. Furthermore, the education level was also not significant similar to Wanyoike et al (2015) and contrary to the findings of Mmbando et al (2015) where education was significant and had a positive effect on market participation. The positive effect was because education improves the understanding of information which promotes market participation (Randela et al, 2008).

CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study was to analyze the determinants of market participation by smallholder goat farmers in Gwanda District. The study used multistage sampling technique for selecting a sample of 100 goat farmers in Gwanda District for data collection using questionnaires. The binary logistic regression analysis was used to determine the factors affecting goat market participation. The results of the study showed that most smallholder farmers producing goats were market participants and the significant factors include gender, marital status, household size, number of goats owned at the beginning of the year, price, marketing experience and number of markets available. Therefore, the study concludes that gender, marital status, household size, number of goats owned at the beginning of the year, price, marketing experience and number of markets available are the determinants of market participation by smallholder goat farmers in Zimbabwe.

To enhance market participation, the study recommends that rural development projects targeting smallholder farmers should consider focusing on improving the productivity of goat enterprises so as to increase goat herd sizes so that there is more surplus to sell in the markets. Similarly, the study recommends that farmer organisations should consider advocating for lucrative supply prices of goats, training farmers on marketing to enrich their experience, as well as linking farmers to buyers both local and in the diaspora.

Furthermore, since the current study did not address the factors that affect the frequency of marketing and numbers of goats sold by each household per year hence further studies on these are recommended as they would give more insights. Similarly, this study did not identify the constraints that affect farmers' market participation in goats, as such, this study recommends further study in this area. In addition, this study used cross-sectional data, a future similar study using longitudinal and qualitative data methods could provide a more dynamic view of the relationships studied and also broaden the context of the study for richer understanding of the market participation respectively. These future studies could also explore systematic

market barriers and local market conditions which could provide valuable insights for developing targeted interventions.

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