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Research Article

Understanding Profitability of Small Stock Animals for Rural Development

F.Mazamabara, E. Zivenge, Never Mafuse*

Department of Agricultural Economics, Education and Extension, Bindura University of Science Education, P.Bag 1020 Bindura

ABSTRACT

The study was carried out to explore profitability of smallholder goat production Zimbabwe. This was guided by key objective of estimating revenue earned and costs incurred in goat production. Structured questionnaires together with personal interviews were employed for data collection. Two out of three wards in Makakabule were purposively selected. Two goat producing villages were randomly selected and then 150 respondents were purposively selected with respect to their willingness to cooperate. Gross Margin analysis indicated that smallholder goat production was a profitable enterprise in the study area since farmers were able to cover all costs with revenue earned. Every US$1 invested in goat enterprise returned US$0.56. The government was recommended to organise formal goat markets, invest in road networks and improve provision of extension services. Goat farmers should adopt modern agricultural information platforms and increase their scale of production with improved breeds to earn higher profits.

Keywords: Goat production, Gross margin, Smallholder, Profitability, Markets

INTRODUCTION

Zimbabwean agricultural sector is well known as the backbone of the national economy since it plays a major role in poverty alleviation, food security, income generation and development of the nation as a whole Munyoro. Despite a decline in agricultural productivity for the past two decades, research from FAO (2020) depicted that the sector contributes approximately 17% to Zimbabwe's GDP, 40% to national export earnings and supplies 60% to raw materials used in agro-industries.

In drought-prone areas of Zimbabwe, particularly the Matabeleland region, livestock production is the major agricultural activity due to the climatic conditions which are not suitable to rain-fed crop production. Livestock production can be an important risk-mitigation strategy which can be used as a form of crop insurance in drought-prone areas.

According to the Ministry of Lands, Agriculture and Resettlement (2018), a decrease in beef cattle production in the recent years has resulted in a deficit in beef supply nationwide, hence the goat industry has a big market opportunity to supply goat meat as an alternative. Adam et al. (2010) exposed that livestock species such as goats and sheep do not only play a pivotal role in the socio-cultural aspects of farmers but also assist to maintain nutrition whilst generating household incomes.

Boer goat (Capra hircus) is considered to be one of the most desirable goat breeds for meat production. It has gained worldwide recognition for excellent body conformation, fast growing rate and good carcass quality.Boer goat (Capra hircus) is considered to be one of the most desirable goat breeds for meat production. It has gained worldwide recognition for excellent body conformation, fast growing rate and good carcass quality.Goats reared in arid regions have comparative advantages over cattle and sheep since they are hardy, drought tolerant and also have a great adaptation capacity to harsh environmental conditions. Due to their good adaptation to harsh environments, goats can utilise a wider variety tree species which characterise the savannah and semi-desert vegetation. They are also able to browse any other plants that would not normally be consumed by other livestock species. More than 95% of the global goat population is found in the dry regions and mountainous areas in developing economies of Asia and Africa.

Goat production has several merits over other small-ruminants production due to the fact that cost of the rearing is comparatively low since less finance is required for feeding and

***Corresponding author: Never Mafuse**, Department of Agricultural Economics, Education and Extension, Bindura University of Science Education, P.Bag 1020 Bindura; Email: nmafuse@buse.ac.zw

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housing among other management practices. Goat production in drought-prone areas such as the entire Beitbridge district part of Rushinga and Muzarabani Districts in Mashonaland Central Province,Binga and Hwange Districts in Matabeleland North Province contributes a lot to drought risk mitigation and empowerment of vulnerable people in poverty-stricken communities. The majority of goat breeds reared in Zimbabwe are indigenous, which include the Mashona and Matebele breed, and farmers are encouraged to introduce the Boer, Saanen and Kalahari red among other exotic breeds which perform far much better.

The consumption of goat meat has increased globally because of its lower total fat, saturated fatty acid and protein content which make it a healthful product and added that smallholder farmers rear goats mainly for premium quality meat during religious as well as festive occasions and sale to source income for financing their agricultural activities and meeting family basic needs. Goats are also important for skins add manure production, especially for those resource-poor farmers that do not own cattle.

Despite all the above-mentioned benefits of goat production in Zimbabwe to alleviate poverty and fight against food insecurity, its profitability in arid regions is unknown. It is therefore against this background that prompted this study to analyse the profitability of smallholder goat production in arid regions.

METHODOLOGY

Description of study area

The study was carried out in Makakabule communal area of Beitbridge District in Matebeleland South Province. The area is one of the driest regions in Zimbabwe, located about 18 kilometers from Beitbridge town, along Aint Sentinel road (Beitbridge-Shashe way) in natural farming region V. According to Dube, Beitbridge District is characterised by mean temperatures of 40°C in summer and 13°C in winter as well as very low, erratic rainfall of 250-450mm per annum on average between November and March. The study area is also characterised by sandy-loam to clay-loam soils with plenty of Mopane trees and a variety of wild bush species. The soils are unfertile, subject to great erosion and require moderate fertilizer applications to ensure economic crop yields. Beitbridge District lies in the far south part of the Lowveld area, sub-divided into 15 wards with 58 villages and a total area coverage of 12 697km.

Livestock production is the major agricultural activity, with crop production done on a smaller scale, particularly under irrigation. The study area has vast herds of goats and due to low rainfall patterns; the farmers grow small grains and other drought-tolerant crops. The main livestock species reared in the study area include cattle, donkeys, goats, sheep and chicken whilst short season maize, groundnuts and sorghum varieties are grown.

Data collection methods

Both primary and secondary data collection methods were employed in this research project. Primary data can be referred to as raw data collected through first-hand research in form of surveys, observations and interviews among other methods whereas secondary data is already processed data/existing information that has been collected by others which can be in form publications, reports or statistics. In this research study, review of literature was used for secondary data collection whilst questionnaires, personal interviews and passive observation were used for primary data collection.

Survey questionnaire

A questionnaire is a research tool with written questions designed to gather information on participant's characteristics, attitudes, beliefs and also experiences with respect to the topic under investigation Bulmer (2004).A well-structured questionnaire, written in simple English to make it respondent-friendly was the main instrument employed in primary data collection. Copies of questionnaire with both closed and open-ended questions were self-administered to collect data from the selected smallholder farmers concerning their demographic characteristics, goat production and marketing as well as challenges encountered. In case of those respondents who were not good at English, data was collected by use of direct local languages (Shona and Venda). The questionnaires were piloted prior to field research to improve questionnaire clarity and also enhance better responses from respondents. Amendments were made to the research instruments based on the results of pilot.

Personal interviews

Face to face interviews were undertaken with the selected households in the study area using a checklist of questions. In the case of questions that seemed difficult for respondents to understand, local languages (Shona and Venda) were used to make understanding easier. The interviews assisted the respondent to be open and share his/her views without limitations. The time for conducting each interview was limited to 35 minutes for the sake of time management and obtaining clear details from the respondents.

Passive observation

This technique was used to justify some of the responses given by the smallholder goat farmers in the study area and also to find out some of the information they were not able to provide.

Secondary data

Review of literature was used as the major secondary data collection technique in the study. It assists to justify how the research study is related to other research studies in the same subject matter. In addition, it provides evidence on data collection, data analysis and results of prior related research work, which will be therefore used to identify research gap. The sources of secondary data used in this study included journals, livestock production reports, publications and text books.

Population, sampling procedure and sample size

The population of the research study comprised of all goat farmers in the selected areas of Makakabule. A multi-stage

sampling technique was employed to select participants from Makakabule communal area of Beitbridge District. The study area was organised into wards, then villages and lastly households within the villages. Purposive sampling was used to select the wards in the study where smallholder goat farming was practised. Two wards (2 and 3) of Makakabule communal area were selected out of three wards based on their accessibility, in terms of goat numbers and road networks. The chosen wards had six villages with a total of 105 households in goat farming where two villages from each ward were thereafter selected using a random sampling technique. A total of 60 smallholder households from the two randomly selected villages were purposively selected as a sample for data collection, with respect to their willingness to participate.

Model specification

Characterising smallholder goat farmers. Descriptive statistics which included mean, frequencies and percentages where used to describe the characteristics of the respondents. Determining challenges faced by smallholder goat farmers.

The Likert scale was used to rank the challenges faced in goat production among smallholder farmers. A product of respondent frequency and ranking number was summed up for all four ranking categories and then divided by 60 (sample size) to come up with a mean ranking for each challenge. To clarify challenge severity to the goat farmers, the most severe challenge was denoted by 4, a serious challenge by 3, a mild challenge by 2 whilst 1 represented not a challenge.

Estimate profitability in terms of costs and returns in smallholder goat production

In order to estimate goat profitability, the Gross Margin Analysis was employed in this research study. A summation of all the variable costs incurred in goat farming were subtracted from the total revenue generated as shown in the equation below, where gross margin was a measure of profitability.

Gross margin = Gross Income – Total Variable Costs.....1

Equation two for Gross Margin analysis was formulated for clarifying how to come up with Gross Income and Total Variable Costs.

Gross income = PQ – Σ(pX).....2

Where P = unit price of goats and their products

Q = total quantity of goats and their products sold

p = unit cost of variable inputs incurred

X = total quantity of variable inputs

Offor summarised the formula for Gross Margin (GM) analysis by deducting Total Variable Costs from Gross Income as: GM = GI – TVC. From the formula on equation two above, Gross Income is the product of P and Q, where TVC is the product of p and X.

It is important to note that Fixed Costs such as depreciation, fixed salaries, equipment rentals and taxes are not included when calculating Gross Margin. In this case GM was used as proxy indicator of profitability A positive gross margin denotes a profit, therefore returns from an enterprise are sufficient enough to cover the costs incurred. On the other hand, a negative gross margin indicates a loss and this entails that the returns earned from a business are not sufficient enough to cover the costs incurred.

RESULTS AND DISCUSSION

Characteristics of smallholder goat farmers

The smallholder goat farmer's characteristics include household demographic information, goat production status and goat markets.

Gender of household head

Table 1: Gender, frequency and percentages of household head.

Gender	Frequency	Percentage
Male	48	80
Female	12	20
Total	60	100

Results of the study indicated that more males were heads of families involved goat production than women. 80% of the households were led by males whereas 20% were headed by females. Despite the fact that a larger percentage of respondents were male headed, women were the main producers of goats. These results support research findings from Olufemu and Dossa where goat ownership is much of women business in Nigeria and southern Benin Republic respectively, although the families are male headed.

Age of household head

Table 2: Age group, frequency and percentages of household head.

Age group (years)	Male frequency	Male %	Female frequency	Female %	Total frequency
25-40	12	34.3	2	8	14
41-54	16	45.7	10	40	26
55-64	5	14.3	7	28	12
65+	2	5.7	6	24	8
Total	35	100	25	100	60

A larger number of both female and male household heads was under the 41-54 years category. The category had 45.7% males and 40% females. This shows that most of the farmers are

within the economically active population who constitute a huge labour supply for goat production. These results agree with the study of Olufemi which was carried out in Nigeria and found out that a larger percentage of smallholder goat farmers had a mean age of 51 years, even though 70% of the households were female headed which is in contrast with results of this study.

Marital status

Table 3: Marital status of household head.

Marital status	Frequency	Percentage
Married	45	75
Single	5	8.3
Widowed	6	10
Divorced	4	6.7
Total	60	100

The study found out that 75% of the total sampled respondents were married with 8.3% of them being single. The category of the divorced recorded 4% which was the lowest figure whilst 6% of the household heads was widowed. This may mean that married people own goats for the purpose of securing food and income for their families as they need to give family food and meeting other financial obligation such as paying school fees.

These results are in line with research findings from Worley which found out that a larger number of the sampled farmers was married, which recorded 86.4%. In addition, this category also recorded more flock sizes which played a significant role in sourcing income for meeting family basic needs and financing their agricultural activities although a larger percentage of the produce was used for family consumption. Results of this study also confirm Baruwa (2013) whose findings showed that 98.3% of the respondents were married and indicated that the goat enterprise is very essential in meeting family responsibilities of the goat farmers. He also added that this percentage of married farmers confers some level of emotional stability which may have a positive link farmer's performance.

Level of education

Table 4: Level of formal education attained by household head.

Level of education	Frequency	Percentage
None	1	1.7
Primary	11	18.3
Secondary	48	80
Higher & tertiary	0	0
Total	60	100

The results showed that, none of the respondents attained higher and tertiary education whereas 1.7% did not attain any level of formal education even primary or secondary. The highest number of the respondents recorded 80% attained secondary education and 18.3% of them attained primary education. The analysis revealed that poverty was major limiting factor for the respondents to go further with education.

A study by Baruwa (2013) in Nigeria revealed that 81.6% of the goat farmers were educated. It was then indicated that education plays a pivotal role in agricultural productivity since educated farmers are be able to understand and adopt new as well as recommended farming technologies which can therefore enhance high yield of results. Meretiwon (1981) also pointed out that education is crucial to the effectiveness of agricultural extension and also success of agricultural production.

Household size

An analysis of household size revealed that smallholder goat farmers' families were made up of an average of 7 members in total. The lowest number of family members recorded among the farmers was 5 whilst the highest number was 9.

Generally, high household sizes are a common feature for poverty stricken communities such as the one in the study area. However, high household size is believed to play a significant role in providing cheap and reliable family labour since the farmers in the study area cannot afford to hire workers due to low income constraints. This is in support with results of Musara. (2013) who indicated that household size significantly determines the participation of households in goat production. They also figured out that as the household size increases, the level of goat production also increases in labour intensive type of enterprises.

Farming experience

Results indicate that most of the farmers in the study have an average experience of 5-15 years goat production and 84.3% of them were in the 5-15 years category.A study by Ogunniyi (2010) indicated that farmers used their experience in their farming business to set specific, measurable, achievable, realistic and time-tabled objectives. Besides this, farming experience assisted farmers to efficiently allocate and utilise the available resources as well planning ahead of the possible risks.

Goat production status

With regard to goat production status, the results are discussed in terms of production system, flock size, purpose of rearing goats, goat breeds, housing structures as well as feed and water source. Results of this study revealed that all the sampled farmers used the extensive production system to rear their goats. This was mainly because the famers are located in a community with vast bush and grazing lands. They also indicated that they cannot afford to buy commercial feeds for their animals.

A study in Osun State of Nigeria by Olufemu also found out that most of the smallholder goat farmers (85%) used extensive management system to rear their goats. Results of this study is also supported by a study of Kumar who found out that goats are mainly reared under extensive production system where they grazed on common property resources, open access grazing resources and private fallow lands in the case of India. However, a study by Enwelu et al. (2015) argued that 72% of the smallholder farmers in Anambra State of Nigeria used semi-intensive management system while 27.8% of them used semi-extensive system.

It was also found out that 92.4% of the farmers reared for the purpose of meat consumption and sale for income to meet basic family needs. The other 7.6% of the respondents reported that they reared goats not only for meat and income but also for manure, skins and traditional purposes such as paying lobola and performing rituals.These results are in support to Nepali (2018) who indicated that goats, often referred to as the 'poor man's cow' are commonly raised for meat, milk, wool and leather in different parts of the world. In addition, the results are also a confirmation of findings by Olufemu who indicated that smallholder goat farming is used to averse other risky businesses and also an important source of livelihood in meeting farmers' financial, social and nutrient needs.

The research study also found out a mean goat flock size of 18 per household in the study area. This shows that goats are important livestock species to the farmers since they manage to raise such a flock size despite the challenges they face. These results are comparable to observations by Mahanjana and Cronje (2000) that recorded a mean goat flock size of 16 in the Eastern Cape region of South Africa and also showed that goats are an important source of meat and milk.

All the farmers revealed that they rear the Matebele goat type, which is an indigenous breed. They clarified that they are not rearing this goat breed by choice but due to the fact that they cannot afford to buy exotic breeds such as the Boer and Kalahari red which perform far much better. Regarding the issue of goat housing structures, the study found out that 58.3% of the farmers used grass thatched shed with poles and mud/ stone floor, 25% used iron roofed shed with bricks and mud/ stone floor and 16.7% of the farmers used mopane pole structures with no roof as they indicated that mopane trees are readily available and they cannot afford to buy roofing material.

Farmers indicated that their goats drink water all year round from Mzingwane river, which a perennial reliable source of water. These results deviate from observations by Mutibvu. (2012) who figured out that, farmers in Simbe communal area relied on various water sources depending on location, season and capacity. The range of water sources included rivers (perennial-51%, seasonal-5.8%), dams (25.5%) and boreholes (9.8%).

Goat markets

Twenty –five per cent (25%) of the farmers confirmed that they sell their animals at auctions whilst 75% of them revealed that they sell their goats to middlemen who come from District like Chivi from Masvingo Province and Gwanda Ditsrict. Most of the farmers indicated that they sell their goats to middlemen and auctions not because of better prices, but mainly because of direct cash payment and lack of information about better markets.

These results support research findings of Chisango which stated that due to lack of access to market information attempts to access lucrative markets remain a major challenge and smallholder farmers end up selling their animals at low prices. Research from FAO (2005) also pointed out that no formal goat markets in Zimbabwe exist; therefore most farmers often have no other better option than to sell their goats at low prices as they will be in need of cash. The results also confirm a study by Gauthier (1995) which revealed that goat market in communal areas of Zimbabwe is informal, with majority of the sales conducted within the villages and also no indication of access to foreign markets, in the case of Masvingo Province.

Challenges faced by smallholder goat farmers: Production challenges

Table 5: Smallholder goat production challenges.

Challenge	Frequency of respondents on 1 scale	Frequency of respondents on 2 scale	Frequency of respondents on 3 scale	Frequency of respondents on 4 scale	Scale Mean ranking
High input cost	15	35	10	0	2
Poor nutrition	0	2	13	45	4
Predators	0	30	30	0	2
Lack of credit	10	30	20	0	2
Lack of extension services	0	15	40	5	3
Parasites and diseases	0	40	15	5	2

High input costs

Results of the study found out that a high input cost is a minor challenge in smallholder goat production. Good adaptation of goats to harsh environments enables them utilise a wider variety tree species and any other plants that would not normally be consumed by other livestock species, so the smallholder farmers do not buy supplementary feeds. The cost of medication was also reported very low since goats are not much affected by parasites and diseases. This was confirmed by Olufemi et al. (2017) who indicated that the cost of the rearing is comparatively low over other small-ruminants production since less finance is

required for feeding and housing among other management practices. Baruwa (2013) also evidenced that goat production requires a low initial capital and guarantees a high return on investment in as fast as two years in the case of Nigeria.

Poor nutrition

The study found out that poor nutrition is a severe challenge in smallholder goat farming due to the environmental conditions of the study area. The area is dry with plenty of Mopane trees and wild bush species which are not the best source of food for goat nutrition. In addition, increased deforestation due to high demand for firewood and veld grass harvesting for thatching purposes result in poor nutrition for goats. This was supported Masikati (2010) confirming that feed shortages in terms of quality and quantity, especially in off-rain seasons is the major constraint to many smallholder farmers in Zimbabwe.

Predators

This challenge was ranked a minor affecting smallholder goat production. Farmers in the study area revealed that they often face a challenge of predators especially hyenas from the nearby game ranch owned by Nottingham Estate, a citrus production company which also do eco-tourism and hospitality management. Evidence from Sanchez et al. (2020) confirmed that the presence of predators such as snakes and wild dogs was a challenge in goat production especially for farmers practising free grazing.

Lack of access to credit

Smallholder goat farmers reported that lack of credit was a minor challenge to their enterprise. They revealed that they incur relatively low costs in goat enterprise and they finance their business with income from personal savings as well as other agricultural and trading activities, hence they don't necessarily worry about loans. Bamigboye et al. (2017) indicated that about 20% of the respondents had financial problems which were suggested to be due to no access to credit facilities from the government or any other formal source besides their personal savings in Ekiti State of Nigeria. However, these results were in contrast to Baruwa (2013) who indicated that more than half (66.7%) of the framers complained of financial problem as a serious challenge due to limited capital for collateral security in the case of Osun State, Nigeria.

Lack of extension services

Farmers indicated that lack of extension services is a serious challenge they face in goat production. They also revealed that few extension officers visit them and at irregular intervals though the Ministry of Agriculture, Climate and Rural Resettlement have Extension officers from Agritex Department and Livestock Section as well as Veterinary Department. However, this is attributed to lack of adequate transport to reach out all the farmers in the study area. This implies that the goat farmers lack proper knowledge from training and recommendations to improve smallholder goat enterprises. Chipasha et al. (2017) confirmed that 68% of the smallholder goat farmers in Choma district of Zambia lack of access to extension services and on-farm training for skills development in goat production.

Parasites and diseases

The farmers reported that parasites and diseases in goat farming is a minor challenge. With regard to parasites, they indicated that external parasites were not a worrisome issue but internal parasites which include lungworm, tapeworm and stomach worm. They reported that they control internal parasites by dosing at each start of every season. Goat diseases were again regarded as a minor challenge but more attention is needed in kids since they are more vulnerable. These results were in contrast to Mutibvu et al. (2012) and Baruwa (2013) who reported disease challenges as a major constraint to the whole livestock sector. Masikati (2010) also indicated high rate of mortality from diseases as the major constraint for cattle, goats and sheep production in smallholder farming systems.

Marketing challenges

Table 6: Smallholder goat marketing challenges.

Challenge	Frequency of respondents on 1 scale	Frequency of respondents on 2 scale	Frequency of respondents on 3 scale	Frequency of respondents on 4 scale	Scale Mean ranking
Poor goat breed	0	10	35	15	3
Lack of goat market	0	5	40	15	3
Poor road network	5	10	45	0	3
Distance to better markets	0	18	35	7	3
Lack of market information	0	14	46	0	3
Low market prices	0	2	10	48	4

Poor goat breed

Results indicate that poor goat breed is a serious challenge among smallholder farmers. The Matebele breed reared by the farmers has no desirable traits in comparison to the Boer or Kalahari red breed which fetch satisfactory prices on both local and international markets. The farmers revealed that they cannot afford to buy and manage exotic goat breeds. This concurs with Qushim et al. (2016) who found out that the major

economic challenge faced by meat goat producers in United States is accessing high preforming meat goat breeds to produce quality meat goats which are competitive for lucrative markets. The same observation is in agreement with GoSA (2012) who reported that because of low endowment in factors of production, the majority of smallholders in South Africa produce low quality products which are neglected at lucrative markets.

Lack of goat market which markets

This was ranked a serious challenge faced by the goat farmers. Absence of formal and lucrative goat markets usually due to information asymmetry and poor goat quality results in the farmers conducting most of the sales in community through middlemen who exploit them by paying low prices. Results from Homann et al. (2016) evidenced that lack of access to reliable goat markets and poor infrastructure is one of the major constraints for smallholder farmers in Zimbabwe. In support to this, GoSA (2012) revealed that most of the farmers end up yielding low returns for their products by selling them at very low farm gate or local market prices because of no access to better markets, in the case of South Africa.

Poor road network

Goat farmers reported that poor road network is a serious challenge faced in Makakabule communal area. There is a gravel road from off-Bulawayo highway to their palace which is in bad state. This limit their access to better markets at low transport costs and also results in middlemen paying for goats at low prices to compensate transport depreciation and fuel costs. In support to this, GoSA (2012) evidenced that smallholder farmers face challenges of poor road network which limit their ability to transport their animals and other products to potentially lucrative markets and also to access market information as well as extension services.

Distance to better market

Farmers indicated that distance to better markets was a serious challenge since due to poor road networks. Butcheries and traders who were reported to pay better prices were located in Beitbridge town, Gwanda and other towns in Matebeleland South Province. This concurs with evidence from FAO (2015) which indicated that remote location hinders access to high value markets among smallholder farmers in the case of Pacific Island countries.

Lack of market information

The results indicated that famers lack adequate information concerning formal goat markets, ongoing prices at different markets, demand and supply situations as well as grading criteria. This challenge was ranked a serious constraint on average. These results agree with a study by Bamigboye et al. (2017) which observed that inadequate market information was worthy of note as a pressing challenge. The study indicated that there was a high demand for goats in Nigeria but inadequate market information constrained the farmers from meeting the market demand.

Low market prices

This was ranked the most severe challenge faced by the smallholder farmers in the study area. Since it was indicated that there are formal goat markets accessed by the farmers, most of the animals were sold to middlemen, butcheries and local dealers who profiteer by buying goats at very low farm gate prices and then resale at relatively higher prices. A study by Baruwa (2013) revealed that realisation of low prices was one of major constraints in smallholder goat production Osun State of Nigeria due to trade of live goats which was unorganised and also in the hands of a large number of middlemen, traders and butchers which does not favour goat farmers at all. Shalander et al. (2010) also confirmed the same challenge of realisation of lower market prices for goats which was mainly due to the involvement of the chain of middlemen and lack of market information.

Gross margin analysis

In this study, gross margin is considered in terms of profit made from goat enterprise. Total variable costs are therefore subtracted from the total revenue earned to determine profit. The variable costs identified in the study area include production and marketing costs incurred in the goat enterprise. The production costs captured by gross margin analysis include labour, which was used in opportunity costs, feeds, veterinary medicines as well as goat house repairs and maintenance. Marketing costs include transport, market and goat clearing expenses. Fixed costs were not considered since the farmers do not pay rent and also do not use machinery and equipment in goat production. With regard to revenue earned from goat farming, the research considered income from live kids and adult buck's sale, kids and adult sale, goat meat, manure as well as milk sales. The table below shows a summary of the gross margin analysis of smallholder goat production in the study area.

Table 7: Gross margin analysis for goat enterprise per annum.

Item	Mean amount (US$)
Variable costs	
costs labour	20
Feeds	-
Veterinary service	25
Goat house repairs and maintenance	5
Market	8
Transport	10
Goat clearing	4

Total Variable Costs	72
Revenue	
Income from female kid	15
Income from doe	30
Income from male kid	13
Income from buck	54
Income from goat milk	-
Gross income	112
Gross margin	40
Return/ $ invested	1.56

Results of the study indicates that, mean gross margin from goat enterprise is US$40 after deducting total variable costs of US $72 from gross income worth US$112. This shows that smallholder goat enterprise is a profitable business since the revenue earned is sufficient to cover all the variable costs incurred. In addition, every dollar invested in the goat enterprise returned US$0.56. Smallholder farmers revealed that they sell an average of five goats per annum (a female kid, male kid, two bucks and a doe). Each buck was sold at an average price of US$27; a male kid worth US$13, a doe was sold at US $30 and a female kid going for US$15. It was also found out that only 30% of female goat is allocated for sale since they are mainly reared for reproduction purposes. Moreover, none of respondents reported that they earn some revenue from goat milk.

With regard to the costs incurred in smallholder goat enterprises, veterinary service costs were reported the highest, with an average of US$25 per annum per household whilst goat clearing costs were the lowest with a mean of US$4 annually for each farmer. It was evident from this research study that farmers earn more profits from goat enterprises if they rear goats in large numbers as compared to the current mean flock size of 18 goats per household.

The profitability analysis results of this study agree with evidence from Baruwa (2013) who found out a rate of returns of ₦0.3 gained from every ₦1 invested in Nigeria. The same study recorded costs estimate of ₦244,182 and returns of ₦560,000, thus a net profit of ₦315.818 (where US$1 was equivalent to ₦160). In support to this Ahuya et al. (2004) also confirmed the profitability of smallholder goat farming, which found out that goat production in Kenya was profitable among smallholder farmers and also contributed a lot to the improvement of rural communities.

Research findings of Bamigboye et al. (2017) also indicated that goat enterprise in Ekiti State was a profitable business since the gross income earned was adequate to carter for all the variable costs incurred. The study indicated that the average Total Variable Costs incurred in goat marketing per annum was ₦489 700.00 while the mean Total Revenue was ₦720 000.00 and mean Gross Margin per seller was ₦230 300.00.

A study by Olufemi et al. (2017) was in support to this since the average benefit to cost ratio of 1.34 depicted that smallholder goat enterprise was profitable, meaning that with investment of ₦1, the business returned ₦1.34. Results from Tanrivermis and Bulbul (2007) also confirmed goat profitability among smallholders in Turkey each US$1 invested in goat production yielded a profit of US$0.13 from Angora goat and US$0.27 from the ordinary indigenous goat breed.

The results that farmers earn more profits from goat enterprises if they rear goats in large numbers confirm evidence of Qushim et al. (2016) which suggested that increasing the size of meat goat operation leads to lower cost meat goat production. In the same vein, a study by Nemeth et al. (2004) also observed that goat farming profitability was a result of low-level labour costs and also profit increased as the herd size increased as well.

However, profitability results of this study are in contrast with Qushim et al. (2016) who found negative profitability in the intensive United States of America goat meat production system. The study recorded negative net returns over both variable and total expenses which marked a loss.

CONCLUSION

The main objective of the research study was to estimate the profitability of smallholder goat enterprises in arid regions of Zimbabwe. Smallholder goat production in the study area was a profitable agricultural enterprise since revenue earned was sufficient to cover the costs incurred, with some income left to refinance agricultural activities and meet basic family needs. This was in support to the assertion that goat farming is pivotal to alleviate poverty in poverty-stricken rural communities.

Although most households were headed by males, more goats are owned by women as compared to men. Most of the farmers were married and reared Matebele goat breed mainly under the extensive production system. Goats were mainly sold to middlemen not because of better prices, but due to lack of market information and access to better markets. Other challenges include poor nutrition and low market prices mainly due to poor goat quality and lack of access to lucrative markets were the major challenges faced by smallholder farmers in goat production.

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