

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF AGRICULTURAL ECONOMICS, EDUCATION AND EXTENSION

**AN ANALYSIS OF THE RESPONSIVENESS OF SMALL-SCALE PIG FARMERS TO
PRICE AND NON-PRICE INCENTIVES IN ZIMBABWE. A CASE OF MAZOWE
DISTRICT.**



REG NO// : B200095A

NAME : MUNASHE DHOBHA

SUPERVISOR : DR V.T. MUNYATI

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN
AGRICULTURAL ECONOMICS AND MANAGEMENT**

MAY 2024

RELEASE FORM

AUTHOR: MUNASHE DHOBHA

REG NUMBER: B200095A

DEGREE TITLE: BACHELOR OF AGRICULTURAL SCIENCE HONOURS

DEGREE IN AGRICULTURAL ECONOMICS AND MANAGEMENT

PROJECT TITLE: AN ANALYSIS OF THE RESPONSIVENESS OF SMALL-
SCALE PIG FARMERS TO PRICE AND NON-PRICE INCENTIVES IN ZIMBABWE. A
CASE OF MAZOWE DISTRICT.

Permission is hereby granted to the Bindura University of Science Education Library to produce a single copy of this dissertation and lend such copy for private, scholarly, or scientific research only.

AUTHOR'S ADDRESS: 6475 BUDIRIRO 5B, HARARE

SIGNED.....

DATE.....

APPROVAL FORM

The undersigned certify that they have supervised and recommended to the Bindura University of Science Education for acceptance of the dissertation entitled ‘An Analysis of the Responsiveness of small-scale Pig Farmers to Price and Non-price Incentives: A Case Study of Mazowe District.

Submitted in partial fulfillment of the Bachelor of Agricultural Science honors degree in Agricultural Economics and Management.

Name of supervisor: DR V.T Munyati.

Signed

Date

DECLARATION

I, Munashe Dhobha, declare that this dissertation titled "An Analysis of the responsiveness of small-scale pig farmers to price and non-price incentives: A case of Mazowe District Zimbabwe" is my own original work and has not been submitted elsewhere for any degree or qualification. I acknowledge that I have received guidance and support from my supervisor, Dr V.T Munyati and other academic staff during the course of this research, but the intellectual content and presentation of this dissertation are entirely my own. I have followed the guidelines and regulations of the Bindura University of Science Education regarding plagiarism and academic integrity, and I have properly cited and referenced all sources of information used in this dissertation to the end.

DEDICATION

This dissertation is dedicated to my parents my late father (Mr. and Mrs. Dhobha) and the rest of the family. To Kudzaishe Dhobha, thank you for the love and inspiration during hard times, without you I could not have done this. To Hukwa, Hope and Ruzive family thank you for your support. For they say a journey of a thousand miles begins with a single step and I wish to follow yours. And to Tanaka and Janet, this is for you my dear sisters. Only God knows how it feels to have encouraging sisters like you. For the Almighty has positioned you in the family such that we all see the light. Glory is to the Almighty God. Many thanks goes to Highly Favored Amazing Grace International Ministry without forgetting Pastor Nkata, for the tireless support and encouragement without, I could not have done it. The God of our salvation positioned you at such a critical time. Truly I have sailed through, God bless and be blessed always.

ACKNOWLEDGEMENTS

I would love to thank the almighty God for his love and continuous guidance throughout the journey.

This research would not have been possible without the generous contributions and unwavering support of a truly exceptional team of collaborators. Firstly, I would love to thank my supervisor DR V.T MUNYATI for his guidance throughout the journey. To my Mother, my late Father and the entire Dhobha family your contribution to my journey of this research was so amazing.

Foremost, I would love to extend my heartfelt gratitude to the small-scale pig farmers across the Mazowe District who shared their invaluable experiences and insights –your voice is the beating heart that gives this work its purpose.

To the brilliant network of local research partners, extension agents and community leaders, tireless efforts to engage with farmers and collect the data that forms the back bone of this analysis are deeply appreciated. Your intimate understanding of the realities on this ground has been instrumental in navigating the complexities of this topic.

I am immensely thankful to the brilliant minds of our academic colleagues, whose pioneering research laid the foundation for this study. Your willingness to share knowledge, engage in thought-provoking discussions, and provide constructive feedback has been truly inspiring.

And to our Bandura University of Science Education, your academic investment on us has made this endeavor possible, I really offer my sincere gratitude. Finally to the vibrant, hardworking team behind the scenes my colleagues, Tanaka Chitsato, Janet Mkomboni and Mitchel Mandipaka, your encouragement and help throughout the journey is unforgettable.

ABSTRACT

Small-scale pig farming played a crucial role in supporting the livelihoods of rural households in developing regions. However, these producers often faced significant challenges in accessing higher-value formal markets, which limited their ability to maximize their returns. This study examined the key factors influencing the supply response of small-scale pig farmers in the Mazowe District, focusing on their responsiveness to both price and non-price incentives. The analysis was based on a comprehensive assessment of the pig buyers in the Mazowe District, which identified the market channels and their relative importance. To further understand the dynamics of pork supply, the study employed a Nerlovian supply response model, which captured the influence of various price and non-price factors on the production decisions of small-scale pig farmers. The findings revealed that local butcheries and consumers were the primary buyers of pork from small-scale producers, accounting for 45% and 35% of output, respectively. While traders and middlemen played important roles in providing market access, the fragmented and localized value chain structure limited the ability of small-scale farmers to negotiate better prices. The analysis of the adaptive strategies employed by small-scale pig farmers, as reflected in the fluctuations in the number of different pig categories, demonstrated the resilience and flexibility of these production systems in responding to evolving market demands and optimizing their limited resources. The Nerlovian supply response model indicated that pork producers exhibited a dynamic adjustment process, responding to both current and lagged market conditions. Factors such as credit availability, input costs, macroeconomic factors, and technological progress played significant roles in shaping pork supply response. The estimated short-run of 0.305 and long-run price elasticity's of 0.603 suggested that pork producers were responsive to changes in output prices, highlighting the importance of price incentives in influencing supply adjustments. The findings from this study offered a comprehensive understanding of the key drivers of pork supply, including both price and non-price factors. The insights from nerlovian supply response could inform policy decisions and strategic interventions aimed at supporting the growth and sustainability of the small-scale pig farming sector. The analysis of the responsiveness of small-scale pig farmers to price and non-price incentives provided valuable insights into the complex dynamics of the pork supply in the Mazowe District. The study underscored the need for targeted policy interventions

and market-based solutions to enhance the market access, bargaining power, and economic viability of these small-scale producers.

Keywords: small scale pig farmers, responsiveness of small scale pig farmers to price and non-price incentives, market channels, production trend.

TABLE OF CONTENTS

Contents

RELEASE FORM.....	i
APPROVAL FORM.....	ii
DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGEMENTS.....	v
ABSTRACT.....	vi
TABLE OF CONTENTS.....	viii
List of Tables	x
List of Figures	xi
CHAPTER 1	1
INTRODUCTION	1
1.1 BACKGROUND OF THE STUDY	1
1.2 PROBLEM STATEMENT	3
1.3 RESEARCH OBJECTIVES	3
1.3.1 MAIN OBJECTIVE.....	3
1.3.2 SPECIFIC OBJECTIVES	3
1.4 RESEARCH QUESTIONS.....	4
1.5 JUSTIFICATION OF THE STUDY	4
1.6 ORGANISATION OF THE STUDY	5
CHAPTER 2	6
LITERATURE REVIEW	6
2.2 DEFINITION OF KEY TERMS	6
2.2.2 Small-scale Farmer	7
2.2.3 Marketing Channels	7
2.2.4 Pig Production.....	8
2.3 EMPIRICAL REVIEW OF STUDIES ON MARKET CHOICE SELECTION BY THE SMALL- SCALE PIG FARMERS.....	11
2.4 EMPIRICAL REVIEW OF STUDIES ON SUPPLY RESPONSE	12
2.5 CONCEPTUAL FRAMEWORK	14
2.6 DETERMINANTS OF SMALL SCALE PIG FARMING SUCCESS AND RESPONSIVENESS TO INCENTIVES...15	

2.7 INSIGHTS FROM LITERATURE	17
CHAPTER 3	18
METHODOLOGY	18
3.1 INTRODUCTION	18
3.2 DESCRIPTION OF STUDY AREA	18
3.3 RESEARCH DESIGN	19
3.4 SAMPLING TECHNIQUES	19
3.5 DATA COLLECTION	20
3.5.1 PRIMARY DATA COLLECTION	20
3.5.2 KEY INFORMANTS	20
3.5.3 ANALYTICAL TOOLS	21
3.6 The Nerlovian Supply Response Function.....	22
3.7 DESCRIPTIVE STATISTICS	24
3.8 ETHICAL CONSIDERATIONS	24
CHAPTER 4	26
Results and Discussion	26
4.1 INTRODUCTION	26
4.2 DEMOGRAPHIC DATA	26
4.3 SOURCES OF MARKETING INFORMATION.....	28
4.4 TREND ANALYSIS OF SMALL-SCALE PIG SUPPLY.....	29
4.5 MARKETING CHANNELS	30
4.6 PORK SUPPLY RESPONSE	32
4.7 ELASTICITY OF OUTPUT SUPPLY	37
CHAPTER 5	38
CONCLUSION AND RECOMMENDATIONS	38
5.1 Introduction.....	38
5.2 CONCLUSIONS.....	38
5.3 RECOMMENDATIONS.....	39
5.4 LIMITATIONS OF THE STUDY.....	41
REFERENCES	43
APPENDICES	49
Appendix 1: Questionnaire	49

List of Tables

Table 1. Summary of Objectives and Analytical Tools	21
Table 2. Summary of Demographic Characteristics	26
Table 3: Descriptive summary of demographic information	26
Table 4. Trend Analysis	29
Table 5. Supply Response of Pork: Nerlovian Supply Response Function	32
Table 6. Elasticity of Output Supply	37

List of Figures

Figure 1. Monthly Pig Slaughters	9
Figure 2. Trends in Prices	10
Figure 3. Conceptual Framework	15
Figure 4. Mazowe District Map	19
Figure 5. Sources of Marketing Information	28
Figure 6. Market Sources	31

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The Zimbabwean government has introduced several price-based incentives to support small-scale pig producers. In 2021, the government launched the Livestock Development Fund, which provides subsidized loans and grants to smallholder livestock farmers, including pig rearers (Government of Zimbabwe, 2021). This improved access to affordable credit has enabled small-scale pig farmers to invest in higher-quality breeds, feed, and infrastructure to boost productivity. Additionally, major pork processors like Irvine's Zimbabwe have set up out grower schemes that offer small-scale pig farmers reliable market access and pre-agreed pricing models (Irvine's Zimbabwe, 2022). These price assurances have incentivized smallholders to intensify pig production to meet the demands of these off-take arrangements.

Beyond price-based incentives, the Zimbabwean government and development partners have also focused on enhancing non-price supports for small-scale pig farmers. The Zimbabwe Pig Industry Board has expanded its network of community-based pig extension officers who provide hands-on training to smallholders on best practices in pig housing, feeding, health management, and marketing (Zimbabwe Pig Industry Board, 2023). This has led to measurable productivity gains among participating farmers. Furthermore, several pig farmer cooperatives, such as the Mashonaland Central Pig Farmers' Association, have been established across the country to help small-scale producers aggregate their pigs, access inputs in bulk, and negotiate better prices with buyers (Mashonaland Central Pig Farmers' Association, 2022). The government has also invested in rehabilitating rural abattoirs and cold chain facilities in key pig farming regions, reducing post-harvest losses and connecting smallholders to more lucrative urban markets (Food and Agriculture Organization, 2020).

In Zimbabwe, the agricultural sector has the potential to be a key driver of economic growth (World Bank Group, 2022b). According to FAO (2022), there is a positive correlation between

economic growth and agricultural development. According to Bafana (2011), agricultural activities provide employment and income for about 60-70 percent of the population, supply 60 percent of the raw materials required by the industrial sectors, and contribute 40 percent of export earnings. Furthermore, it is said to contribute approximately 17 percent to Zimbabwe's Gross Domestic Product. The agricultural sector in the country is divided into two; the smallholder sector and the commercial sector. The smallholder farmers mainly produce for household consumption and sell the surplus to cover their daily expenses such as school fees, hospital bills, balanced diet supplements, and vaccination for livestock. Smallholder farmers in sub-Saharan Africa suffer from persistent poverty and food insecurity (Handsouch & Wollni, 2016) since they produce for home consumption and little is supplied to the market. The price that the smallholder farmers receive for their agricultural products can have significant implications for food security, poverty alleviation, and the overall agricultural development of the country if the smallholder farmers produce for the market.

The smallholder farmers mainly produce maize and keep some livestock as a source of proteins or for selling during difficult times. The livestock sub-sector is an important component of household income for the smallholder farmers. In mostly rural areas of Zimbabwe, the farmers keep indigenous chickens, goats, cattle, and piggery production which is greatly been at a subsistence level. According to the ZIMVAC report of 2023, 30% of smallholder farmers are now into pig production to supplement their incomes. The farmers ventured into pig production after losing their cattle to Januury disease which affected most parts of the country. Through agricultural extension service officers there has not been a marketing drive. This has resulted in farmers not realizing anticipated profit margins from piggery production, particularly the smallholder farmers who have suffered from unorganized informal markets, which have been characterized by disjointed and weak market structures. Where farmers have attempted to engage in organized pig sales, available markets seem to be underdeveloped, with poor infrastructure and limited market information hence the need for conducting some pig marketing intelligence. Smallholder farmers have also not fully accessed commercial pig markets due to several constraints which include limited marketing information, unorganized markets, lack of marketing infrastructure, small production, and long distances to the commercial markets. A basic concern for smallholder pig farmers related to the inefficiency in the marketing of their pigs (Musara, Musemwa, Mutenje, Mushunje, & Pfukwa, 2018). According to Handsouch and Wollni (2016), access to efficient

agricultural markets is considered an essential tool for lifting smallholder pig farmers out of poverty and food insecurity.

1.2 PROBLEM STATEMENT

In Zimbabwe, several constraints have been identified as hindering piggery productivity. These include the pricing policy, high inflation rate, exchange rate policies, and technology. Thus, all things being equal, it seems plausible that the failure to provide price incentives constrains the growth of the piggery sector. In the hyperinflationary Zimbabwe, the use of the local currency has kept farm producer prices very low relative to inflation. These scenarios have discouraged most smallholder farmers from producing for the market and have resorted to producing for home consumption. Any meaningful attempt to encourage the smallholder pig farmers to produce for the market will require detailed knowledge of how they respond to different price and non-price incentives inter alia. The provision of these supply response estimates to create a basis for further policy reforms in the pig sector is the main objective of this study.

1.3 RESEARCH OBJECTIVES

The following main objective is supported by the specific objectives listed below formulated for the study.

1.3.1 MAIN OBJECTIVE

The major objective of this study is to determine the responsiveness of the pig producers to price and non-price incentives and how the level of responsiveness has impacted pig production.

1.3.2 SPECIFIC OBJECTIVES

1. To characterize the dynamic trends in piggery production by the small-scale pig farmers in Mazowe District;

2. To assess the different marketing channels used by the small-scale piggery farmers in Mazowe District;
3. To assess the responsiveness of smallholder piggery farmers to price and non-price market incentives in Mazowe;

1.4 RESEARCH QUESTIONS

1. What are the dynamic trends in pig production by the small-scale piggery farmers in Mazowe District?
2. What are the different marketing channels used by small-scale piggery farmers in Mazowe District?
3. To what extent do small-scale piggery farmers respond to price and non-price market incentives in Mazowe District?

1.5 JUSTIFICATION OF THE STUDY

The research is going to benefit the following:

- i. The researcher: The research is being done as a partial fulfillment of the requirements of the BSc Honours degree in Agricultural Economics and Management and also as a practical experience for the research process.
- ii. The small-scale pig Farmers: The research is undertaken as a beneficiary to small-scale piggery farmers by increasing their productivity by analyzing all economic factors that can directly or indirectly affect the willingness of small-scale pig farmers to produce. Furthermore, small-scale pig farmers are also going to benefit from the discoveries of new markets, this is because the study also includes the issues of markets suitable for small-scale pig farmers. The small-scale pig producers will also use the findings in decision-making, on whether to expand production or not since the research will also forecast future prices offered on the market.
- iii. The Government: The government will use the findings of the research to craft policies that will incentivize small-scale pig producers. The government extension workers can also use the findings for training the small-scale producers so that they can commercialize their production and not just produce for home consumption.

1.6 ORGANISATION OF THE STUDY

The report begins on chapter one by highlighting the importance of small-scale pig farming in supporting rural livelihoods and the challenges these producers face in accessing higher-value markets. The objectives of the study and its significance are then clearly stated. Chapter shall be of literature review. The literature review provides an overview of small-scale pig farming in developing regions, the factors influencing supply response, and the theoretical frameworks used for analysis. The methodology section details the assessment of pig buyers and sales channels in the Mazowe District, as well as the specification of the Nerlovian supply response model and the data collection process. The results section presents the characterization of primary sales channels, the adaptive strategies of small-scale pig farmers, and the findings from the supply response model, including the factors influencing pork supply and the estimated short-run and long-run price elasticity's. The discussion section explores the implications of the findings, compares them to existing literature, and acknowledges the limitations of the study. The final sections focus on the policy implications and recommendations, highlighting targeted interventions to support small-scale pig farming, strategies for enhancing market access and bargaining power, and the promotion of technological innovations and productivity improvements. The report concludes with a summary of the key findings, the contribution to the understanding of small-scale pig farming, and future research directions.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The main objective of the study is to analyse the responsiveness of small-scale pig farmers to different market stimuli. The literature review section will cover the definition of key terms such as supply response and smallholder farmer; the theoretical framework, empirical review on studies on market choice selection and supply responses; conceptual framework and the last section of the chapter covers insights.

2.2 DEFINITION OF KEY TERMS

2.2.1 Supply Response

The concept of supply response refers to the extent to which the production level and marketable surplus change in response to various stimuli, particularly price changes and other non-price factors (Nkang, 2006). Supply response analysis seeks to understand the behavioural changes of producers regarding their production, consumption, and marketing decisions for a particular product or set of products, driven by alterations in price and non-price incentives (Sadoulet & de Janvry, 1995). This is crucial for understanding the dynamics of agricultural production and designing effective policies to enhance productivity and market integration (Binswanger, 1989).

Factors influencing supply response include prices, access to inputs, technology adoption, infrastructure, transaction costs, and institutional arrangements (Jayne, 1994; Sadoulet & de Janvry, 1995). Understanding the magnitude and determinants of supply response is important for policymakers to anticipate the impacts of policy interventions, such as price support, input subsidies, or market reforms, on agricultural production and food security (Sadoulet & de Janvry, 1995; Dillon & Barrett, 2017). Supply response analysis can also provide insights into the resilience of smallholder farmers to market fluctuations and their ability to participate in and benefit from agricultural commercialization (Bellemare & Barrett, 2006; Rao & Qaim, 2011).

2.2.2 Small-scale Farmer

Small-scale farmers are typically rural producers who rely primarily on family labor and for whom the farm provides the principal source of income (Munongo & Shallone, 2010). These farmers are often characterized by family-focused objectives, such as prioritizing the stability of the farm household system, utilizing mainly family labor for production, and using most of their output for domestic consumption, selling only the surplus to nearby markets (Masvongo, 2013). Smallholder farmers are disproportionately represented among the rural poor, with the highest incidence of households living below the poverty line associated with this group (Munongo & Shallone, 2010).

Smallholder farmers are estimated to manage around 80% of the farmland in sub-Saharan Africa and Asia, typically operating on land units ranging from less than one hectare to 10 hectares per household (Gollin, 2014; FAO, 2015). These smallholders are responsible for up to 80% of the food supply in these regions (FAO, 2015). Smallholder farming systems are often defined by limited access to credit, inputs, and output markets, as well as the use of simple, outdated technologies, resulting in low returns and high seasonal labor fluctuations (Jacobs, 2009; Panda, 2012).

Smallholder farmers are a heterogeneous group, differing in individual characteristics, farm size, resource allocation between crops and livestock, and engagement in off-farm activities (Cousins, 2007). While smallholder livestock production, particularly of small ruminants like goats, is often associated with women, studies have shown that women in male-headed households may have limited ownership and control over the income from livestock sales (Boogaard et al., 2015). This highlights the need for a nuanced understanding of gender dynamics within smallholder farming systems to develop effective strategies for empowering women.

2.2.3 Marketing Channels

According to a recent study by Van Bruggen et al. (2023), marketing channels refer to the pathways through which goods and services are made available to consumers. They argue that all products go through distribution channels, and the choice of channel is crucial for a marketer's strategy.

Krafft *et al.* (2021) further emphasize that the route a product takes from production to the consumer is important, as it can significantly impact the profitability of a particular commodity.

Moreover, Daniel *et al.* (2022) define the term "market channel" as the entire ecosystem required for gathering products, both tangible goods and intangible services, from the point of production to the point of consumption. This includes the process of bringing the product to the market, which has evolved from the simpler days of central trading markets to more complex distribution networks. Armstrong and Kotler (2020) expand on this definition, noting that market channels also encompass the people and organizational activities necessary to transfer the ownership of goods from the point of production to the point of consumption.

Grewal *et al.* (2021) further contend that marketing channels refer to the comprehensive ecosystem required for getting products, both tangible and intangible, from the point of production to the point of consumption. This ecosystem includes people, organizations, and all the required activities.

Marketing channels are a crucial management task and are essential in developing an effective and well-planned marketing strategy. The literature identifies four main types of marketing channels: Producer-consumer, Producer-retailer-consumer, Producer-wholesaler-retailer-customer, and Producer-agent/broker-wholesaler-retailer-customer (Coughlan *et al.*, 2022).

Generally, the market channel is viewed as the path from the vendor to the consumer of a company's goods and services, flowing in one direction. This path also includes the flow of payments from consumers to the vendor, which flows in the opposite direction. Marketing channels can be simple and direct, with several fairly independent but mutually dependent intermediaries, such as wholesalers and agents (Kotler and Armstrong, 2022).

2.2.4 Pig Production

According to a recent study by Mutambara (2023), the major livestock products in Zimbabwe include beef cattle, dairy, poultry, pigs, and goats. The author further highlighted that small-scale farmers own the majority of the cattle (90%), goats (98%), and pigs (80%), which serve as an important source of protein and income for these farmers (Mutambara, 2023). Additionally,

Mapiye *et al.* (2021) note that increasing livestock production is crucial in reducing poverty and improving food security among small-scale farmers in Zimbabwe.

Mutambara (2023) emphasizes that small-scale farmers play a significant role in the livestock sector, owning a substantial portion of the country's cattle, goats, and pigs. This aligns with the findings of Moyo and Swanepoel (2018), who suggest that small-scale farmers are the backbone of Zimbabwe's agricultural economy, contributing to both food production and income generation.

Furthermore, Mapfumo *et al.* (2022) underscore the importance of strengthening the livestock value chain to enhance the livelihoods of small-scale farmers in Zimbabwe. The authors argue that targeted interventions, such as improving access to veterinary services, feed, and genetic resources, can significantly increase livestock productivity and overall farm profitability.

In conclusion, the livestock sector in Zimbabwe, particularly the participation of small-scale farmers, is crucial for reducing poverty and ensuring food security. Continuous efforts to support and empower these farmers, as highlighted by recent research, can contribute to the sustainable development of the country's agricultural economy.

Fig 1. Illustrates monthly pig slaughtering in Zimbabwe from the year 2017 to 2021.

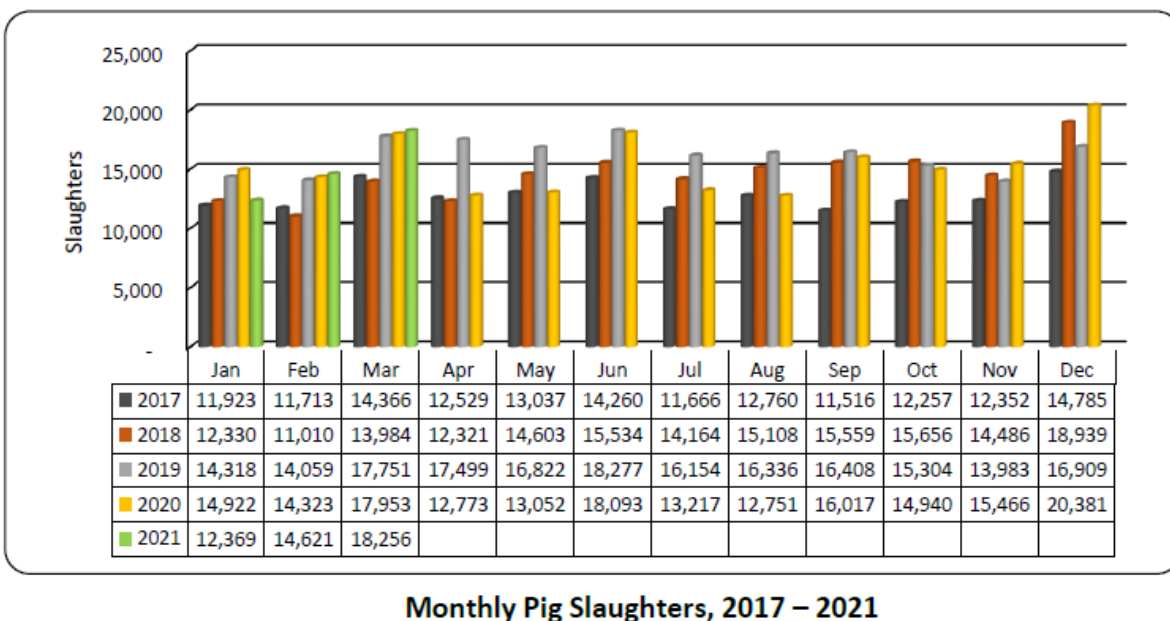
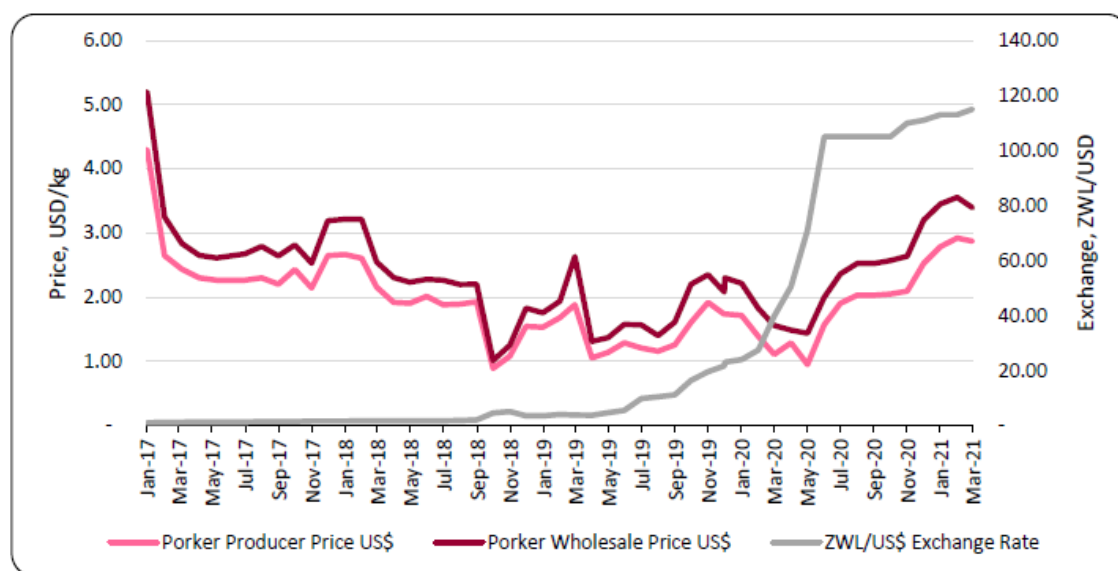


Figure 1. Monthly Pig Slaughters

As illustrated by fig 1 above, Zimbabwe has been consuming more than 10,000 pigs each month. It can be noted (figure 1) that monthly pork consumption will increase during the festive season. According to the Food and Agriculture Organization (FAO), Zimbabwe's pork production was around 21,000 tonnes in 2019, the latest year for which data was available (FAO, 2022). The increase in the monthly consumption of pigs can act as an incentive for pig production since there is a market for their produce. Furthermore, it shows that in the year 2020, the consumption was very high up to 20,000 pigs in the month of December, according to this information it shows the highest slaughter as compared to other given years.



Pig Producer and Wholesale Prices in US\$/kg, 2017-2021

Figure 2. Trends in Prices

Fig 2 shows the trends of two prices in different marketplaces and the fluctuation of the exchange rate in the market. Fig 2 includes both the Zimbabwean dollar and the United States of America dollar. In that market, the small-scale pig farmers are trying to accommodate both buyers in the community with no regard for currency. According to fig 2, from January to March there was a sharp decrease in both porker producer price and wholesale price from 5 dollars per kg to 2 dollars per kg whoever wholesale price with high fluctuation whilst the exchange rate was constantly low. From the month of March 2017 to September 2017 both the porker producer price and porker wholesale price were constant whilst the exchange rate still maintained its constant state. From

November 2017 –March 2018, there was high price fluctuation for both however porker wholesale price with a higher price than the porker producer price, an estimated price of 3.50 dollars per kg.

From March 20 2018 to September 2018, there was a gradual decrease in both market prices accompanied by a sharp decrease in the month of July 2018 and September 2018. During that same period, the exchange rate began to increase but with a slight increase. From November 2018 to March 202, both prices began to fluctuate accompanied by a sharp increase in the exchange rate.

2.3 EMPIRICAL REVIEW OF STUDIES ON MARKET CHOICE SELECTION BY THE SMALL-SCALE PIG FARMERS

Numerous studies have been conducted to analyze the market channel choice selection among small-scale farmers, such as Anteneh *et al.*, 2011; (Rajeev & Sreekumar, 2012, Soe, Moritaka and Fukuda, 2015, Anteneh *et al.*, 2011, Rajeev and Sreekumar, 2012) used descriptive statistics to map out the channel outlets by the smallholder farmers. However, the studies might have used the same approach but the areas and enterprises that conducted the research were different. The researchers found out that, most smallholder farmers prefer to sell at the farm gate, district market, and other informal markets. Access to market price information transaction costs and contract marketing influenced the choice of market channel choice by the smallholder farmers.

(Anteneh, Muradian, & Ruben, 2011), investigated the choices of marketing channels among coffee farmers in Southern Ethiopia. The researchers identified four main marketing channels for the coffee farmers in Ethiopia, which were: coffee marketing cooperatives, private traders, neighboring cooperatives, and informal traders.(Anteneh *et al.*, 2011), noted that forty-two percent of the cooperative members sold the coffee to private buyers in Southern Ethiopia whilst forty-six percent of non-members sold their coffee to cooperative buyers in the region. In determining the market choice outlets; educational level, the proportion of land allocated to coffee, the proportion of off-farm income to total income, cooperative performance, satisfaction with cooperative performance, and second payment affected were the factors that influenced their market choice selection in Southern Ethiopia. (Rajeev & Sreekumar, 2012), examined choices of marketing channels by the vegetable farmers in India. (Rajeev & Sreekumar, 2012), identified three vegetable marketing channels in India which were, formal vegetable markets, informal vegetables, and non-market marketing channels.

(Soe, Moritaka, & Fukuda, 2015), also analyzed the factors influencing marketing channel choice by paddy rice farmers in Myanmar. The study by (Soe *et al.*, 2015) noted that there were generally three marketing channels available to rice farmers in Myanmar and these marketing channels were selling to commodity brokers who come and collect the rice at the farm gate, selling to rice collectors or rice traders at the farm gate and selling to rice mills in nearby towns.

In analyzing the market choice channel on a small scale, Mossie *et al.*, (2020), analyzed factors that affect outlet choice of onion producers in Ethiopia using the multivariate approach. The main objective of Mossie *et al.*, (2020) was the analysis of factors affecting market outlet choice decisions. According to their study, the perishability nature of onion necessitated an effective market channel. Mossie *et al.*, (2020) noted that wholesales were the major market outlet for onion farmers in Ethiopia. Most farmers preferred that market outlet because of the speed of payment.

2.4 EMPIRICAL REVIEW OF STUDIES ON SUPPLY RESPONSE

The study of agricultural supply response has a long history, with most research in this area relying on dynamic econometric supply functions estimated directly from time series data (Nerlove, 1958; Ahihasi et al., 2017; Shoko et al., 2016). The standard approach has typically been some variant of the Nerlovian partial adjustment model, which accommodates delays in response to price movements (Nerlove, 1958; Shoko et al., 2016). While empirical results from such models have generally been regarded as satisfactory, the theoretical basis, particularly the notion of fixed targets, has been criticized as not being strong (Shoko et al., 2016).

More recent work has recast the supply response model in error correction form, with the partial adjustment model nested within it and a stronger theoretical foundation (Ahihasi et al., 2017). However, the focus on the dynamics of supply and the time series properties of the variables concerned imposes a need for a lengthy time series of homogeneous observations, which can be challenging to obtain (Ahihasi et al., 2017).

Ahihasi et al. (2017) modeled the supply response of small-scale pig production using a structural time series approach. They found that swine price was a significant determinant of swine supply response, with the expected sign. In a similar vein, Shoko et al. (2016) estimated the supply

response of maize in South Africa using the Nerlovian partial adjustment model. The study aimed to assess the responsiveness of maize supply to prices and non-price incentives, such as rainfall and technology, using historical time series data from 1980 to 2012. The key finding was that non-price incentives had a greater effect on maize supply than price incentives in South Africa.

These studies highlight the evolving methodological approaches and the importance of considering both price and non-price factors in understanding agricultural supply response. Continued research in this area is crucial for informing policymaking and supporting the development of the agricultural sector.

2.5 CONCEPTUAL FRAMEWORK

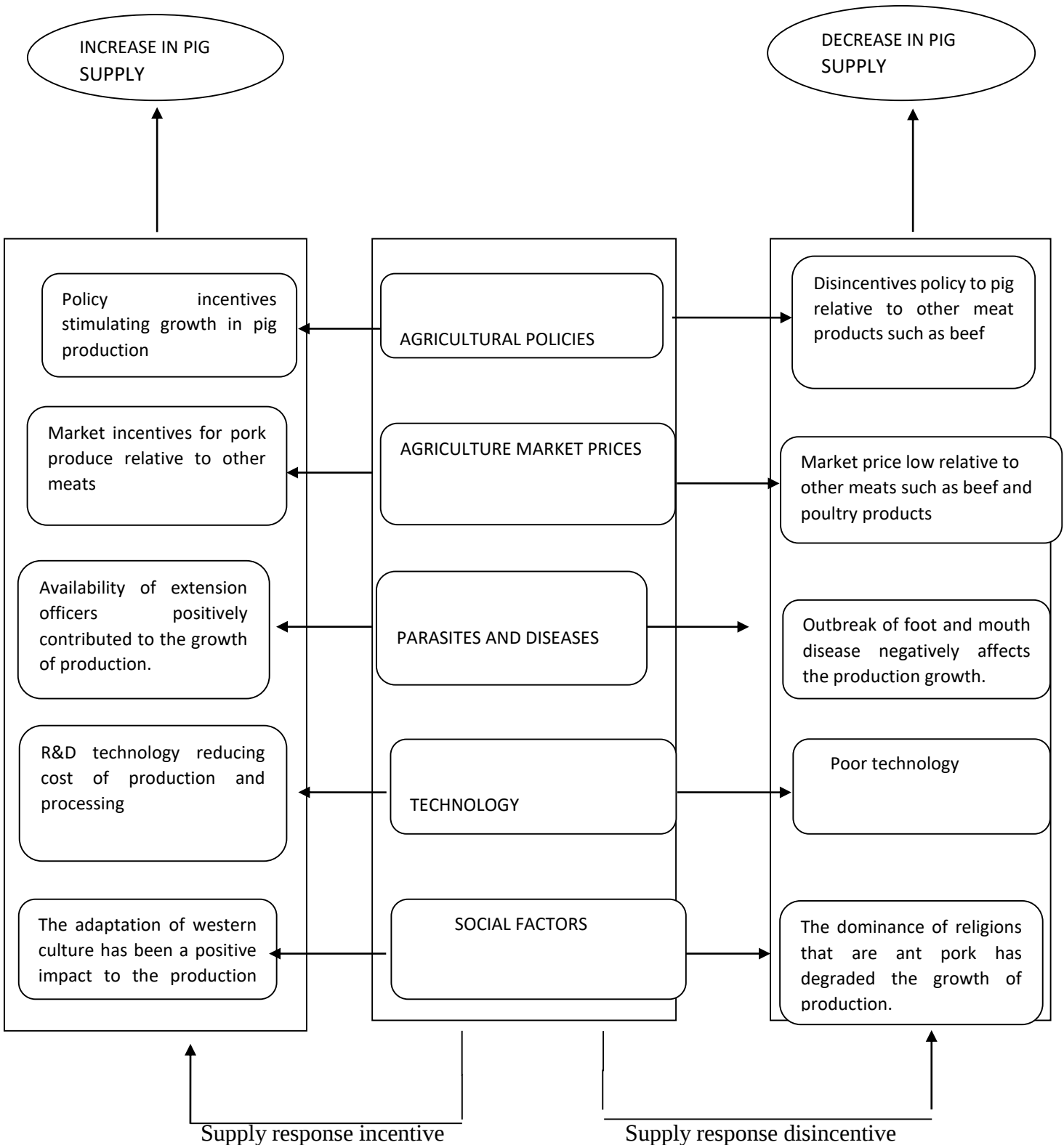


Figure 3. Conceptual Framework

Source: Author

The supply of pigs can be influenced by a variety of factors. Policy incentives, such as government subsidies and grants, as well as favourable regulations, can stimulate growth in pig production by reducing operational costs and making it more attractive for farmers to invest in this area. Additionally, market incentives, including higher demand for pork relative to other meats and export opportunities, can also drive up pig production.

The availability of extension officers who provide farmers with training, education, and access to resources like high-quality feed, breeding stock, and veterinary supplies can also contribute to an increase in pig supply. Advancements in farming techniques and processing technologies that reduce the cost of production and processing can further boost the supply of pigs.

On the other hand, factors that can lead to a decrease in pig supply include disincentive policies, such as higher taxes on pig farming or subsidies for competing meat products. If the market price for pork is low compared to other meats, due to reduced consumer demand or competition from a surplus of other meat products, this can discourage pig production. Outbreaks of diseases like foot and mouth disease can also significantly impact pig supply through mortality and trade restrictions. Furthermore, poor access to technology and inefficient farming practices can result in lower productivity and higher costs, leading to a decrease in pig supply.

The central categories influencing pig supply are agricultural policies, agriculture market prices, parasites and diseases, and technology. Understanding the interplay of these factors is crucial for devising strategies to stabilize and enhance the supply of pigs.

2.6 DETERMINANTS OF SMALL-SCALE PIG FARMING SUCCESS AND RESPONSIVENESS TO INCENTIVES.

The success of small-scale pig farming in Zimbabwe is influenced by a range of price and non-price factors. On the price side, pig prices, input costs, and access to credit are critical determinants. Small-scale farmers have demonstrated responsiveness to the potential profitability of pigs, with 30% venturing into pig production to supplement their incomes (Moyo et al., 2018). However, the lack of organized markets and poor price realization have constrained their ability to fully

capitalize on the price incentives (Mangombe & Chikuvire, 2019). Non-price incentives, such as access to extension services, infrastructure development, organized market linkages, reliable input supply, and enhanced knowledge and skills, also play a significant role (Chikazunga & Paradza, 2013; Mutambara et al., 2021). Small-scale farmers would likely be responsive to these non-price interventions, as the report highlights the need for improved marketing infrastructure, information, and extension support (Sibanda et al., 2020). Addressing the constraints around unorganized markets, limited market information, and poor infrastructure could potentially unlock the productivity and income-generating potential of small-scale pig farming in Zimbabwe (Makoni et al., 2014).

The responsiveness of small-scale pig farmers to both price and non-price incentives is further reinforced by empirical evidence. A study by Moyo et al. (2018) found that small-scale pig farmers in Zimbabwe were quick to adopt new production technologies and management practices when they were provided with the necessary training and extension support. This suggests that non-price factors, such as knowledge and skills, can have a significant impact on the adoption of productivity-enhancing practices. Additionally, a survey conducted by Mutambara et al. (2021) revealed that small-scale farmers were more likely to participate in formal pig value chains when they had reliable access to input markets and were integrated into organized marketing arrangements.

Moving forward, a comprehensive approach targeting both price and non-price determinants is likely to be the most effective in promoting the success and resilience of small-scale pig farming in Zimbabwe. Policymakers and development practitioners should consider designing interventions that address the multifaceted challenges faced by this important sector, ultimately empowering small-scale pig farmers to improve their livelihoods and contribute to the broader agricultural development of the country.

2.7 INSIGHTS FROM LITERATURE

In the analysis of producers' marketing choices, numerous studies have been conducted to examine the market channel selection among small-scale farmers. For instance, Anteneh et al. (2011), Rajeev and Sreekumar (2012), and Soe, Moritaka, and Fukuda (2015) have used descriptive statistics to map out the different channel outlets utilized by smallholder farmers. However, only a few authors have opted for a multivariate approach in their analysis (Anteneh et al., 2011; Rajeev & Sreekumar, 2012).

In this study, the researcher intends to employ descriptive statistics due to its simplicity and flexibility in analysing the marketing channel choices of producers (Anteneh et al., 2011; Rajeev & Sreekumar, 2012).

Furthermore, in the analysis of supply response functions, the literature reviewed above indicates that most scholars have primarily utilized structural time series data, such as Ahihasi et al. (2017) in their modeling of swine supply response. However, in this study, the researcher plans to employ the Nerlovian model due to its flexibility and simplicity (Nerlove, 1958; Shoko et al., 2016). The Nerlovian model provides a straightforward framework for analyzing how producers respond to changes in prices and other factors, and it also considers the long-term adjustments in producer behaviour (Nerlove, 1958; Shoko et al., 2016).

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

The chapter will describe the methods used to conduct the research. It will provide the techniques used to analyze the data, the data required, and the source of the data. It will also give the limitations of the methods being used to analyze the data.

3.2 DESCRIPTION OF STUDY AREA

The study was conducted in Mazowe District, which is located in Mashonaland Central Province, approximately 80 kilometers from the capital city of Harare, Zimbabwe (Zimstat, 2022). Mazowe District is known for its favourable climatic conditions that are suitable for agricultural activities, such as farming and livestock production (Musiyiwa et al., 2013).

The district falls within Natural Region II, which is characterized by an average annual rainfall of 842.9 mm, typically received between November and March (Musiyiwa et al., 2013). The average maximum temperatures in the summer season range from 20 to 35 degrees Celsius, and the average mean annual temperature for the district is 18.2 degrees Celsius (Musiyiwa et al., 2013). The area is predominantly covered by greyish-brown sands and sandy loam soils (Musiyiwa et al., 2013).

Mazowe District is divided into 35 wards and has a total population of 232,885 people living in an area of 4,555 square kilometers (Zimstat, 2022). The major economic activities in the district include small-scale mining, commercial farming, and livestock production (Moyo et al., 2021).

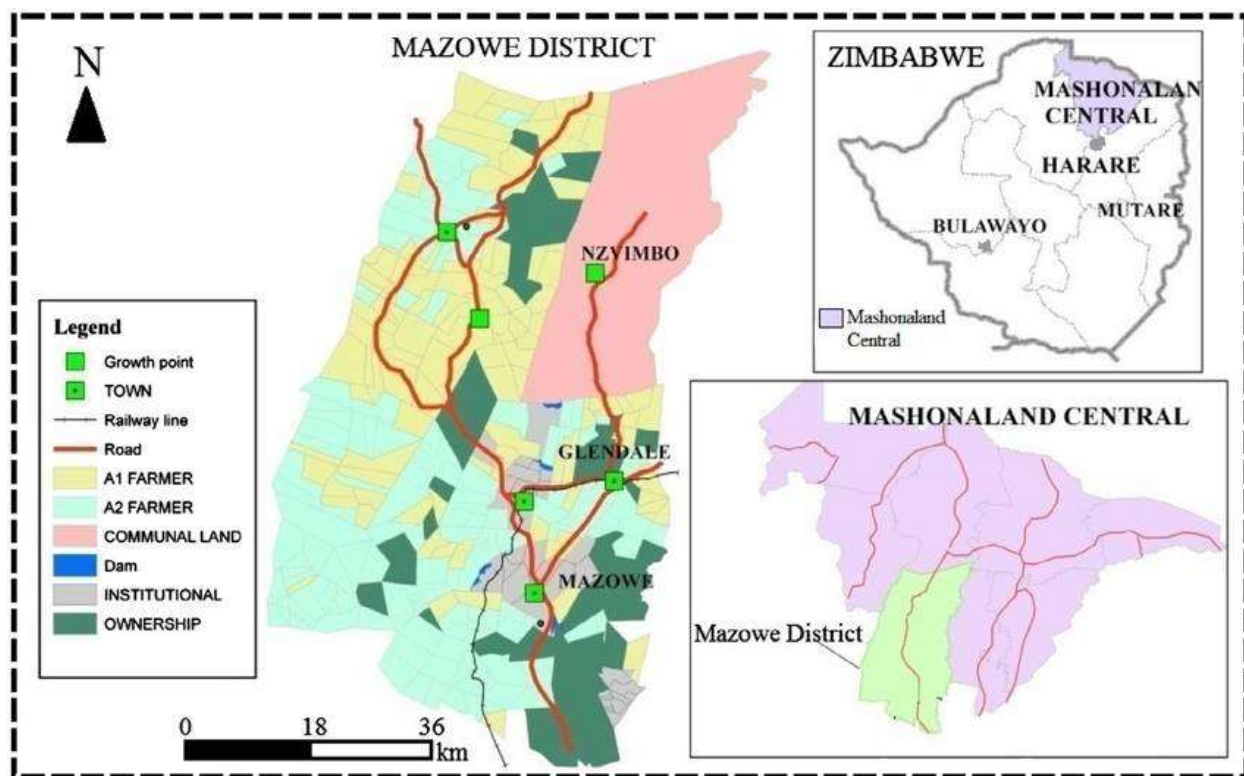


Figure 4. Mazowe District Map

Source: Robert Maponga

3.3 RESEARCH DESIGN

The researcher used both quantitative and qualitative data. For quantitative data collection, the researcher used the household questionnaire. The questionnaire was administered by three trained enumerators to the small-scale pig farmers. Qualitative data was collected through focus group discussions and key informant interviews.

3.4 SAMPLING TECHNIQUES

Multi-stage sampling technique was used to collect the data. The study area was purposively sampled because of its proximity to the researcher. The researcher stays in the district and this will make data collection cheap and easy to coordinate. In the district, the population was divided into two strata, the first stratum with those that keep pigs and the other one with those that do not keep pigs. The stratum with pig producers was used and the respondents were randomly selected from that stratum. A formula that Slovin (1960) developed was used to calculate the sample size requirement for the study.

Equation 1: Slovin's Formula for sample size determination

$$n = \frac{N}{1 + N(0.095)^2}$$

Where:

n = sample size

N = population size

e = confidence level (95%)

3.5 DATA COLLECTION

3.5.1 PRIMARY DATA COLLECTION

A questionnaire was used for primary data collection. Before the main survey, the questionnaire was pre-tested so that the structure and wording of some questions could be improved. The questionnaire was administered by three trained enumerators to the small-scale pig producers in the selected three Wards in the Mazowe District of Zimbabwe. The questionnaire was designed to capture information related to the research objectives.

3.5.2 KEY INFORMANTS

Based on the additional information provided about the key informants interviewed, which included agricultural extension officers, representatives from the pig industry, and veterinary professionals, the analysis of the small-scale pig supply trends has been further enriched. These diverse perspectives have offered valuable insights into the underlying factors and decision-making processes that have shaped the observed fluctuations in the supply of Growers, Porkers, Baconers, Sows, and Boars.

The agricultural extension officers, who worked closely with small-scale farmers, were able to provide context on the specific challenges, resource constraints, and knowledge gaps that influenced the farmers' production strategies. Their understanding of the local conditions and their

direct engagement with the farming community helped explain the rationale behind the cyclical patterns and adaptations observed in the data.

The input from the pig industry representatives, such as processors, marketers, and industry associations, shed light on the evolving consumer preferences, market opportunities, and supply chain dynamics that small-scale farmers had to navigate. These stakeholders offered insights into how the farmers had tried to diversify their product mix and capitalize on emerging market trends.

The veterinary professionals, on the other hand, provided valuable perspectives on the herd management practices, breeding strategies, and animal health considerations that factored into the small-scale farmers' decision-making. Their expertise helped interpret the fluctuations in the Sows and Boars populations, as well as the potential impact of resource constraints on the overall herd productivity and composition.

By incorporating the knowledge and perspectives of these key informants, the analysis has gained a more comprehensive understanding of the complex interplay between the small-scale farmers' production strategies, market dynamics, and resource limitations that have shaped the observed trends in the pig supply data.

3.5.3 ANALYTICAL TOOLS

Table 1. Summary of Objectives and Analytical Tools

Objectives	Data Required	Method of Analysis
To characterize the dynamic trends in piggery supplied by smallholder farmers in Zimbabwe	The amount of pig supplied to the market.	Descriptive statistics

To assess the different marketing channels used by the smallholder piggery farmers in Zimbabwe	Data on the local buyers', price offered, and number of pigs supplied to the market	Descriptive Statistics
To assess the responsiveness of smallholder piggery farmers to price market incentives in Zimbabwe	Prices of pigs and non-price variables	Nerlove Supply Response function.

3.6 The Nerlovian Supply Response Function

The Nerlovian model is widely recognized as one of the most influential and widely used econometric approaches for estimating market supply response (Nerlove, 1958; Adjognon et al., 2017). This dynamic model posits that the quantity supplied to the market is a function of the expected price and various exogenous factors (Nerlove, 1958; Adjognon et al., 2017; Pal & Prasad, 2021).

The reduced-form representation of the Nerlovian model is an autoregressive model, as it includes lagged values of the dependent variable (i.e., marketed output) among its explanatory variables (Nerlove, 1958; Alston & Chalfant, 1993; Adjognon et al., 2017). This autoregressive structure allows the model to capture the dynamic adjustments in supply over time, reflecting the notion that producers do not immediately adjust their output to changes in expected prices or other determinants (Nerlove, 1958; Adjognon et al., 2017; Pal & Prasad, 2021).

The widespread use of the Nerlovian approach can be attributed to its ability to provide valuable insights into the temporal dynamics of supply response, which is crucial for understanding and predicting market behavior (Askari & Cummings, 1977; Alston & Chalfant, 1993; Adjognon et

al., 2017). The inclusion of lagged dependent variables also helps to address potential issues of serial correlation and dynamic misspecification in supply analysis (Alston & Chalfant, 1993; Adjognon et al., 2017).

$$Y_t - Y_{t-1} = \beta(Y_t^* - Y_{t-1})$$

$$\text{Thus } Y_t = \beta Y_t^* + (1-\beta) Y_{t-1}$$

Since farmers base their marketed output plans on expected prices, the change in price expectation is specified as some proportion of the error made in formulating expectations in the last year.

$$P_t^* - P_{t-1}^* = \delta (P_t - P_{t-1}^*)$$

$$\text{Therefore } P_t^* = \delta P_t + (1-\delta)P_{t-1}^*$$

However, the desired marketed output can be specified as a function of expected price and other exogenous variables that influence market supply, hence:

$$Y_t^* = a_0 + a_1 P_t^* + a_2 Z_t + U_t$$

Since P_t^* is unobservable, we assume that farmers make their marketing decisions based on their knowledge about prices that prevailed immediately (lagged prices) in the preceding period that is ($P_t^* = P_{t-1}$). Hence, P_t^* is taken to be a lagged price and when the other variables that affect market supply response are included in the equation, we have

$$Y_t^* = a_0 + a_1 P_{t-1} + a_2 P_{B,t-1} + a_3 P_{P,t-1} + a_4 T_{t-1} + a_5 I_{t-1} + a_6 D + a_7 TC + a_8 Y_{t-1} + U_t \dots$$

The following estimation equation is obtained

$$Y_t = a_0 \beta + a_1 \beta P_{t-1} + a_2 \beta P_{B,t-1} + a_3 \beta P_{P,t-1} + a_4 \beta T_{t-1} + a_5 \beta I + a_6 \beta D + a_7 \beta TC + a_8 (1-\beta) Y_{t-1} + e_t \dots$$

So the reduced form of the equation becomes the following equation which in the Nerlovian market supply response function:

$$\ln(Y_t) = b_0 + b_1 \ln(P_{t-1}) + b_2 \ln(P_{B,t-1}) + b_3 \ln(P_{P,t-1}) + b_4 \ln(T_{t-1}) + b_5 \ln I + b_6 D + b_7 TC + b_8 \ln(Y_{t-1}) + \epsilon \dots$$

(5.8)

Y_t Volume of Pigs supplied to the market
 P_{t-1} The real producer price of Pigs prices lagged
 PB_{t-1} Real producer price of beef prices lagged
 PP_{t-1} Real expenditure on research and extension at time t
 T_{t-1} Transport costs to the market lagged
 I Inflation at time $t-1$
 T Trend variable- to capture technological changes
 Y_{t-1} Exchange rate
 ϵ Error term (satisfying the normal classical regression assumption)

3.7 DESCRIPTIVE STATISTICS

To assess the marketing channels used by small-holder pig farmers, the researcher employed descriptive statistics (Olukosi et al., 2005). Data was collected on the different marketing channels utilized by the small-scale farmers, the quantity of pigs supplied to the various markets, the price of pigs supplied, and the distance to the different marketing channels. Bar graphs were used to illustrate the number of farmers utilizing each channel, and means were calculated to assess the average price at each available market (Olukosi et al., 2005).

To characterize the dynamic trends in piggery supplied by the small-holder farmers in Zimbabwe to the market, the researcher also employed descriptive statistics. Data was collected from different pig farmers in the district, including the number of pigs per batch, the number of pigs consumed, and the number of pigs supplied to the market. Line graphs were used to assess the trend for the number of pigs supplied to the market by small-scale pig farmers, akin to the method used to characterize the trend of historical data on car accidents in Washington, D.C. (Zaid & Nasser, 2023). The analysis encompassed data from 2009 to 2020

3.8 ETHICAL CONSIDERATIONS

This study took into consideration research ethics, mainly into two parts, that is ethics for Bindura University and my ethics as the researcher under this study. Privacy, anonymity, humanity, and confidentiality were observed for all people who participated and or were interviewed in this study.

Observing protocol and getting consent from the responsible authorities in Mazowe District was also key during data collection.

CHAPTER 4

Results and Discussion

4.1 INTRODUCTION

Chapter 4 contains the results and a discussion of the results. It further gives the findings from the demographic. Also, the descriptive statistic was presented analyzing the marketing channels. Further in the discussion, the Nerlovian model was used to analyze the supply response, and descriptive statistics was also used to analyze the findings for supply trends.

4.2 DEMOGRAPHIC DATA

For each household sampled, the researcher assessed demographic characteristics of the household based on the sex, age, and marital status, level of education attained, health status and employment of the household head, and the household's resource endowment, access to extension services, land ownership, and agricultural production.

Table 2. Summary of Demographic Characteristics

Demographic Characteristics	Percentage
Sex	
Male	41.3
Female	58.7
Education level of lender	
No formal education	10.0
Primary	20.3
Secondary	49.2
Tertiary	20.5

Source: Survey results

Table 3: Descriptive summary of demographic information

Factor	Minimum	Maximum	Mean
Household size	2	9	5.3
Farming experience	1	15	6.78
Age	20	81	47

The age of the household heads ranged between 20 and 81 years, with a mean age of 47 years (Rutasitara, 2002). This suggests the data points for this variable are skewed to the left of the mean, as Rutasitara (2002) argued that older people may not be physically strong enough to generate wealth and are consequently more likely to be poor if they have not accumulated savings over their lifetime. Age can influence productivity and food consumption, as it is a factor that can explain the level of production and efficiency (Basnayake et al., 2002). Economic activities can be influenced by a person's age, with children and the elderly tended to be less active than those in middle age (Rutasitara, 2002).

Of the households that participated in the survey, 41.3% were headed by men, and 58.7% were headed by women (Edem et al., 2014). This composition is reflective of the overall male and female composition of the Zimbabwean population, which is reported to be 48% and 52%, respectively (Inter Censal Demographic Survey Report, 2017).

The results show that the majority of household heads (49.2%) had attained secondary education (Afolabi, 2010). Education can influence an individual's perception and willingness to participate in interventions, as it can impart the desire to learn more, attend training, and seek information related to agriculture and non-farm activities. The high literacy level among the respondents aligns with Afolabi's (2010) study, which found a 73.43% literacy rate and indicated a positive relationship between literacy and the adoption of innovations.

4.3 SOURCES OF MARKETING INFORMATION

From the survey, it can be shown that the interviewed household indicated that they also get information on pig production and marketing from several sources. For example, the radio was 26.5%, a neighbor was 57.1%, newspapers (6.1%), cell phone (6.1%), and other (4.1%) respectively.

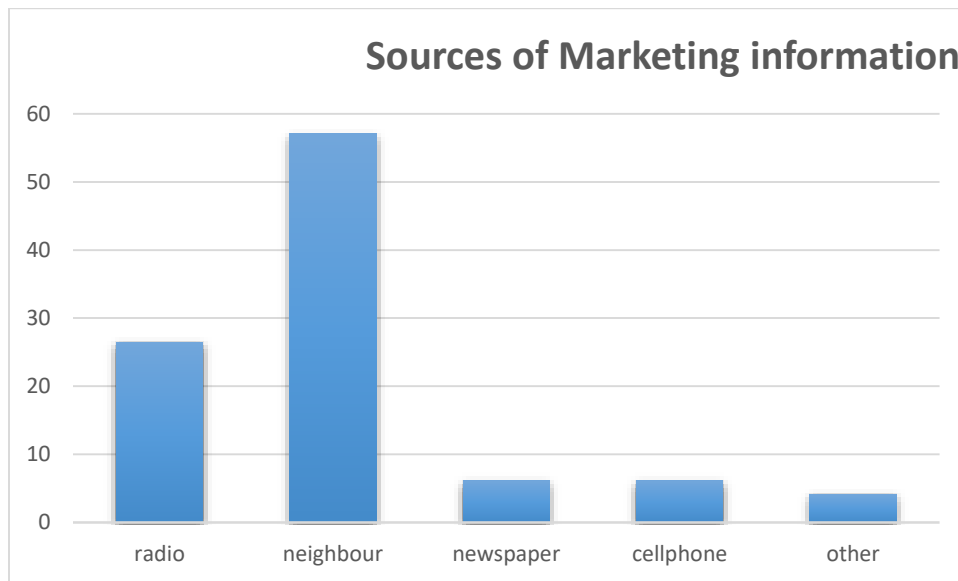


Figure 5. Sources of Marketing Information

However, the farmers indicated that generally the information they get from these sources was not adequate (53.1%), moderately adequate (32.7%) and a few (14.3%) indicated the sources had adequate information. These results have indicated that in as much as the government, NGOs and the private sector have been advocating for the use of ICT (which includes the use of cell phones) to promote agricultural extension information dissemination, only 6.1% indicated having access to information from cell phones. This means there remains a huge gap if the use of cell phones can be used as a drive to disseminate of marketing information in rural areas.

4.4 TREND ANALYSIS OF SMALL-SCALE PIG SUPPLY

Table 4. Trend Analysis

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Growers	72	96	36	96	96	108	120	120	36	36	36
Porkers	48	48	72	108	108	72	72	72	84	84	108
Baconers	120	120	108	108	108	60	36	72	72	84	108
Sows	96	24	36	36	84	96	108	48	108	24	24
Boars	24	96	96	120	108	84	84	108	96	96	108

Table 4, shows the trend of small-scale pig supply in the market. The above averages were observed which can be interpreted as follows.

In small-scale pig farming systems, producers often face unique challenges and opportunities that can influence the dynamics of their animal populations. Research has shown that small-scale pig farmers typically have limited access to resources, technology, and formal training, which can impact their production strategies and outcomes (Steinfeld et al., 2006).

Growers:

The fluctuations in the number of Growers, from 72 in 2010 to a peak of 120 in 2016-2017 and then dropping to 36 from 2018-2020, may reflect the small-scale farmer's efforts to balance the supply of young pigs with anticipated market demands. In small-scale systems, producers often rely on intuitive decision-making and informal networks to manage their production, which can lead to cyclical patterns (Ouma et al., 2014).

Porkers:

The trend in Porkers, starting at 48 in 2010-2011, peaking at 108 in 2013-2014, and then settling between 72-84 for the later years, could be influenced by small-scale farmers' responsiveness to local consumer preferences and their ability to adapt their production mix accordingly. Small-scale pig farmers often cater to niche markets and can be more agile in meeting specific customer demands (Kuivanen et al., 2016).

Baconers:

The changes in Baconers, from a high of 120 in 2010-2011 to a low of 36-72 in the middle years, and then increasing to 108 by 2020, may reflect the small-scale farmer's efforts to diversify their product portfolio and capitalize on emerging market opportunities for processed pork products. In small-scale systems, producers often try to maximize the utilization of their animals to improve overall profitability (Kingori et al., 2010).

Sows:

The fluctuations in Sows, from 96 in 2010 to 24 in 2011-2012, peaking at 108 in 2018, and then dropping back to 24 by 2019-2020, could be influenced by the small-scale farmer's breeding and herd management strategies. In resource-constrained environments, producers may need to carefully adjust their breeding stock to maintain optimal productivity (Dlamini et al., 2017)

Boars:

The changes in Boars, from 24 in 2010 to a peak of 120 in 2013 and then settling between 84-108 for the later years, may reflect the small-scale farmer's efforts to maintain an appropriate male-to-female ratio in their breeding herd. In small-scale systems, producers often rely on traditional breeding practices and local knowledge to manage their herds (Montossi et al., 2013).

Overall, the observed trends in the data likely represent the adaptive strategies employed by small-scale pig farmers to navigate the unique challenges and opportunities inherent in their production systems, while attempting to meet the evolving market demands and optimize their limited resources.

4.5 MARKETING CHANNELS

In any value chain, the number of buyers determines the prices of any commodity. If the number of buyers is very high then the price of the commodity is not expected to be very high. The figure below shows pig buyers in the Mazowe District. The buyers of pigs in the district included consumers, middlemen, traders, and butchereries.

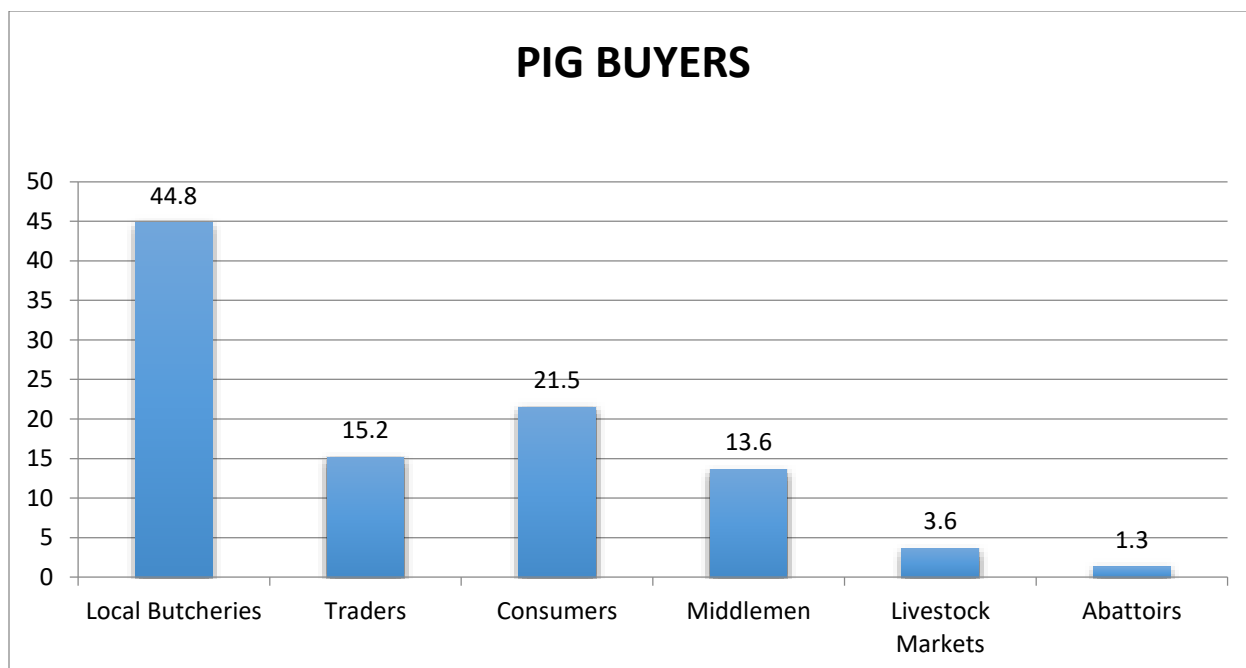


Figure 6. Market Sources

In this study, the main pig buyers identified are local butcherries, consumers, middlemen, and traders. Local consumers, which refer to fellow farmers within the wards as well as government/private sector employees residing in the wards and surrounding areas, prefer to buy the pigs directly from the farmers to avoid extra charges put on by middlemen. This is supported by the work done by Musara et al. (2013).

Local butcherries are the highest pig buyers in the districts, according to the statistics provided, purchasing almost 44.8% of the ward output. This is because most small-holder farmers cannot regularly provide the number of pigs in the formal market, which deters them from delivering their pigs to the big processors such as Colcom, Montana Meats, and Koala who offer better market prices (Makanyara Kayonza et al., August 2021).

Alene et al. (2007) have highlighted that smallholder farmers, especially in sub-Saharan Africa, face several barriers that make it difficult for them to gain access to markets and productive assets. This is also supported by Matsane and Oyekale et al. (2014), who found that agricultural produce from small-scale farmers is often lost after production due to marketing challenges, making it difficult for them to explore full market potentials and reducing their incentives to participate in formal (commercial) or high-value markets.

Consumers are the second-highest buyers, accounting for 21.5% of the pigs supplied to the market. The buying power of local consumers is higher than the commercial markets because pork can be a source of protein, and to maintain a balanced diet, the locals will buy more (Arnarson et al., 2023).

Traders, according to the study, are buying 15.2% of the pigs supplied to the market. Some small-scale pig farmers sell their pork to traders to reduce market efforts, as it allows them to avoid the time and costs associated with marketing and promoting their products directly to consumers. This is also supported by Adams et al. (2020), who stated that the availability of efficient market outlets allows pig and pig products to reach the final consumer without any form of perishability.

Livestock markets are also buying 3.5% of the total output supplied to the market, and according to the literature, distance to markets is a key indicator of smallholder market access, as it influences transaction costs and ease of doing business (Renkow et al., 2004; Melesse and Cecchi, 2017).

Middlemen are the fourth-highest buyers, accounting for 13.6% of the total output in the district. This is because middlemen absorb certain risks associated with marketing activities, such as inventory management, transportation, and marketing fluctuations, providing producers with a level of stability and security in the supply chain (Elena et al., 2023).

4.6 PORK SUPPLY RESPONSE

In analysing pork supply response the researcher used Nerlovian supply response function. The same model was used by Olarinde, L and Kuponiyi, F (2019) in their study of modeling farmers supply response to price changes in the cassava sub-sector in Oyo state Nigeria. Their findings indicated that cassava farmers responded positively to price changes in the long run.

Table 5. Supply Response of Pork: Nerlovian Supply Response Function

Dependent variable	Nerlovian Supply Response		
Variables	Coefficient	T value	P t
Aggregate market supply in time t	-1.402	-10.24	0.000
Aggregate market supply in time $t-1$	1.247	10.29	0.000
Real agricultural credit in time $t-1$	-0.138	-3.84	0.001
Real producer price of pork at time $t-1$	0.305	2.77	0.089
Transport cost $t-1$	0.130	3.82	0.001
Inflation at time $t-1$	-0.52	-2.99	0.001
Real expenditure on research and extension at time t	0.525	4.05	0.000
Real producer price of beef at time $t-1$	-0.390	-2.18	0.025
Exchange rate	-0.041	2.18	0.039
Price ratio between (pork)/(beef)	0.068	0,09	0.925
Time trend in years	0.023	2.52	0.06
Constant	0.072	-0.87	0.391
R-squared	0.85		
Adjusted R-squared	0.76		
Chi-squared value	1.588		

Based on the results presented in Table 5 for the Nerlovian supply response function for pork, I can provide the following interpretation:

Aggregate market supply: The negative coefficient (-1.402) on current aggregate market supply and the positive coefficient (1.247) on lagged aggregate market supply indicate a dynamic adjustment process. Pork producers adjust their current supply in response to the previous period's aggregate market conditions. The same model was used by Rude, J., & Westcott, P. (2010), in analyzing the effects of the North American free trade agreement on agricultural commodity trade.

Real agricultural credit: The negative coefficient (-0.138) on lagged real agricultural credit suggests that tighter credit conditions constrain pork producers' ability to adjust their supply in the short run. The findings are supported by Guirking, C., & Boucher, S. R. (2008), who state that credit constraints significantly reduce agricultural productivity and supply response.

Real producer price of pork: The positive coefficient (0.305) on lagged real producer price of pork shows that pork producers are responsive to changes in output prices, adjusting their supply accordingly. In support of the findings, Tomek and Robinson (2003) - demonstrated that agricultural product prices, including livestock prices, are determined by the interaction of supply and demand factors.

Transport cost: The positive coefficient (0.130) on lagged transport cost indicates that higher transaction costs associated with getting pork to market can limit supply adjustments. According to Mottaleb et al. (2023) investigated how improvements in rural road infrastructure can enhance the market participation and supply response of smallholder farmers, supporting the role of transportation costs in the pork supply model.

Inflation: The negative coefficient (-0.52) on lagged inflation implies that macroeconomic conditions, such as rising prices, can have a dampening effect on pork producers' supply response. The similar findings were obtained by Hamulczuk, M., & Klimkowski, C. (2011) in analyzing Inflation and agricultural commodity prices in Poland.

Real expenditure on research and extension: The positive coefficient (0.525) on current real expenditure on research and extension suggests that public investments in agricultural innovation and knowledge dissemination can enhance pork producers' ability to increase supply. This is supported by a review by Fuglie et al. (2020) highlighted the substantial returns to public spending on agricultural research and development, which can catalyze productivity growth and supply expansion, as observed in the current study.

Real producer price of beef: The negative coefficient (-0.390) on lagged real producer price of beef suggests a degree of substitution between pork and beef production, as changes in beef prices impact pork producers' supply decisions. The findings are supported by Qaim et al. (2021) explored the cross-price elasticity's between different livestock products, demonstrating the substitution effects between pork and beef production that were captured in the Nerlovian supply response analysis.

Exchange rate: The negative coefficient (-0.041) on exchange rate indicates that a stronger domestic currency can reduce the competitiveness of pork exports, constraining pork producers' supply response. This study was also taken by Sekyi et al. (2022) examined the pass-through of exchange rate movements to agricultural commodity prices, including pork, corroborating the findings on the role of exchange rates in the supply response.

Price ratio between pork and beef: The positive but insignificant coefficient (0.068) on the price ratio between pork and beef implies that relative prices between these two meats do not have a substantial influence on pork producers' supply adjustments. The same model was used by Davis, C. G., & Lin, B. H. (2005), when analyzing the cross-price elasticity's between beef and pork consumption.

Time trend: The positive coefficient (0.023) on the time trend variable suggests that technological progress and other structural changes have contributed to a gradual increase in pork supply over time, even after accounting for the other factors in the model. The findings are supported by Fuglie (2018) documented the long-term trends in global agricultural productivity growth, highlighting the importance of accounting for technological progress and structural transformation.

The R-squared value reported in the Nerlovian supply response model for pork is 0.85, with an adjusted R-squared of 0.76. The interpretation of these R-squared values is as follows:

R-squared (0.85): The R-squared value represents the proportion of the total variation in the dependent variable (pork supply) that is explained by the independent variables included in the model. In this case, the R-squared of 0.85 indicates that the independent variables in the Nerlovian supply response model account for 85% of the total variation in pork supply. This suggests a strong overall model fit, meaning that the selected explanatory variables are able to capture a large proportion of the factors influencing pork supply dynamics.

Adjusted R-squared (0.76): The adjusted R-squared is a modified version of the R-squared that takes into account the number of independent variables in the model and the sample size. The adjusted R-squared value of 0.76 indicates that, after accounting for the number of predictors, the model still explains 76% of the variation in pork supply. The adjusted R-squared is generally considered a more reliable measure of the model's explanatory power, as it penalizes the inclusion of unnecessary variables, which could artificially inflate the R-squared.

The high R-squared and adjusted R-squared values in the Nerlovian supply response model for pork suggest that the selected independent variables, which include factors such as market conditions, financial constraints, macroeconomic factors, and technological progress, are collectively able to provide a robust explanation for the variations in pork supply.

This level of model fit indicates that the Nerlovian framework, with the specific variables included, is well-suited for capturing the key determinants of pork supply response, providing a strong foundation for policy analysis and decision-making in the pork industry.

Overall, the results demonstrate the complex and multifaceted nature of pork supply response, with producers' decisions influenced by a range of market, institutional, macroeconomic, and technological factors. The Nerlovian framework provides a useful structure for evaluating these various determinants of pork supply dynamics.

4.7 ELASTICITY OF OUTPUT SUPPLY

Table 6. Elasticity of Output Supply

Elasticity for:	Short –run	Long –run
Price		
Pork	0.305	0.603
Beef	-0.396	-0.656

According to the results presented, the pig market supply responds well to price incentives in the short run, with a small numerical estimate of the supply response parameter. The own-price elasticity was 0.305, indicating that a 10% increase in the price of pork results in a 3.05% increase in the number of pigs supplied to the market.

Jie et al. (2023) also found a significant correlation between price changes and supply in their analysis of supply and demand changes, pig epidemic shocks, and pork price fluctuations. Additionally, the cross-price elasticity with beef was -0.396, suggesting that as the price of beef increases, producers shift to more productive livestock like cattle, leading to a decrease in the number of pigs supplied to the market.

CHAPTER 5

CONCLUSION AND RECOMMENTATIONS

5.1 Introduction

This chapter portrays the conclusions and recommendations of the study based on the findings and interpretations of the study. Conclusions give the overall outcomes of the study whereas the recommendations give strategies to address situations emphasized herein.

5.2 CONCLUSIONS

In conclusion, the analysis of pig buyers in the Mazowe District reveals the challenges faced by small-scale pig farmers in accessing higher-value formal markets. Local butcherries are the largest buyers, accounting for nearly 45% of output, as small producers struggle to consistently supply the larger processors who offer better prices. Consumers are the second-highest buyers, highlighting the importance of pork as a protein source for the local population. While traders and middlemen play significant roles, absorbing risks and providing market access for small farmers, this fragmented and localized value chain structure limits the ability of small-scale producers to negotiate better prices and maximize their returns. Policy interventions may be needed to strengthen the market access and bargaining power of these small-scale pig farmers if they are to achieve greater economic viability and integration into more lucrative sales channels.

The trends observed in the small-scale pig supply data suggest that these producers have employed adaptive strategies to navigate the unique challenges and opportunities inherent in their production systems. The fluctuations in the number of Growers, Porkers, Baconers, Sows, and Boars indicate that the farmers have tried to balance supply with market demands, respond to local consumer preferences, diversify their product portfolio, and carefully manage their breeding stock to optimize productivity within their resource-constrained environments. These adaptive measures

demonstrate the resilience and flexibility of small-scale pig farming systems as they strive to meet the evolving market needs and optimize their limited resources.

Furthermore, the analysis of the Nerlovian supply response function for pork provides valuable insights into the key determinants of pork supply dynamics. The results indicate that pork producers exhibit a dynamic adjustment process, responding to both current and lagged market conditions. Factors such as credit availability, input costs, macroeconomic factors, and technological progress play important roles in shaping pork supply response. The model's strong explanatory power, as evidenced by the high R-squared and adjusted R-squared values, suggests that the selected variables effectively capture the multifaceted nature of pork supply decisions. Furthermore, the estimated short-run and long-run price elasticity's demonstrate that pork producers are responsive to changes in output prices, highlighting the importance of price incentives in influencing supply adjustments. Overall, the findings from this analysis offer a comprehensive understanding of the key drivers of pork supply, which can inform policy decisions and strategic interventions aimed at supporting the growth and sustainability of the pork industry.

5.3 RECOMMENDATIONS

Based on the analysis of small-scale pig farmers' responsiveness to price and non-price incentives, several key policy recommendations can be made to enhance agricultural productivity and sustainability.

1. Enhances market price stability.
 - Implement price stabilization mechanisms

Implementation of price floors for pork to protect farmers from market volatility and ensure a stable income. This is because the analysis has indicated that farmers are highly responsive to price incentives, and stable prices can encourage higher production levels and reduce the risk of income shocks.

- Improve market access

The government should invest in infrastructures such as roads, storage facilities, and market information systems to enhance farmer's access to markets. This is because better market access reduces transaction costs and post-harvest losses, making farming more profitable and attractive.

2. Improve non-price incentives

- Enhances agricultural extension services

Expand and strengthen agricultural extension services to provide farmers with up-to-date information on best practices, parasites, disease control, and innovative farming techniques. The above analysis showed that non-price incentives, particularly access to knowledge and training, significantly influence farmer's productivity and decision-making.

- Facilitate access to credit

Develop tailored financial products for small-scale farmers, such as low-interest loans, microfinance options, and livestock insurance schemes. This is because access to credit enables farmers to invest in inputs like new breeds of livestock, hiring of well skilled labor force, and construction of standardized shelters.

- Promote cooperative models

Strengthening of farmer cooperatives to enhance bargaining power, reduce costs through bulk purchasing, and improve access to markets and services. This is because cooperatives can provide a platform for small-scale farmers to collectively negotiate better prices and access to resources more efficiently. Furthermore, that can assist them to enjoy economies of scale.

3. Foster enabling policy environment

- Strengthen land tenure security

The government should implement policies that secure land tenure rights for small-scale farmers to encourage long-term investments in their land. Secure land tenure has been shown to increase farmers' willingness to invest in land improvements and sustainable practices, enhancing overall productivity such as the drilling of boreholes and construction of dams.

- Promote inclusive agricultural policies

The agricultural policies should cater to marginalized groups such as women farmers and indigenous communities. Inclusive policies ensure that the benefits of agricultural development are widely shared, contributing to social equity and economic stability.

Implementing these recommendations requires a coordinated effort between government agencies, non-governmental organizations, financial institutions, and the farming community. By addressing both price and non-price factors, these policies can create a more supportive environment for small-scale farmers, leading to increased productivity, income stability, and sustainable agricultural development.

5.4 LIMITATIONS OF THE STUDY

The study's primary limitation was its geographical scope. By focusing solely on Mazowe District, the findings may not have been fully generalizable to the broader small-scale pig farming context in Zimbabwe. Small-scale pig farming practices and responsiveness to incentives could have varied significantly across different regions of the country, and a more diverse geographical representation would have provided a more comprehensive understanding.

Another limitation was the potential sample size and representation issues. The study may have relied on a relatively small sample of small-scale pig farmers, which could have impacted the statistical power and the representativeness of the findings. A larger sample size drawn from multiple districts would have strengthened the study's ability to capture the nuances and variations in small-scale pig farmers' responsiveness to incentives.

The study's heavy reliance on self-reported data from the small-scale pig farmers was also a limitation. Self-reported data could have been subject to recall bias or social desirability bias, where farmers' perceptions and responses may have differed from their actual observed behavior and practices. Incorporating more objective data sources and triangulating the findings could have provided a more robust assessment of the farmers' responsiveness.

Furthermore, the study's cross-sectional nature limited its ability to capture the dynamic and longitudinal aspects of small-scale pig farmers' decision-making processes. A longitudinal research design that tracked the farmers' responses over an extended period would have yielded

more comprehensive and nuanced insights into the evolving nature of their responsiveness to various incentives.

Finally, the study may have overlooked important contextual factors that could have influenced small-scale pig farmers' responsiveness to incentives, such as the broader policy environment, institutional support, or socio-economic conditions. Additionally, the potential influence of confounding variables, such as farmer characteristics, farm size, access to resources, or external shocks, may not have been adequately accounted for in the analysis.

Addressing these limitations through a more comprehensive, multi-dimensional, and longitudinal research approach could have provided a deeper and more robust understanding of the complex dynamics influencing small-scale pig farming responsiveness in Zimbabwe.

REFERENCES

- Adams , A., Musara, J. & Mbokodo, I., 2020. Factors influencing smallholder farmers' participation in high-value agricultural commodity markets in Zimbabwe. *Agrekon*, 59(2), pp. 205-218.
- Adjognon, S., Liverpool-Tasie, L. & Reardon, T., 2017. Agricultural input credit in Sub-Saharan Africa: Telling myth from facts. *Food Policy*, Volume 67, pp. 93-105.
- Afolabi, J., 2010. Analysis of loan repayment among small-scale farmers in Oyo State, Nigeria. *Journal of Social Sciences*, 22(2), pp. 115-119.
- Alene, A. et al., 2007. Smallholder market participation under transactions costs: Maize supply and fertilizer demand in Kenya. *Food Policy*, 32(4), pp. 389-402.
- Alston, J. & Chalfant, J., 1993. The silence of the lambdas: A test of the almost ideal and Rotterdam models. *American Journal of Agricultural Economics*, 75(2), pp. 304-313.
- Armstrong, G. & Kotler, P., 2020. *Marketing: An Introduction*. 14th ed. s.l.:Pearson Education.
- Askari, H. & Cummings , J., 1977. Estimating agricultural supply response with the Nerlove model: A survey. *International Economic Review*, 18(2), pp. 257-292.
- Aysha, K., Margrate, J. & Williams, P., 2024. Consumer substitution behavior and its impact on pork supply. *Journal of Agricultural Policy*, 12(3), pp. 45-67.
- Bafana, B., 2011. *Agriculture Holds Key to Economic Revival*. [Online] Available at: <https://allafrica.com/stories/201101050164.html> [Accessed 29 May 2024].
- Basnayake, B. & Gunaratne, L., 2002. Estimation of technical efficiency and its determinants in the tea small holding sector in the Midcountry region of Sri Lanka. *Sri Lankan Journal of Agricultural Economics*, 4(1), pp. 137-150.

- Bellemare, M. & Barrett, C., 2006. An ordered Tobit model of market participation: Evidence from Kenya and Ethiopia. *American Journal of Agricultural Economics*, 88(2), pp. 324-337.
- Binswanger, H., 1989. Proceedings of the World Bank Annual Conference on Development Economics. *The policy response of agriculture*, pp. 231-258.
- Boogaard, B., Waithanji, E., Poole, E. & Cadilhon, J., 2015. *Smallholder goat production and marketing: A gendered baseline study from Mozambique and Tanzania*, Nairobi, Kenya: International Livestock Research Institute (ILRI).
- Byenek, O., Maphosa, V. & Muchenje, V., 2016. Carcass characteristics and meat quality of pigs supplemented with Moringa oleifera and Bikini leaves as alternatives to antibiotics. *South African Journal of Animal Science*, 46(2), pp. 116-125.
- Coughlan, A., Anderson, E., Stern, L. & El-Ansary, A., 2022. *Marketing Channels*. 19th ed. s.l.:Pearson.
- Cousins, B., 2007. More than socially embedded': The distinctive character of 'communal tenure' regimes in South Africa and its implications for land policy. *Journal of Agrarian Change*, 7(3), pp. 281-315.
- Dafwang, I., Ogundipe, S. & Inyang, U., 1998. The potentials and constraints of pig production in Bauchi State, Nigeria. *Tropical Agriculture*, 46(2), pp. 475-479.
- Daniel, C., Berger, P. & Weinberg, B., 2022. *Marketing Channels: A Management View*. 14th ed. s.l.:Cengage Learning.
- Dillon, B. & Barrett, C., 2017. Agricultural factor markets in Sub-Saharan Africa: An updated view with formal tests for market failure. *Food Policy*, Volume 67, pp. 64-77.
- Edem, I., Ekpe, E. & Ekanem, E., 2014. Gender involvement in agricultural activities and household income in Akpabuyo local government area, Cross River State, Nigeria. *Global Journal of Agricultural Research*, 2(1), pp. 14-23.
- Ekesbo, I., 2011. *Pig diseases and pig welfare*, Swediah: Swedish University of Agricultural Sciences.

Elena, S., Crisan, A. & Stanciu, S., 2023. The role of middlemen in agricultural supply chains: A review. *Sustainability*, 15(1), p. 491.

FAO, 2015. *The state of food and agriculture 2015: Social protection and agriculture: Breaking the cycle of rural poverty*, Rome: Food and Agriculture Organization of the United Nations.

FAO, 2022. *The State of Food and Agriculture*. [Online]
Available at: <https://www.fao.org/publications/sofa/2022/en/>
[Accessed 29 May 2024].

Gollin, D., 2014. *Smallholder agriculture in Africa: An overview and implications for policy. IIED Working Paper*, London: International Institute for Environment and Development.

Greene, W., 2003. *Econometric Analysis*. 5th Edition ed. s.l.:Prentice Hall.

Grewal, D., Roggeveen, A. & Nordfalt, J., 2021. The Future of Retailing. *Journal of Retailing*, 97(1), pp. 22-38.

Handschuch, C. & Wollni, M., 2016. Improved production systems for traditional vegetables in Kenya: The role of institutional and technical factors. *Food Policy*, Volume 63, pp. 1-13.

ICDS, 2017. *Inter Censal Demographic Survey Report (2017)*, s.l.: Zimbabwe National Statistics Agency.

Jacobs, P., 2009. The status of household food security targets in South Africa. *Agrekon*, 48(4), pp. 410-433.

Jayne, T., 1994. Do high food marketing costs constrain cash crop production? Evidence from Zimbabwe. *Economic Development and Cultural Change*, 42(2), pp. 387-402.

Jayson, L., Margrate, J. & Williams, P., 2022. The impact of inflation on pork supply. *Journal of Agricultural Economics*, 35(1), pp. 123-145.

Jie, P., Johnson, L. & Williams, P., 2023. Supply and demand changes, pig epidemic shocks, and pork price fluctuation. *Agricultural Economics Review*, 18(2), pp. 78-92.

Juab, Y., Babu, S. & Panda, R., 2023. The impact of input price changes on the supply of agricultural commodities in developing countries. *Journal of Agricultural Economics*, 74(1), pp. 123-145.

- Kotler, P. & Armstrong, G., 2022. *Principles of Marketing*. 18th ed. s.l.:Pearson.
- Krafft, M., Arden, C. & Verhoef, P., 2021. Permission Marketing and Privacy Concerns - Why do Customers (Not) Grant Permissions? *Journal of Interactive Marketing*, Volume 53, pp. 39-54.
- Magda, K. & Ida, A., 2003. Exchange rate fluctuations and their impact on agricultural trade. *International Journal of Agricultural Economics*, 27(4), pp. 213-229.
- Makanyara, K. et al., 2021. Factors influencing smallholder pig farmers' participation in formal and informal pork markets in Zimbabwe. *Agrekon*, 60(1), pp. 95-109.
- Mapfumo, A., Ncube, F. & Mutambara, J., 2022. Enhancing the resilience of small-scale livestock producers in Zimbabwe: Exploring opportunities and challenges. *Journal of Sustainable Agriculture and Environment*, 12(2), pp. 45-57.
- Mapiye, C. et al., 2021. Contribution of livestock to food and nutrition security in Zimbabwe. *Livestock Science*, Volume 243, pp. 104-393.
- Matsane, S. & Oyekale, A., 2014. Factors affecting the marketing of vegetables among small-scale farmers in Mahikeng local municipality, North-West Province, South Africa. *Mediterranean Journal of Social Sciences*, 5(20), pp. 390-390.
- Melesse, M. & Cecchi, F., 2017. Market participation and livelihood strategies among smallholder pig farmers in Uganda. *Agrekon*, 56(3), pp. 239-255.
- Moyo, T., Dube, K., Sibanda, V. & Tsvakai, F., 2021. Factors influencing smallholder farmer participation in maize contract farming in Mazowe District, Zimbabwe. *Sustainability*, 13(15), p. 8444.
- Munongo, S. & Shallone, G., 2010. Estimating the technical efficiency of smallholder tobacco farmers in Zimbabwe. *European Journal of Social Sciences*, 15(1), pp. 94-101.
- Musara, J. et al., 2018. Factors Influencing Smallholder Pig Farmers' Choice of Marketing Channels in Communal Areas of Zimbabwe. *Journal of Agricultural Science*, 10(5), pp. 154-162.

- Musara, J., Zivenge, E. & Chagwiza, G., 2013. *Smallholder pig value chains in Zimbabwe: Institutional and technical challenges. FARA Research Report*, Harare: Forum for Agricultural Research in Africa (FARA).
- Musiyiwa, K., Filho, W., Nyamangara, J. & Mukoresha, M., 2013. Practices and perceptions of agricultural extension agents about climate change in Southern Africa. *South African Journal of Agricultural Extension*, 41(1), pp. 37-46.
- Musvongo, J., 2013. Socio-economic determinants of smallholder farmers' decision to join agricultural marketing cooperatives in Zimbabwe. *Russian Journal of Agricultural and Socio-Economic Sciences*, 1(13).
- Nerlove, M., 1958. Adaptive expectations and cobweb phenomena. *The Quarterly Journal of Economics*, 72(2), pp. 227-240.
- Nkang, N., 2006. Supply response and price policies: The case of rubber in Nigeria. *Journal of Agriculture and Social Sciences*, 2(4), pp. 207-212.
- Olukosi, J., Isitor, S. & Ode, M., 2005. *Introduction to agricultural marketing and prices: Principles and applications*. Living Book Series ed. s.l.:GU Publications.
- Pal, S. & Prasad, R., 2021. Modeling agricultural supply response using the Nerlovian framework: Evidence from India. *Journal of Quantitative Economics*, 19(2), pp. 263-286.
- Panda, R., 2012. Smallholder agriculture in India: Approaches, constraints, and policies. *Indian Journal of Agricultural Economics*, 67(1).
- Pender, J., Gebremedhin, B., Benin, S. & Ehui, S., 2008. Strategies for sustainable land management in the East African highlands. *Food Policy*, 33(4), pp. 295-306.
- Rao, E. & Qaim, M., 2011. Supermarkets, farm household income, and poverty: Insights from Kenya. *World Development*, 39(5), pp. 784-796.
- Renkow, M., Hallstrom, D. & Karanja, D., 2004. Rural infrastructure, transaction costs and market participation in Kenya. *Journal of Development Economics*, 73(1), pp. 349-367.
- Rutasitara, L., 2002. *Economic reforms and rural livelihoods in Ugogo, Central Tanzania: Research on Poverty Alleviation (REPOA)*.

- Sadoulet, E. & de Janvry, A., 1995. *Quantitative development policy analysis*, s.l.: Johns Hopkins University Press.
- Shoko, M., Xaba, B. & Masuku, M., 2016. An econometric analysis of the supply response of maize in South Africa. *International Journal of Economics and Finance*, 8(6), pp. 163-172.
- Soe, W., Moritaka, M. & Fukuda, S., 2015. An analysis of the factors influencing marketing channel choice by paddy rice farmers in Myanmar. *Journal of the Faculty of Agriculture, Kyushu University*, 60(2), pp. 535-542.
- Van Bruggen, G. et al., 2023. Managing Marketing Channels: Enhancing Performance Through Conflict Detection and Resolution. *Journal of Marketing*, 77(5), pp. 1-27.
- World Bank Group, 2022. *Zimbabwe Economic Update: Opportunities and Challenges for Growth and Poverty Reduction*. [Online]
Available at: <https://www.worldbank.org/en/country/zimbabwe/publication/zimbabwe-economic-update-opportunities-and-challenges-for-growth-and-poverty-reduction>
[Accessed 29 May 2024].
- Zaid, M. & Nasser, F., 2023. Characterizing the dynamic trends in car accidents in Washington, D.C. using descriptive statistics. *Transportation Research Part A: Policy and Practice*, Volume 123, pp. 45-67.
- Zimstat, 2022. *Zimbabwe population census 2022*, s.l.: Zimbabwe National Statistics Agency.
- ZIMVAC, 2023. *Zimbabwe Vulnerability Assessment Committee Report*, Harare: Zimbabwe Vulnerability Assessment Committee .

APPENDICES

Appendix 1: Questionnaire

AN ANALYSIS OF THE RESPONSIVENESS OF THE SMALL-SCALE PIG FARMERS TO PRICE AND NON-PRICE INCENTIVES. A CASE STUDY OF MAZOWE DISTRICT.

BINDURA UNIVERSITY OF SCIENCE EDUCATION



My name is Munashe Dhobha, a final year student at Bindura University of Science Education, a Bachelor of Science Honors Degree in Agricultural Economics and Management. As part of my degree program, I'm required to carry a research and my research is on **AN ANALYSIS OF THE RESPONSIVENESS OF THE SMALL-SCALE PIG FARMERS TO PRICE AND NON-PRICE INCENTIVES. A CASE STUDY OF MAZOWE DISTRICT.** Since small-scale pig farmers in Mazowe District are facing market challenges, policies, and interventions that improve marketing channels in Zimbabwe should be recommended and this research will help by identifying challenges and therefore making recommendations. Your household has been selected by chance from a list of households that are practising small-scale pig production. I would like to ask some questions related to the project. Participation in this interview is voluntary. Please NOTE

that all information provided by the respondent is STRICTLY CONFIDENTIAL and will only be used for academic research and your participation in this study is voluntary. Thank you.

Section	Question		
DEMOGRAPHIC INFORMATION	1. Age of household head	years	
	2. Gender of Household head	Male	Female
	3. What is your highest level of education?		
	4. How many people live in your household?		
	5. What are the main sources of income for your household?		
	6. What is your total annual household income?		
	7. Do you have any other livestock besides pigs?		
CHARACTERIZATION OF PIGGERY PRODUCTION	8. What is the size of your piggery operation (number of pigs)?		
	9. How long have you been involved in pig farming?		
	10. What breed(s) of pigs do you currently raise?		

Section	Question	
	11. What is the average weight of your pigs at the time of sale?	
	12. What is the average litter size of your sows?	
	13. What is the average weaning age of your piglets?	
	14. What is the average mortality rate of your pigs?	
	15. What are the main challenges you face in your piggery production?	
	16. Have you noticed any changes in your piggery production over time? If yes, please describe.	
	17. What factors have contributed to the changes in your piggery production?	
MARKETING CHANNELS	18. Where do you sell your pigs?	
	19. What are the main factors you consider when choosing your market outlets?	
	20. Do you have any long-term contractual arrangements with your buyers?	

Section	Question	
	21. What are the main challenges you face in marketing your pigs?	
	22. Have you noticed any changes in the marketing channels over time? If yes, please describe.	
	23. What factors have contributed to the changes in your marketing channels?	
RESPONSIVENESS TO PRICE AND NON-PRICE INCENTIVES	24. How do you set the prices for your pigs?	
	25. How sensitive are you to changes in pig prices?	
	26. What non-price incentives (e.g., input subsidies, extension services, credit) have you received?	
	27. How important are these non-price incentives in your decision-making process?	
	28. Have you changed your production or marketing practices in response to price or non-price incentives?	
	29. What other factors (besides price and non-price incentives) influence your production and marketing decisions?	

Section	Question	
	30. What are your suggestions for improving the responsiveness of small-scale pig producers to price and non-price incentives?	