NATIONAL UNIVERSITY OF LESOTHO

The Contribution of Small-Scale Commercial Piggery Farming to Farmers' Livelihoods in Teyateyaneng Urban Council, Berea, Lesotho

by

Morongoenyane Lichaba (201001215)

A Dissertation Submitted to the Department of Development Studies in Partial Fulfilment of the Requirements for Master of Arts Degree in Development Studies

Supervisor: Dr Mokone 'Musi

NUL Roma **August 2022**

Acknowledgements

First and foremost, I give honour and praise to the Almighty God for his blessings and continuous strength He embedded on me throughout my research. None of this would have been completed without God.

I would like to thank my supervisor, Dr Mokone 'Musi for his vision, sincerity and motivation that have deeply inspired and kept me pushing. His patience has provided me an opportunity to learn and grow in my career, he imparted knowledge that I will forever treasure. I also want to thank Dr Bonaventure Mkandawire for his mentorship and guidance. Dr Mokhoele Hala-hala deserve thanks from the bottom of my heart for the patience and pressure endured during editing this work.

I would like to express my sincere gratitude to the community of Teyateyaneng urban council for their warm welcome during data collection and the Ministry of Agriculture. I wish to give my special gratitude to everybody that has contributed to the completion of this work, I am very much thankful.

I am extremely grateful to my mother ('Mankopane) for her love, prayers and empathy during this research writing, to my two siblings (Morongoe and Limpho) thank you for your continuous support. Lastly, a special thank you to my late father (Leeto), he has taught me how to endure pain without giving up.

To all of you, Thank you

Declaration

I declare that this thesis, which is submitted to the National University of Lesotho, is, to the best of my knowledge, my original work and has not been published or submitted to any university before. Other authors' work has been used and appropriately acknowledged.

Researcher	Date
M. Lichaba	05/08/2022

Supervisor	Date

Abstract

This study was conducted in Teyateyaneng urban council in Berea focusing on the contribution of small-scale piggery farming to farmers' livelihoods. The main objectives were to determine whether pig farming generates income for farmers; has increased their wellbeing; improved their food security as well as reduce their vulnerability. A mixed method approach was used to conduct the study where qualitative data was initially collected through one on one interviews followed by quantitative data collection. Qualitative data was collected from nine key informants and the results obtained from them were used to structure and obtain quantitative data from one hundred and twenty pig farmers in TY Urban council.

The findings obtained through a thematic analysis revealed that farmers' livelihoods have been positively affected by small scale pig farming which has shown a socio-economic impact on their households. The statistical software (PSPP) was used to determine whether farmers were able to generate income and the majority (60.8%) agreed while the minority denied (39.2%). The chi square test was also used to determine the association between farmers' demographics and livelihood outcomes. The results obtained showed that there is no association between the variables except farmers' marital status and employment status which were significantly associated.

List of Maps

List of Figures

List of Tables

List of Abbreviation

DAFF	Department of Agriculture, Forestry and Fisheries
DFID	Department for International Development
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
IFAD	International Fund for Agricultural Development
LGA	Livestock Global Alliance
KZN	Kwazulu-Natal
MDGs	Millennium Development Goals
PSPP	Program for Statistics
QUAL	Qualitative
QUAN	Quantitative
SDGs	Sustainable Development Goals
SLF	Sustainable Livelihood Framework

Contents

Chapter One: Overview and Orientation of the Study

1.1 Background and Introduction to the Study

The domestication history of pigs is known to be more of an archaeological puzzle due to the nature of the wild boars from which modern pigs descended. Among the various species found universally such as warthog, pygmy and the pig deer, only the wild boar has been domesticated (Hirst, 2019). Further noted is that such an independently occurring domestication dated to 9,000 to 10,000 years ago in eastern Anatolia and China where the modern swine breeds originated (Hirst, 2019). Hirst (2021) further noted that humans learned how to control wild animals' access to food and other basic needs of life by changing their wild natural behaviour into friendly natured partners in farming. According to (Giuffra, E., Kijas, M.H., Amarger, O. V., Carlborg, J., Jeon, T. & Andersson, L.,2000) domestication of pigs was estimated to have happened 9, 000 years ago initially in the near east from local populations of wild boars. The two main types of domestic pigs were identified, a European (Sus scrofa) and an Asian farm (Sus indicus), with the sus scrofa believed to have originated from the European wild boar and the latter unknown. Researchers alleged that Europe began refining these animals 11,000 years ago and began to be adapted globally (Liberatore, 2016).

Livestock structures inhabit an estimated 30 percent of the planets' ice-free earthly surface area and are an important universal asset with a value of at least 1.4 trillion (Steinfeld *et al.,* 2006). In developing countries, the livestock sector has been progressing in reaction to the growing demand for livestock products, thus providing employment to about 1.3 billion people around the world

and directly supporting the livelihood of 600 million poor smallholder farmers (Thornton *et al*., 2006).

While some researchers linked the pigs to the dismantled Coalbrook on the Cape coast in 1778, Burgess (2013) traced their arrival in Lesotho to the Portuguese seafarers. Research also reported about 47,157 thousand pigs in Lesotho in 2020, albeit with some noticeable changes in recent years. For instance, an increasing trend will reportedly be observed between the years 1971 and 2021(Knoema, 2020). Animal husbandry has many features boosting economic viability for providing tradable goods to be supplied by small-scale farmers even under harsh weather conditions. Therefore, farmers could partake in the market throughout the year (Otte*et al*., 2012).

The increasing demand for livestock products compelled mostly by the growing population, income growth and urbanisation acts as a main opportunity for increasing farmers' productivity so as to assist in poverty eradication and economic growth in developing countries (Thornton, 2010). Further noted is that an emerging growth for locally produced livestock products is increasing in most areas. In the ensuing, keeping livestock and marketing their end products can help to diversify the local food availability in an area (Hale *et al.*, 2011).

The continuous growth of the livestock sector provides a significant breakthrough for agricultural development, poverty eradication, income distribution, food security gains and human nutrition for farmers. For the FAO (2022), the agricultural sector can also assist in uplifting rural women and young people, and revamp the efficient use of resources for improving and protecting the tenacity of families against climate shocks. Many livestock farm farmers could greatly benefit from the increasing market demands for livestock products.

According to (Otte et al., 2012) the underprivileged can benefit from the fact that livestock development crafts demand for labour, supports economic connections with the feed and processing industries and also builds food security through the supply which can lead to a decrease in prices for food of animal origin. Livestock production is key to the livelihoods of farmers by providing employment and family income for the producers and acting as a safety net for the producers. Based on nationally representative data obtained from developing countries, Davis *et al*. (2007) reported 68 per cent of the households obtaining income from keeping livestock. The livestock waste contributes to soil fertility which renders more crop production for the many farmers and the surplus could be sold in the market to gain more income. A vast majority of farmers that survive on agricultural practices live in developing countries. As the IFAD (2010) observed, close to 450 million small-scale farmers globally render survival to an estimated 2 million people.

Hegde (2019) mentioned that livestock has directly affected the livelihoods and food security positively, especially many farmers in developing countries. In such countries, farmers occupy a small land and have low income from crop production, thereby relying mainly on animal husbandry for food security. As such, the farming sector has reduced, despite being central to improving most households. Hegde (2019) and Turner (1978) observed challenges facing any steps towards changes in this sector due to the traditional mindset of the farmers, lack of infrastructure and absence of technology.

Livestock husbandry is an opportunity for the majority of less privileged and illiterate rural families. As such, it is vital to ensure that these family enterprises are able to generate adequate income for sustainable livelihood. Pig farming is a big business for large and small farmers. The case in point is South Africa, where breeding pigs for household consumption or for income and investment is a vital activity among the communities (Sibongiseni, *et al.*, 2016). However, in the

case of Lesotho, there is limited literature on the contribution of small-scale piggery production to the livelihoods of farmers though few studies have reported women as having formed pig farming groups for their livelihoods (Vincent & Freeland, 2008). Turner (2001) noted this sector as apparently being of negligible economic importance, with a handful of small stock, pig or few chickens' farmers, being among the poorest households engaged in such livelihoods' endeavours. Men have reportedly patronisingly dismissed pigs as 'the cattle of women', thus considering both pigs and poultry as important livelihood assets for poor and female-headed households. In fact, the contribution of pigs to livelihoods has hardly been given due attention like other animals and their products (Ferguson, 1990; Hoag, 2018; Rantšo & Makhobotloane, 2020).

1.2 Statement of the problem

Despite the evidence that pig farming has the potential to contribute to small- and large-scale farmers' livelihoods, there is apparently insufficient nor documented information on the contribution of small-scale pig production to the farmers' livelihoods in Lesotho. Pig farming has been sidelined and largely been known to the people with close links to communities. Information available on pigs is about indigenous pig breeds, where they are found, their characteristics and their suitability for rural conditions (Lesotho Urban Agriculture Report, 2011/2012), excluding ways in which people farm with and benefit financially from pig farming and/or pig farming potential. This situation is different from such livestock as cattle, sheep and goats which have attracted scholarly attention, with resultant documentation on their contribution to livelihoods as in the animals themselves and their products (Rantšo & Makhobotloane, 2020).

1.3 Aim of the Study

The aim of this research was to assess the contribution of small-scale piggery farming through assessing the perceptions of the small-scale farmers about contribution of piggery farming to livelihood outcomes.

1.3.1 Research Objectives

a) To determine whether pig farming has generated income for the small-scale commercial pig farmers;
b) To investigate how small-scale pig farming contributed to the well-being of the farmers;
c) To establish whether pig farming has contributed food security among the farmers;
d) To assess whether small-scale commercial pig farming has reduced farmers' vulnerability to socio-economic shocks;
e) To establish whether there is a significant association between the socio-economic characteristics (gender, education, marital status) of the participants and their perceptions concerning the contribution of small-scale pig farming to livelihood outcomes (income, improved well-being, improved well-being, improved food security and reduced vulnerability).

1.3.2 Research questions

a) How does pig farming contribute to income generation?
b) What is the contribution of pig farming to the farmers' well-being?
c) What is the contribution of pig farming to farmers' food security?
d) How has pig farming reduced farmers' vulnerability?

e) How are the socio-demographic characteristics of the participants associated with their perceptions concerning the contribution of small-scale farming to their livelihoods?

1.4 Significance of Study

This study is anticipated to contribute to literature on pig farming in Lesotho. The study would also address the void in research on pig farming, noting that the foci have to date been on such areas as cattle, goat and sheep farming and then. Finally, the study will probably contribute to policies worth implementing on ensuring the growth and sustainability of the piggery sector in the country and possibly elsewhere.

1.5 Chapter Summary

This chapter has entailed the background of the domestication of pigs and where the pigs originated. Five research questions that will assist the researcher to address the research objectives were also tabulated to shape and provide guidance for the study.

Chapter Two: Literature Review

2.1 Introduction

This chapter reviews the literature related to piggery farming both in developing countries and developed countries. The chapter begins with an overview of the poverty situation in Lesotho, thus demonstrating how different means of livelihoods including pig farming could improve lives of the Basotho. The chapter further presents the theoretical framework which underlies this study.

2.2 Review of Available Literature

2.2.1 Overview of Poverty in Lesotho

Lesotho is a country which is entirely surrounded by South Africa. The country has a population of about 2.2 million, the majority of whose livelihoods is subject to agriculture (Worldometer, 2022). Since Lesotho gained independence from the United Kingdom in 1966, it has been overwhelmed by political instability and stagnant economic growth, leaving the majority of the population in hunger. Mofolo and Rethabile (2021) reported 66 per cent of Lesotho's population as living in rural areas and relying on subsistence farming for household consumption, with the success of each harvest feeding many people. Drought experienced between 2015 and 2016 has negatively impacted on the efforts by the SDG and MDG in eradicating poverty in the country (Mekuriaw, 2014).

The main agricultural problem facing Lesotho is overgrazing, coupled with overstocking, resulting in land degradation, the problem which can be solved by destocking the land in the country (Mofolo & Rethabile, 2021). It has been recommended that destocking can be achieved by

substituting pigs, poultry, rabbits and other confined animals which do not utilise range resources for cattle, sheep and goats (Emmanuel, 2022).

The report compiled by the Help Lesotho (2015) showed that the decline in agricultural production is one of the main causes of poverty which has led to imports rising beyond 60 per cent of food requirements and livestock from neighbouring South Africa. Piggery production has played a vital role in the lives of people in Masvingo province, Zimbabwe, thus enhancing availability of food through garden farming and support of non-agricultural activities such as credit savings and improved household consumption gained from the sale of pork and increased households' savings (Chazovachii, 2012).

Pim (1935) and Staples and Hudson (1938) warned of the future of the livestock sector in Lesotho, suggesting solutions such as incorporating the construction of markets and information dissemination including animal health care and improved breeds. Vecerek*et al*. (2015) stated that the poverty rate dropped from 56.6 per cent in 2002 to 49.7 per cent in 2017, albeit being followed by an enormous decrease recorded in urban areas with noticeable stagnation in the rural parts of Lesotho. Livestock is thus regarded as an asset that generates income for households although the recent economic income growth has not reflected any remarkable increase in livestock (Vecerek*et al*., 2015).

Lesotho's poverty status can thus be avoided through using agriculture. Although the Government of Lesotho claims to practically engage in helping Basotho with agricultural produce, the policies formulated on poverty reduction should be reviewed to support farmers.

2.2.2 Combating poverty and hunger through agriculture

Agriculture is considered to be the pillar of a country's economic growth. Therefore, an increase in agricultural production would benefit in ensuring food security, employment opportunities, improvement of rural livelihoods and nutrition (Thornton, 2010). The agriculture sector is noted for adding around five per cent of the country's GDP and creating employment and income for sustaining the majority of the rural population (SPARS_LES 2019/20-2023/24). The Small-holder Agriculture Development Project (SADP) was initiated in Lesotho in 2011 to give small-holder farmers opportunities to increase their productivity and penetrate the market for more profits (Thornton, 2010).

The study conducted in China revealed the recent increasing demand of pork as influenced by highly consumed pig end products per capita, coupled with the support for new pig production systems by the government policies (Zhaohai Bai, 2019). May *et al.* (2002) emphasised that more people in Lesotho have become increasingly dependent on subsistence farming for their livelihoods with 32 per cent of families asserting agricultural production as their main source of income. Increasing households' income through agricultural production is essential to survival of families against shockwaves and food insecurity (May *et al.*, 2002). Further, livestock and land farming is more dominant in rural parts of Lesotho, whose dependency on subsistence farming and livestock sales is a means of survival for most families, more than the urban areas, especially Maseru. Das *et al.* (2021) mentioned that most small-scale pig farmers in India produce for their livelihood and food security.

For the World Bank (2007), agriculture is more effective in increasing economic growth of a country and reducing poverty worldwide, with China's cumulative agricultural progression

predicted to have been 3.5 times more effective in reducing poverty than growth outside agriculture. A steep decline in poverty alleviation for many rural households was also noted in Ghana owing to agricultural growth (May *et al.*, 2002). The overall meat production in developing countries tripled between 1980 and 2002. From 45 to 134 million tons, coupled with massive growth was experienced in countries noted for rapid economic growth, mostly in East Asia, where poultry and pig's production were dominant (Thornton, 2010).

Other studies have demonstrated a positive correlation between income growth and demand for livestock products (Steinfeld *et al.*, 2006). Between 1950 and 2000, there was an annual global per capita income growth rate of 2.1 per cent (Maddison, 2003) and it was noted that income growth was followed by an increase in expenditure on livestock products (Steinfeld *et al.*, 2006). The term livestock is defined as domestic or domesticated animals that are kept mainly for agricultural purposes. Typical examples are large ruminants such as cattle and small ruminants such as pigs, goats, donkeys as well as poultry, which amount to about 40 per cent of agricultural output in the developing world (World Bank, 2017).

Livestock is considered key to income generation for one in five people internationally. The emphasis has been on the urgency of controlling livestock infectious diseases, which are accountable for over 20 per cent loss in production (Livestock Global Alliance, 2016). It is further noted that poverty eradication is extremely unlikely without the livestock sector as it is one of the rapidly growing agricultural sectors ranking number five of the ten highest-value commodities globally. The LGA (2016) continued viewing the livestock sector as accounting for about 40 per cent of international agricultural Gross Domestic Product in the developing world.

Hale *et al*. (2011) explained that small-scale piggery producers have two key options. These include keeping limited soars and boars aimed at selling piglets after weaning to people who rear

pigs for pork or farmers who buy feeder pigs and raise them to a market weight. Agriculture is considered as the vehicle to combat poverty in rural areas mainly because agricultural activities provide employment for many rural people (Steinfeld *et al.,* 2006). Machethe (2004) emphasised that agriculture has a three-fold contribution to poverty reduction: decreasing food prices, providing employment and refining farm income. Several studies have shown that the high population of women engaged in piggery could be the way of growing the family household to assist in the farm also majority of adult people in the societies are married (Jibowo, 2012: Onyekuru et al.,2020).

2.2.3 Reasons for farming and owning pigs in developing countries

The growing demand for meat in developing countries has been a persuading motive for piggery farming (Strom *et al.,* 2017). Mosoti (2015) study showed that in Kenya, steady returns and protection against tragedies were prioritised for rearing pigs, and the sector has played a significant socioeconomic role at household and national levels. For example, forty per cent of the livestock and pig production farmers of the overall population of 5.8 million agricultural farmers in Tanzania, demonstrated a noticeable growth due to high demand in pork intake (Kimbi*et al.,* 2015).

According to Brody (2017), people prefer pig farming because pigs grow faster and provide more meat, with fewer bones in their carcass, hence increased profits. Pigs are also relatively easier to raise and require little space. In North-western Ethiopia, Mekuriaw and Asmare (2014) found that pig production significantly yields supplementary income for households, culminating in creating employment and boosting the existing food scarcity in the area.

The increasing food insecurity in developing countries has propelled small-scale farmers to actively partake in piggery farming for consumption and income generation from selling pork and piglets (Fisher & Gordon, 2008). The FAO (2021) noted that the growing prevalence of moderate to severe food insecurity has been slowly increasing worldwide since 2014, with the increase in 2020 equated to that of the previous five years combined.

Animal Farm Ng (2018) explained that one of the main reasons for piggery farming is that pigs multiply rapidly, a sow can farrow between 8 and 18 piglets at a time and they also grow to a market size quickly, thus benefiting small-scale farmers. Pig farming can be combined with such other agricultural activities as crop farming, with the pig manure being used to fertilise field crops for food security for households and growth in farm's aggregate output (Madec *et al.*, 2010).

In addition, Hirst (2021) explained that livestock contributes to food security differently. Included here are straight access to animal source food, cash income from selling livestock and their products and increased crop production due to livestock manure used on gardens. Livestock production is vital for the agricultural economy in the developing countries, where the majority of unemployed women can obtain constant income from selling meat for their families (Madec *et al.*, 2010). The FAO (2021) noted animal products being highly nutritious and providing income for small-scale producers in developing countries, resulting in buying food and agricultural inputs.

2.2.4 Benefits of pig farming

Cupido (2020) sees livestock as integral to and necessary for social life and food provision to poor communities in South Africa. Pig farming, in particular, seemingly is vital for improving the lives of emerging small-scale pig farmers in Tanzania (Strom *et al.*, 2017). Pig farming has helped small-scale farmers with an extra source of revenue and animal protein, Kimbi *et al*. (2016) and

spent the money received from selling meat from pig farming on supporting their families and improving their livelihoods. Cupido's (2020) study in Tanzania is a case in point which reported the main income source or one of the main income sources for many farmers as based on pig production (Strom *et al.,* 2017). Mutua *et al.* (2010) also attested to many farmers' views on the advantages of rural farming in African and Asian countries. Most farmers have reported that pigs are less labour-intensive than ruminants, since they allowed time for the farmers to attend to other chores (DAFF, 2015; Gcumisa, 2013; Mutua *et al.,* 2010).

Pigs can be produced in various production systems, giving people of various backgrounds the opportunity to become pig farmers (Cupido, 2020). Genetically, pigs are able to convert feed to meat more efficiently than ruminants. They also have a faster growth rate and breed easily, able to farrow twice a year and produce multiple piglets each time (Lekule & Kyvsgaard, 2003; Mutua *et al.,* 2010). (Gcumisa, 2013; Mutua *et al.,* 2010). Requiring less space than that for ruminants, pigs especially when reared intensively, are beneficial to farmers who have little land for farming (Cupido, 2020).

Other benefits of keeping pigs include the production of manure (Meissner *et al*., 2013), with some farmers in Western Kenya and KZN, South Africa claiming that pigs and/or their fat products could be used to ward off evil spirits (Gcumisa, 2013; Mutua *et al.,* 2010). Pigs have also been used for social functions (Cupido, 2020). For example, they can be offered as gifts or food to enhance social status in South Africa since many rural societies place value on livestock which can also be exchanged as dowry as an indicator of social importance (Meissner *et al.,* 2013).

2.2.5 Pig industry and pig consumption in Lesotho

Lesotho relies on imported pork from the neighbouring country, South Africa, due to low supply from the local market that does not meet the demand (Knoema, 2020). There is only one slaughtering facility in Berea district which discourages the sector from growing in other districts due to high transportation costs incurred during slaughtering (Knoema, 2020). Seeiso and Mccrindle's (2009) study in Lesotho revealed that 92.5 per cent of butcheries as illegally selling uninspected carcasses to the majority of the population. As the Department of Agriculture, Forestry and Fisheries (2019) stated, due to low supply, Lesotho applied zero per cent tariffs on pork imported from South Africa which is among the major export countries in 2018, with 21 per cent increase in value and 26 per cent increase in the quantity imported.

The pig industry is dominated by females in Lesotho because most households are female-headed, and in some cases, many men are based as migrant workers in South African mines (Nagaratna, 2013). Ferguson (1985) explained that pigs are women's animals because they feed, take care of them and in most cases are owned solely by women whereby in non-female headed households, the money gained from selling pork and piglets is separated from the family income, which makes the sector mostly female-dominated. The qualitative study conducted in Kenya showed that the main reasons for pig farming were consistent income and immunity against emergencies (Mbuthia, 2016).

Pig farming in Lesotho is a smaller enterprise than that of grazing animals. The Farming System Program Report (1986) baseline survey found 28% of the households at Siloe, 39% at Nyakosoba, and 8% at Molumong keep pigs, with the average number of 1.4 animals per household. Also reported were a few good-sized operations in the lowlands, accounting for most of the pork

products produced in the country. The need for mainly relying on imported feeds is a serious problem for farmers in a small-scale operation. The latest livestock inventory from the Bureau of Statistics recorded 53,031 pigs. It is unlikely that swine production will become a major industry in Lesotho (Farming System Program Report, 1986).

2.2.6 Marketing of pigs

Marketing is an activity practised by humans so as to satisfy their needs through an exchange of values (Petrus *et al.,* 2011). There is a high demand for pigs in developing countries, albeit with limited supply or low production for the current market. Sharma and Vanlalmalsawma (2017) noted that the state of pig marketing is unstable in developing countries, due to the limited number of farmers, who are even dispersed over a large area in the pig sector. The increasing demand in animal products is a factor of the growth in population size, family income and urbanisation (Petrus *et al.,* 2011).

Studies observed that improving the local markets for the piggery sector could develop the advantage of small-holder farmers whose financial rewards could be obtained by exploiting the opportunities in the market (Tadesse *et al.,* 2013). Marketing of pork for small-scale producers in Vietnam is inexpensive because many consumers prefer fresh pork over frozen pork which is mostly found in the small market, where over 93.3 per cent of consumers support the small-scale piggery producers (Dang-Nguyen *et al.,* 2010). Piggery production in urban areas is preferable because exotic and improved breeds which are more suitable for income generation are kept which mostly attract more consumers (Petrus *et al.*, 2011).

In addition, Ajala and Adesehinwa (2008) indicated that pig marketing in Nigeria is subjected to live sales, and is mostly controlled by middlemen, involved in modern entrepreneurship which is

limited to few government-owned limited liability companies with a negligible amount of trade. Operating under a free marketing system, market activities in the pig industry could be bought directly from the farmers or retailers. Moreover, 32 per cent of the pigs transported to the urban market was expected to be sold at maximum prices because of unstipulated marketing arrangements (Ajala & Adesehinwa, 2008).

For Machete and Chabo (2020), 1991 saw pork accounting for about 40 per cent of the total meat produced in Malaysia with an additional 50 per cent growth rate making the sector the most rapidly growing of all other agricultural subsectors. Yet the study in Malaysia showed that regardless of the high production, the market showed no corresponding increase due to the market system that is described by the long delivery chain, significant post-harvest loss and disorganised market structures (Tan Siew *et al.*, 1989).

The marketing route goes through many mediators before reaching the consumer. Merchants buy from the farm and transport live pigs to abattoirs in cages, involving long transportation resulting in weight losses and some fatalities due to unfavourable weather conditions (Ouma *et al.*, 2015). Machete and Chabo (2020) further considered marketing of pigs to be more competitive at the farm level than the retail level due to geographical differences. Costs incurred in transporting pork from the abattoir to either local or rural consumers are reflected in the final purchasing price (Costales, 2007).

Corroborating, Magsasaka (2021) posited that during pig selling, suitable consignment and travelling should be considered to avoid losses due to injuries, shrinkage where pigs could lose between 2 and 10 per cent of their initial weight. Pig production contributes significantly to livestock production, with the total amount of meat consumed and manure obtained from pig production used as fertiliser for household crop production. Elsewhere in Vietnam, pork

consumption increased from 12.84 kg/head in 2001 to 20.1 kg/ head in 2013, where preferably fresh pork was bought by over 93.3 per cent of consumers from the market (Dzung, 2014). The Vietnamese supply chain has principally been built on small-scale piggery farming where the farmers sell pigs to the middleman to transport them to the abattoirs; only a few farmers close to slaughter houses would sell directly to them (Petrus *et al.,* 2011).

2.2.7 Pig farmers in developing countries

Ouma*et al.* (2015) study in Uganda reported the farm animals' region as essentially benefiting the rural financial system and livelihood. However, with the developing urban populations the farm animals' region has been growing in towns and within the surrounding areas. Pig farming in urban areas is a mostly household activity dominated by female labour. It has largely been concentrated in slums characterised by substandard housing mechanisms with limited urban technology, with daily activities done by household members (Abu Hatab*et al*., 2021). In India among the various livestock types, piggery production is crucial as most farmers in this sector are socio economically weaker sections of the community (Saraswat, 2006).

Chiduwa*et al*. (2008) stated that the increase in meat consumption in developing countries surpasses that used in developed countries although the meat production is surplus in developed countries, with most of the meat being exported to developing countries. As Lekule and Kyvsgaard (2003) observed, the overall meat consumption increased by 70 per cent globally between 1971 and 1995, with 26 per cent increase accounted for consumption in developed countries. The FAO (2021) reported pork as the most common meat consumed in the world, accounting for 44 per cent of meat protein obtained from pork and pork products.

Apparently, pigs have the potential for increasing the economic returns in a country. Unlike other livestock such as ruminants, pigs mature faster thus being readily faster for the market; they are easily fed, with minimal investment (Siboningiseni*et al.,* 2016). The inability of small-scale commercial pig farmers to meet the demands of the growing population in Africa has totalled the imported pork to about $295 million (Mosoti, 2015). The pork production in Kenya is considered to provide lower carcass yields matched to Uganda, and South Africa considered to be the main pork-consuming countries in Africa (Chiduwa*et al.,* 2008).

The urban livestock farming is characterised by many benefits which include lower transportation costs, improved local crop production from the manure used and distributed income among local producers (Cupido, 2020). Strom *et al*. (2017) mentioned that rearing livestock in urban and peri-urban areas is vital for survival, advanced nutritional status and improved quality of life by selling pork, especially for the less fortunate people. The small-scale commercial piggery production needs limited inputs of labour and feeding and can run concurrently with household chores while providing a sustainable source of income for women (Kagira, 2010).

The study conducted in Cambodia revealed that many small-scale piggery producers were women, mostly engaged in raising pigs for sale, the finding which confirmed other studies in developing countries (Strom *et al.,* 2017). Weka *et al*. (2020) also mentioned that a shift in pig production system from small-scale subsistence occurred in the 1960s in Thailand when the improved breeds were imported from the United Kingdom.

2.2.8 Pig Breeds kept in developing countries

Lesotho Country Report (2005) showed that the introduction of exotic breeds in Lesotho was aimed at improving the performance of local breeds initiated as the government programme. Such

exotic pig breeds found in Lesotho are Landrace, Large white and Duroc. The need for pork meat in the market has been influenced by the growing prices of red meat, while the country's demand has been met by imports due to lack of suitable slaughter facilities (Lesotho Country Report, 2005). Chicken and pig are essential to food security for they are reared mainly for food refuge and cash income rather than for prestige as in the case of cattle, goats and sheep (Lesotho Country Report, 2005).

The selection of pig breeds is based on the production skills of farmers and market sustainability for the produce supplied (Kagira, 2010). Part of the exotic breeds found in the Republic of South Africa (Landrace, Large White and Duroc) is, in particular, used in the industrial sector (Swart *et al.,* 2010). Exotic breeds have been crossbred in some rural areas and smallholder farms, thus motivating a few farmers to desert the indigenous breeds, partially because indigenous breeds are less valuable because of their low production and excessive fat (Halimani*et al.,* 2012).

Suri (2012) indicated that pork accounted for a higher percentage of the amount of meat consumed in India. Pork was produced due to urbanisation, resulting in improved income for small-scale pig farmers, hence poverty alleviation. Huyen *et al.* (2017) stated that most popular breeds kept in Nagaland state, India were large black and Burmese black and their crossbreds, more commonly raised by small-scale farmers. The substitution of crossbreds resulted from increased demands for pork by the tribal population and the ability of indigenous breeds to adapt to local conditions. Furthermore, the mountainous parts of India favoured the crossbreds due to their better growth, low death rate and more back fat chunkiness than the indigenous breeds (Kagira, 2010).

For Weka *et al*. (2020), indigenous pig breeds are distinctive and unique to their original ecological areas, thus having genetic features which include resistance to diseases, adaptability to unfavourable weather and harsh production mechanisms in developing areas. Such production

qualities that are vital for survival could be inherited by future breeds. However, the fast-paced demand for pork has forced farmers to choose exotic breeds which grow faster and have a large litter size making them ready for market, while the advantages of keeping local breeds are forfeited for their inability to compete with exotic breeds (Weka *et al.,* 2020).

Exotic breeds are said to be more vulnerable to severe weather conditions and reliant on high quality feeds (Lekule & Kyvsgaard, 2003). The right type and quality of pig breeds kept by a farmer increases the probability of a successful and profitable yield. Agricdemy (2019) asserted that the most popular commercial pig breeds in Nigeria are Yorkshire, Landrace, Hampshire, Duroc breeds and their crosses. These breeds are known for providing lean meat, high feed convention, resistance to diseases and ability to withstand hot temperatures compared to local breeds (Agricdemy, 2019).

Exotic breeds that are popularly reared in developing countries are large white, land race, Duroc and Hampshire due their ability to grow faster and produce higher yields. Reports from the Lesotho Country Report (2005) and (Suri, 2012) in India, noted an increasing demand for pork in developing countries due to growing population. As such, a market deficit leading to import of pork and pork products from other countries has been reported. Also, Suri (2012) reported two breeds as retained in Thailand, native pig breeds such as Raad or Ka Done, Puang, Hailum, Kwai, and wild pigs, and the main commercial breeds, including land race, large white, duroc and their crossbreds. Native breeds are characterised by slower growth and reproduction than the commercial breeds, although they are able to survive during hot and humid conditions (Saraswat, 2006).

2.2.9 Lesotho pig distribution by district and type

According to the Lesotho Urban Agriculture Report (2011/2012), Lesotho's pig production capacity differs in each district. The presentation of pigs' distribution is shown in Table 1. Maseru reportedly had the highest number of pigs (88,447) in 2011/12, while Mokhotlong had the lowest with 409 pigs. Large White pigs were found in large numbers in Maseru (34,402). Maseru had the highest number of Landrace pigs (43,598). Nationally, the most common type of pig was Large White (80,535), followed by Landrace with 53,279 pigs, while the least common type was Large Black with 1,128. The statistical report shows just the amount of pork consumption in every district. In Lesotho, the Division of Animal Production is responsible for all production activities including advice on breeds for use and their procurement (Motsamai, 2005).

Table 2.1: Distribution of Pigs by District and Type, 2011/2012 Agricultural Year

District	Large White	Landrace	Large Black	Duroc	Other Pigs	Total
Botha-Bothe	7,497	178	0	0	0	7,675
Leribe	18,207	63	19	232	8,048	26,570
Berea	616	731	0	0	1,419	2,766
Maseru	34,402	43,598	1,109	1,591	7,747	88,447
Mafeteng	7,415	7,474	0	0	0	14,889
Mohale's Hoek	10,835	0	0	0	2,629	13,464
Quthing	79	1,048	0	0	0	1,127
Qacha's Nek	676	0	0	0	20	695
Mokhotlong	68	167	0	0	175	409
Thaba-Tseka	740	19	0	0	0	759
Lesotho	80,535	53,279	1,128	1,823	20,037	156,802

Source: Lesotho Urban Agricultural Report (2011/2012)

2.2.10 Breeding

Pig breeds kept by small-scale commercial farmers are based on their preferences and ability to produce the quality and quantity needed in the market. Hady and Lammers (2015) defined breeding as a method practised to pair a boar and a sow in order to incorporate desired features. Emmanuel (2022) offered the case of Rwanda where an experimental project to use drones to transport boar semen to veterinarians for artificial insemination to increase farmers' access to improved marketable breeds was carried out. The project improved the pig industry, predicted to be the main supplier of meat.

The new expansion of artificial insemination can assist in cutting costs associated with keeping a boar for mating with many sows, in some cases transferring diseases and risking the quality of production (Chauhan *et al.*, 2016). The high demand of pork in the market favours fast-growing breeds over indigenous pigs and higher returns for the small-scale commercial pig farmers, especially in developing countries where there is consistent demand. Akanno *et al.* (2014) stated that the genetic enhancements of pigs in tropical developing countries has concentrated on imported exotic breeds useful for commercial breeding.

Improvement of the livestock sector adds to the agricultural input in the GDP of developing countries which can be obtained by improving the productivity of distinct animals (Chauhan *et al.*, 2016). Leroy *et al.* (2016) emphasised that since the beginning of the 20th century, numerous measures have been conducted to produce new breeds which are more favourable in the market. However, the attainment has relied largely on local environments. Lack of adaptation of the crossbreds to the unfavourable weather conditions, and vulnerability to diseases have rendered them unsustainable in some developing countries.

Ocampo *et al.* (2005) indicated that in areas where the local conditions permit cross-breeding, sustainable pig production is attained which has assisted farmers to realise continuous animal performance and increased profits. The gap between the performance of breeding in developed countries and developing countries could be filled by the maximum livestock production through crossbreeding for improving the local breeds (Chauhan *et al.,* 2016). Crossbreeding between the local and developed genetic breed permits in favourable weather conditions has increased production traits including growth and milk production (Leroy *et al.,* 2016).

In most developing countries, pigs are limited, with boars mostly roaming round from poorly built housing. If pigs are not confined to properly constructed housing, breeding becomes unmanageable. Ocampo *et al.* (2005) stated that in Colombia, farmers did not manage breeding, culminating in farmers' failing to understand the overall performance of pigs. Unrestricted breeding leads to prolonged weaning of piglets, thus making the sows lose weight and need more time to gain and restore weight creating fruitless pigs (Nath *et al.,* 2013).

Fisher and Gordon (2008) stated that in Vietnam, the local breeds have been replaced and crossbred with higher producing exotic breeds because local breeds are noted to be smaller and produce low yield due to their inability to convert food. However, according to (Le Thi *et al.,* 2005), local breeds are more advantageous for small-scale producers because of their ability to stand unfavourable weather conditions, survive on poor quality feeds as well as immunity to diseases.

2.2.11 Pig housing

With the rising national demand for protein, pork is considered to be a vital source of animal protein in developing countries (Ryan *et al.,* 2015). There is little theoretical research on pig

housing and health management of pig housing in Lesotho where many small-scale farmers practise backyard farming. Different housing methods and associated health dangers have been studied (Steinfeld *et al.,* 2006). Tracey and Menkeh (2018) reported that the building of livestock housing depends on the management system, where extensive animal husbandry requires minimal inputs since animals are allowed to roam freely and for small-scale production has limited housing needs.

The choice of the design of pig housing should enable their natural behaviour such as wallowing and social interaction giving them an opportunity to show their social needs to avoid proneness to stress which could lead to wandering in their confined space and rebellious activities such as endangering other pigs (Smith *et al.,* 2014). Temperature monitoring is also vital to ensure that during cold seasons pigs are warm, by providing enough bedding for insulation purposes while in hot conditions air circulation is needed to avoid overheating, and wallowing will assist them to cool (Smith *et al*., 2014).

According to Ryan *et al*. (2015), there are three dimensions of indoor housing system based on manure management that are practised by piggery farmers in Switzerland. These include deep litter system, scrapped systems and slatted system. Tracey and Menkeh (2018) explained deep litter systems as encompassing a clean dry place where absorbent bedding is regularly changed, with animals being able to partition their housing into resting areas and defecation areas using their natural instincts. With a scrapped housing system, the areas are subdivided structurally with manure being removed; this is advantageous since there is little or no bedding needed (Tracey & Menkeh, 2018).

The slatted housing involves the setting up of slatted floors, enabling faeces to be kept in a separate division from that occupied by animals, with no bedding required (Tracey & Menkeh, 2018). Pigs

are believed to be more adaptable to weather conditions. However, it is vital to have their body temperature kept at a minimal level, because of the heat loss which could cause fatalities (Kyle, 2019). Pigs control the heat by clustering together in groups during the cold weathers or by using bedding to keep warm. Therefore, organising proper pigsty is vital (Nsoso *et al.*, 2006).

Piglets are even more vulnerable to cold weather conditions because they are born with less fat that could help to keep them warm. They should, therefore, be kept in places hotter than that of the adult pigs (Nsoso *et. al*., 2006). Chiduwa *et al*. (2008) mentioned that appropriate pig housing for piglets is vital, especially because any pre-weaning mortality is common when piglets are being unprotected from awful climate changes as in cold, rain and predators. Pregnant sows are housed separately in gestational stalls, which allows for minimal movement, proper monitoring and feeding by the farmers (Ryan *et al*., 2019).

Gebretsadik *et al*. (2016) emphasised that free range, this is non-restricted roaming pigs, pose challenges of damaging domestic crops thereby threatening food security and affecting community relationships or causing clashes within the community. Gebretsadik *et al*. (2016) study in Ethiopia concluded that local materials such as wood and grass could be used for building pigsties for keeping pigs in a safe clean environment.

2.2.12 Nutrition

Small-scale piggery production is constantly dependent on farmers for food and water on a daily basis (Chauhan *et al*., 2016). Regardless of the importance of pig farming and its improvement of household income of small-scale farmers, the sector is confronted and has had challenges. These include inability to provide sustainable feeds for pigs, thus discouraging many potential farmers,

and demotivating the already producing farmers from competitively participating in the market due to unsustainable and failing production (Tatwangire, 2014). The motive of increasing production to meet the demand of pork in the market is compromised because farmers panic expanding their production due to the challenge of obtaining the right amount of feed needed for the ideal development of pigs (Chauhan *et al.,* 2016).

Fisher and Gordon (2008) showed that the majority of cattle and pig farmers resorted to locally available feeds rather than nutritious specified feeds for animal feeding. The initiative was regarded as a working strategy to manage the feed scarcity in the urban and peri-urban of Kampala although some nutrients were lacking thus affecting the optimal growth of livestock. As mentioned earlier, pigs are among the livestock that are easily maintained through feeding, (Saraswat, 2006) noted that pigs require more concentration in their food as good converters of meat.

Elsewhere, the aggregate expenses incurred for feeding pigs was estimated at 75 per cent of the total costs of keeping pigs (Thys *et al.,* 2016). With nutritional deficiency being common in pigs, their feeding programme should be cost-effective so as to make more profits. Feeding barley with wheat, maize, sorghum, molasses could provide required energy-giving food for pigs as meat-producing animals (Saraswat, 2006). The study conducted in rural Eastern Zambia showed that participants emphasised non-confined pigs as impossible to feed appropriately. Therefore, pigs, especially their piglets, were found to be losing weight, because of scavenging and eating human faeces (Thys *et al*., 2006).

Feed shortages were regarded as the main reason for non-confined piggery, mostly during rainy seasons where feed crops for pigs were scarce. According to Smith (2006), feeding expenses incurred in piggery farming accounts to 75-80 per cent of the aggregate costs of keeping pigs. As such, feeding has been the costliest part of this sector, with the grains compounding to about 55-

70 per cent of pig rations. Otte *et al.* (2012) attributed the excessive price of feed to the market inadequacies, particularly in developing countries that do not permit small-holder farmers to compete with traders.

2.2.13 Healthcare and Mortality

Vecerek *et al*. (2015) noted that unregulated transportation of pigs for slaughter is one of the major causes of fatalities. Fatigue, injury and loss of weight occur during the movement of pigs, with the situation worsening in hot seasons; if pigs are unmonitored, they untimely die. According to Vecerek *et al.* (2015), the share of pigs that die during transportation in the European Union ranges between 0.0033 per cent and 0.5 per cent. Health care measures are crucial for keeping pigs to avoid losses which could negatively affect the livelihood, especially of farmers who mainly survive on income earned from the sale of livestock.

According to Mainau *et al.* (2015), pre-weaning piglet mortality mainly hits the commercial and welfare of farmers and the piglets usually die within 48 hours after farrowing. Crushing by the sow is considered to cause death of piglets, due to hunger; when piglets take more time close to the sow, they are likely to be squashed (Thys *et al*., 2016). Maternal behaviour is vital for the survival of piglets. Thus, good feeding of a sow enables the longer suckling period which promotes speedy growth and weight gain.

Mainau *et al.* (2015) mentioned that the scarcity of milk production in sows might account for 6 to 17 per cent of pre-weaning mortality. Inadequate and poor diet is the common cause of malnutrition in piggery which is noticeable by the sluggish growth of pigs. Growing pigs require more nutritious food than adults, and lactating sows have a weight gain. The African Innovation Institute (2016) showed that disease and parasites are economical threats in the piggery sector.

Therefore, farmers should diligently observe pigs for any diseases, and use veterinarians in the local area for guidance and infections for early diagnosis and management.

Diseases in piggery are considered to be the main challenge for small-scale producers. Diseases affect the pig performance, thus negatively impacting the income of the majority of farmers who rely on farming for household livelihood (Carter *et al.*, 2013). Health security measures are hardly considered in small-scale production because of financial constraints for veterinary services. Burgess (2020) mentioned that small-scale farmers usually miss the prophylactic procedures such as vaccination of pigs, thus facing an outbreak of diseases which affects the entire livestock production.

2.3 Theoretical Framework

This section discusses the theoretical framework underpinning this study, **Sustainable livelihood Framework (SLF).** For Chambers and Conway (1992), a livelihood entails the capabilities, assets and activities required for a means of survival. Sustainable livelihood is defined as a sufficient amount of food and income that can sustain a household to meet necessities acting as a security to resources and income earning activities for the survival of families. According to Bigsten and Tungsten (2011), livelihood has been popularised by the development theory. In this view, livelihood involves various activities in which people engage to generate income for the households rather than mainly focusing on formal actions.

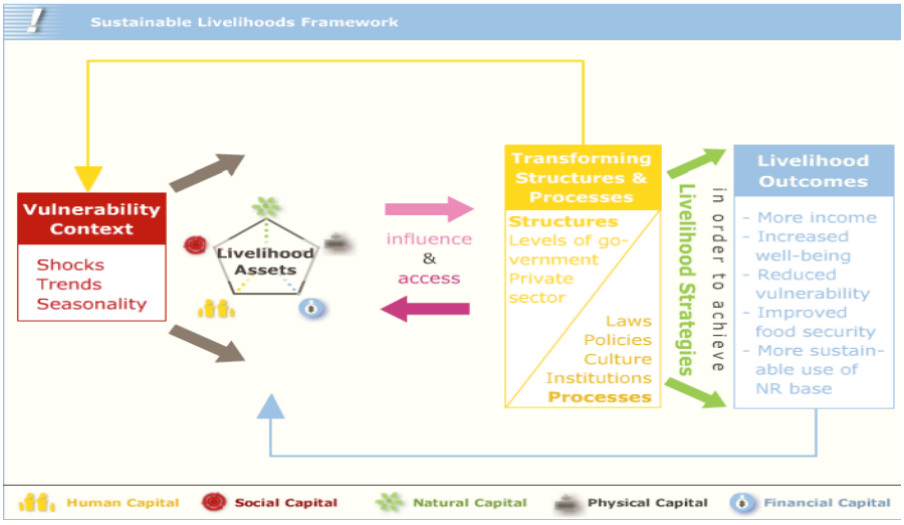
Haan and Zoomers (2003) reiterated the model of livelihood as involving people, families and groups attempting to make a living to provide the basic needs, enduring risks and taking on new chances for survival of households. Changes in resource availability mainly influenced by seasons challenge the livelihoods of households whether they can manage with uncertainties and sustain

their households over the economic tremors (Marschke &Berkes, 2006). According to Hatab*et al*. (2021), the Covid 19 pandemic has affected the small-scale livestock farmers, many of whom own livestock informally thus resulting in deteriorating food security and livelihoods of such farmers.

The Department for International Department (2000) defined SLF as supportable when it has the capabilities, assets and activities needed for living and absorbing current shocks and unforeseeable setbacks. The assets and capabilities are the most vital necessities for humans, the feature which explain the choices and strategies, worth implementing to determine the welfare outcome.

The sustainable livelihood framework aims to assist the poor to obtain improved longevity livelihood, measured using poverty indicators. Figure 2.1 below shows that SLF is an analytical tool for appreciating the livelihood mechanisms and their interactions with institutions such as the government and private sector, to achieve sustainable livelihood outcomes, more income, increased well-being, reduced vulnerability and improved food security (DFID, 2000). The ability of farmers to withstand the externalities (shocks, trends and seasonality) positively impacts on their livelihood outcomes.

Figure 2.1



Data source: DFID (2000)

Several scholars have used the Sustainable Livelihood Framework with success in livestock and pig farming in particular (Wang et al, 2021; Ho et al, 2022). They employed the SLF to determine the extent to which livestock contributes to livelihoods and their studies revealed that livestock generates income for the majority of farmers. The primary outcome of a study conducted in Jharkhand that employed a mixed methods approach showed that cattle, goats and pigs had a huge contribution towards the sustainable livelihood of the participants (Kumar et al., 2015). It was also emphasised that education, availability and access to natural resources and usage of traditional knowledge increased the sustainability of production systems.

2.4 Chapter Summary

This chapter discussed the concepts that were used to build this research and their meanings that will be adopted. Empirical literature is also discussed and entails pig farming and its contribution to farmers' livelihoods. The livelihood theoretical framework adopted in this study included the relevant concepts and how they were used and adopted in other countries.

Chapter Three: Research Methodology

3.1 Introduction

Assembling information is the most crucial part of research writing because it assists the researcher to obtain relevant answers to the research questions. This chapter entails the research methods used for data collection and justification for such specific tools. Also included are when, where and how the data were collected for the study. The specific methods and tools discussed in this chapter are research approach, research design, description of study area, target population, data collection methods, data analysis methods, ethical considerations and validity and reliability of instruments and findings.

3.2 Research approach

Grover (2015) offered three principal research approaches to any research paper, namely qualitative, quantitative and mixed methods. Premised on the positivist tradition, quantitative approach is usually used to cover a large population collecting numerical data (Daniel, 2016). Qualitative approach is interpretive and descriptive, and is intended to assist researchers to understand how and why certain phenomena happen (Stevens, 2021). Quantitative approach makes use of qualitative data that can be gathered in observations and analysed through grouping the data into categories. Yin (2009) further noted that qualitative approach investigates mainly the ways in which humans view their social world and their ideas on certain phenomena. The mixed-methods, on the other hand, are pragmatic, combining the elements of both qualitative and quantitative approaches to support and validate each other, Dawadi (2021), thereby increasing the rationality, and giving insights of the research and dependability of results (Bryman, 2007).

This study used the mixed-methods approach for two major reasons. Firstly, the study intended to understand the feelings of the small-scale pig farmers concerning their contribution to livelihoods, drawing on the literature showing the dearth of knowledge in this area of livestock in Lesotho. Noticeable in the literature is that piggery differs from such livestock as goats, sheep and cattle where scholars have contributed to knowledge (Rantšo & Makhobotlonae, 2020). Hence part of the study warranted the use of qualitative aspects of the mixed methods. Secondly, the study aimed to assess the extent to which the qualitative perceptions of the participants were widespread among the small-scale pig farmers in the Teyateyaneng, necessitating the use of quantitative approach to complement the qualitative approach.

The mixed-methods approach has been used successfully in different contexts. Doyle *et al.* (2009) provided eight benefits of employing mixed methods in research. Examples are triangulation, completeness, offsetting weaknesses and providing stronger inferences, answering different research questions, explanation of findings, illustration of data, hypothesis development and testing, instrument development and testing. Integrating qualitative and quantitative data allows more comprehensive data and clear understanding of the research problems than using one approach alone (Fetters & Freshwater, 2015). The rationale for using a mixed-methods approach is that neither qualitative nor quantitative alone can give deep insights into and responses to the research questions for the study. In addition, incorporating mixed methods helps to lower overdependence on quantitative records to explain social incidence studies which might be subjective. Although validity and reliability are acquired from quantitative research, qualitative research offers significantly in-depth, subjective and insightful interpretations of reports that offer attainable solutions to social phenomena (Jogulu & Pansiri, 2014). Jokanya (2016) emphasised that using a mixed-methods approach rather than a single approach assists qualitative and

quantitative questions to inform each other differently. Teddlie and Tashakorri (2009) affirmed that the research questions, objectives and the context of the research paper should be key to choosing a mixed-methods approach.

The study on evaluation of the production systems and constraints of smallholder pig farming conducted in Mpumalanga province, South Africa employed a mixed-methods approach where one of the research questions was to investigate the contribution of small-scale piggery to family income (Munzhelele, 2015). Chazovachii's (2012) study in Masvingo province in Zimbabwe to assess the contribution of piggery production to empowerment of rural people, also employed a mixed-methods approach to obtaining the in-depth views of farmers on the empowerment, resulting from piggery production. Therefore, this study used the mixed-methods approaches, particularly to complement the findings to answer different research questions. Also noted is that the first four sets of research questions could be answered using a qualitative approach, while the last research question warranted the use of the quantitative approach.

3.3 Research Design

Groover (2015) explained research design as a comprehensive strategy chosen to solve the problem that should integrate various elements of the study logically towards solving the problem systematically. Unlike qualitative and quantitative approaches, the mixed-methods approach employs a unique research design, with both qualitative and quantitative data collected simultaneously and having one approach inform the other. The research design assisted the researcher to obtain the results which answered the research questions logically for the study. As Dawadi (2021) observed, the choice of mixed methods research design should be carefully considered, prioritising either the qualitative data collection and analysis or quantitative data

collection and analysis; otherwise, both methods could equally be considered, depending on the research questions of the study.

Because of limited research on the contribution of small-scale commercial piggery farming to livelihoods in Lesotho, the sequential exploratory research design was adopted in this study. The design is considered to be the initial stage of research and helps to obtain alternative approaches to the phenomenon (Akhtar, 2016). This design enhanced an understanding of the small-scale commercial piggery farming in this study. Qualitative and quantitative data were kept independent throughout data collection and analysis. However, presenting the results in Chapter Five, the study began to mix the findings and the results of the two strands of the mixed-methods approach.

3.4 Sampling technique and sample size

A sample is defined as a portion of the population that represents the characteristics of the entire population of the study (Kabir, 2016). For a qualitative sample size, a set of key informants was purposefully chosen, based on their influence and roles in the society. According to Neuman (2014), non-probability permits for a sample that correlates the determination of the study and for a case to be chosen on the basis of a precise setting. Key informants provided the relevant information because of their in-depth knowledge about the phenomenon under study. As such, these informants provided first-hand information for this study.

For a quantitative sample, the study was conducted on small-scale piggery producers who keep pigs mainly for pork production and piglets with the basic intention to sell to the market or individual households. The target population were small-scale piggery farmers in Teyateyaneng

urban Council with the same characteristics, piggery producers with a minimum of two to a maximum of 50 pigs per farm.

Matata *et al.* (2001) explain the target group as a group of producers with similar characteristics enough to implement the same advice and recommendations. A simple random sampling was used for giving all the units in the study an equal chance of being chosen to participate in the study. Since the household piggery farmers were apparently few and found in scattered villages, the researcher randomly chose certain households to include for the interviews so as to ensure representativeness of the entire population and avoid any bias.

Close-ended and open-ended questions were administered for quantitative and qualitative data collection for the study. During the one-on-one interviews, the researcher ensured consistency of the interviews to obtain insights of the participants into the research problem of the study. The table below (Table 3.1) summarises the sample size and sampling procedures used.

Table 3.1

Category	**Sample size**	**Sampling Procedure**
Key informants		Purposive sampling
Councillors	2	
Chiefs	2	
Local Butchery owners	2	
Chesa Nyama street vendors	2	
Agricultural demonstrator		

	1	
Small scale commercial piggery farmers	120	Simple random sampling

3.5 Study Area

The study was conducted in Berea district which is one of the districts of Lesotho. Berea has a population of about 262,616, that is 13.32 per cent of the total population of the country as per the housing and population Census (Bureau of Statistics, 2016). There are 10 constituencies and nine community councils in Berea, with the industrial town being Teyateyaneng (TY), as depicted in the following diagram.

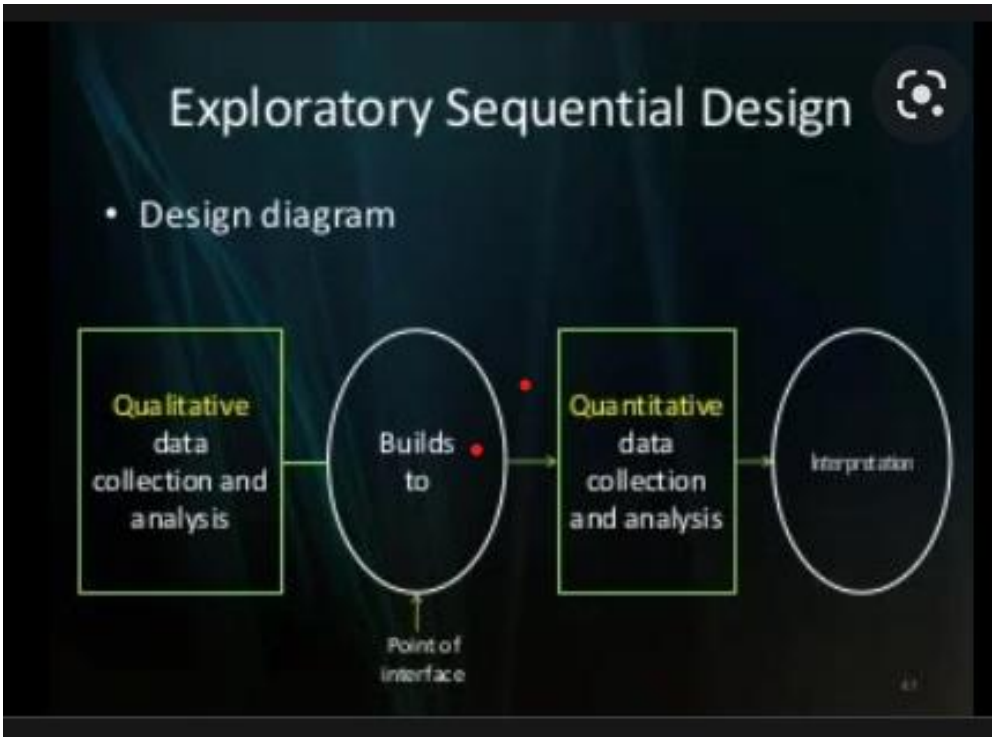
Map 3.1

Source: WorldAtlas.com (February 24, 2021)

3.6 Data Collection Methods

Data collection is a systematic process of collecting observations or measurements and permitting the researcher to obtain primary information and original depth of the research problem (Bhandari, 2021). The goal of data collection is to obtain valid and reliable information that will be used in analysing and building credible responses to the research questions (Kabir, 2016). The study followed a sequential exploratory strategy during data collection and for analysis as depicted by the following diagram.

Figure 3.2



Source: Sequential Exploratory Strategy adopted from (Terrell, 2016)

For the first phase which is quantitative data collection, guided face-to-face interviews were conducted as a research tool to provide primary data. Open-ended questions were administered and the same questionnaire was used for key informants. Their responses were recorded and transcribed at a later stage. A conductive controlled verbal conversation was maintained during the interview which assisted the respondents to fully express themselves. Blanche and Durrheim (1999) further noted that throughout the individual interview, it is vital that the researcher forms a stability in the way they enquire questions such that the interviewer discloses like a regular discussion and a question-and-answer session.

For the second phase of the study, close-ended questionnaires were completed during one-on-one interviews. To prevent bias and ensure that every participant is asked the same questions, the

research guide was prepared which entailed a list of questions that were asked the participants in a particular order. The interviews were administered in both official languages, Sesotho and English depending on the preference of the interviewee. Kabir (2016) emphasised the aim of data collection as obtaining quality raw information that then transforms into rich data analysis and permits the creation of convincing and credible answers to research questions.

3.7 Data Analysis

Data analysis is the process of transforming data with the main intention of obtaining information that responds to the research questions of the study. Creswell and Plano Clark (2017) mentioned that data analysis in mixed-methods approach involves analysing distinctly the qualitative data using qualitative methods and quantitative data using quantitative methods. This process also involves merging both databases using approaches that integrate the qualitative and quantitative results.

After data collection through interviews, the researcher classified and analysed the data, with qualitative data being transcribed, classified and categorised, and then thematic data analysis used for analysis. The quantitative data were assigned numeric values to each response in the database and sanitised, correcting data entry errors after collection to ensure meaningful results. The quantitative data were also analysed using the PSPP statistical package. Graphs and charts were created using PSPP for clear and simple presentation of the data.

3.7.1 Qualitative data analysis

Qualitative data include words, texts, observations, people and their activities. Qualitative data analysis, therefore, involves processes and procedures that are used on collected data to change them into some form of explanation, understanding or interpretation of the people and situations

under study. The researcher familiarised herself with the data and looked for trends and themes that are shown by the collected data. The *Àtlas* was used to create themes and generate reports which made it easy and less time-consuming for data analysis. The researcher chose key informants to inform the analysis, based on their roles in the lives of the small-scale piggery farmers. Most of the informants are people who purchase pork and/or piglets from farmers for either their businesses or carrying out the administration of village development and empowering the villagers.

Thematic analysis was used to analyse qualitative data. Caulfield (2019) views thematic analysis as a method of analysing qualitative data that are mostly practical on conducted interviews and transcripts. For Braun and Clarke (2006), thematic analysis is a method for systematically identifying, organising, and offering insights into patterns of meaning (themes) across a dataset. Further, Thome (2000) highlights data analysis as the most crucial phase of qualitative research which is given limited discussion in literature. Therefore, to provide informing results, the researcher has done thorough analysis to ensure validity of the outcomes.

From Braun and Clarke (2006), thematic analysis includes a continuous moving back and forward amongst the entire data set, the coded extracts of data analysed, and the analysis of data shaped. Thematic analysis took large amounts of data and formed them into groups according to their resemblance which assisted the researcher to make sense of and develop connotation from the content. Thematic analysis is significant when the research aims at finding out about people's experiences, views and opinions (Warren, 2020).

Braun and Clarke (2006) considered a six step-by-step guide for use by researchers when undertaking thematic analysis. The guide includes familiarisation with the data, generating initial

codes, searching for themes, reviewing themes, defining and naming themes, and lastly producing the report.

3.7.2 Quantitative data analysis

Analysing data using statistical methods helps to investigate variables that are being studied, their effects, relationships and contribution of the observed themes to the world (Lutabingwa & Auriacombe, 2007). Jansen and Warren (2020) explained quantitative data analysis as analysis of numerical data or data that can be converted into numbers without changing the meaning.

The statistical software that is PSPP **(**Program for Statistics**)**, was used as an analysis tool to easily transform data and provide meaning behind the numbers. The software accommodated all numerical values and provided reports, graphs for illustration. To determine the association between the livelihood outcomes and demographic characteristics of small-scale farmers, a chi-square test was employed. The null hypothesis was tested for each demographic characteristic to determine whether they would bring any significance in the livelihood outcomes. The results could be significant if the chi square value were equal to or less than the designated alpha level (0.05) and the null hypothesis would thus be accepted. For Puter and Azmang Ong (2017), investigating any significant differences between two variables towards one variable of interest could employ PSPP as a statistical software.

3.8 Validity and Reliability in the qualitative phase

As Taylor (2013) observed, validity means providing evidence that the end products of the conducted research are representative to the expected outcome patterns among the variables of interest based on theoretical arguments and empirical evidence. Avoiding any bias in the analysis and data collection was the principle for valid interpretation by not introducing the judgement of

the researcher. The factual data were collected from the participants to ensure validity of the study. The study obtained its relevance by including experts from the livestock sector through the Ministry of Agriculture.

The data collected from conducting interviews was transcribed and the atlas.ti was used to form codes and themes related to research questions. Thematic analysis was used where common themes were categorised and the views of participants were summarised, inclusiveness of short statements and longer quotes were used and different identifiers to show participant's responses (Tlali and Musi, 2022).

3.9 Validity and Reliability in the quantitative phase

In the second phase of data collection, validity was considered by using the research instruments intended to measure the variable of interest and also reliable in a way that if the same research is conducted and measured using different instruments, the same results would be obtained. The level of significance 0.05 (p value) was used as a baseline to determine the association between the socio characteristics and livelihood outcomes which is considered to provide the measure of the degree of data rapport with the null hypothesis (Di Leo and Sardanelli, 2020).

The questionnaire had the five main research questions concepts which were intended to measure the validity of results obtained in the first phase of data collection, the qualitative phase. Each of the research question items was measured on a four-point Likert scale ranging from strongly agree to strongly disagree. Both negative and positive statements were used to obtain reliable and consistent results from the participants. A questionnaire guide was piloted on a few participants to test its validity and later corrected accordingly to cater for all research objectives before data were collected.

3.10 Ethical Considerations

Prior to the data collection, the participants were requested of their informed consent thus preparing for one-on-one interviews. A thorough explanation was made to the respondents about the importance of the study and ultimate objectives that the study aims to achieve. The purpose was for the participants to understand the importance of participating in the study and adhering to the interview guide. Participation in the study was voluntary, thus allowing participants to withdraw from the study and/or ensuring their comfortably answering all the questions in the study. Participants were also assured of anonymity where their names were not written on any form of paper to protect their identity in which case such labels as P1, P2…. P9 were used for reference. Permission to photograph the target pigsties was requested before they could be presented in the study.

3.11 Chapter summary

The chapter outlined the data collection methods that were used in this study and the procedures conducted to obtain the results. It also clarified that the study followed a mixed method approach and one on one interviews were conducted in both phases, qualitative and quantitative. The study was conducted in Teyateyaneng Urban council in Berea Lesotho.

Chapter Four: Qualitative Data Presentation and Analysis

4.1 Introduction

This chapter presents qualitative data collected from the key participants from Teyateyaneng Urban Council in Berea District. The key informants were chosen for the qualitative data analysis which would, in turn, complement quantitative data in Chapter 5. The findings are presented using themes constructed from the research questions. The categories and codes developed during data analysis were used to illustrate the themes and both short and longer codes are used to show that data was collected from various participants. The next section presents demographic information of the key participants, followed by a summary of themes and categories generated during data analysis. Then follows a detailed presentation and analysis of the themes related to the literature and theoretical framework.

4.2 Participants

There were nine key participants for this study who held different positions among the units of analysis. They were deemed to have inside information on whether pig farming improved farmers' livelihoods. As Table 4.1 shows, the informants included the District Livestock Officer, the community councillors and people who bought pork on a daily basis, all of whom would have an idea about its contribution to the livelihoods of the small-scale pig farmers.

Table 4.1: A profile of key participants of the study

Key informants	**Participant's label**	**Sex (Male=M, Female=F)**	**Age**
District Livestock Officer	P1	M	40-50
Councillor 1	P2	M	40-50
Councillor 2	P3	M	40-50
Chief 1	P4	F	50-60
Chief 2	P5	M	50-60
Butchery Owner 1	P6	M	30-40
Butchery Owner 2	P7	F	30-40
ChesaNyama Street Vendor 1	P8	M	30-40
ChesaNyama Street Vendor 2	P9	M	30-40

Source: Data April, 2022

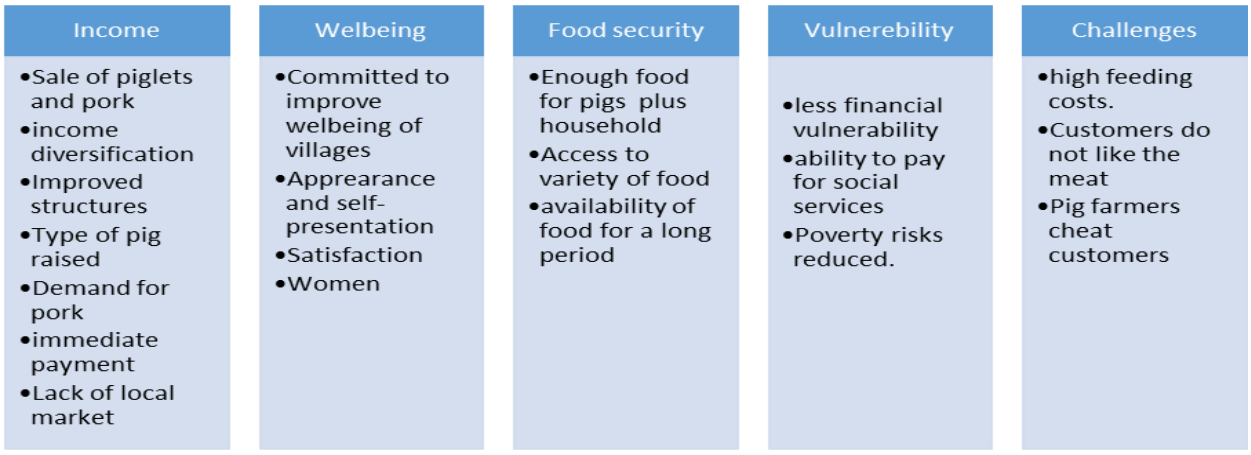
Table 4. 1 shows that most of the participants were males resulting in a total of seven males and only two females. Their age ranged between 30 and 60 years and held different positions within the community and piggery value chain, including the chiefs (traditional leaders), community

councillors, district agricultural officers, butchery owners and people who buy and sell pork on a daily basis.

4.3 Themes

Data analysis resulted in five major themes for this study, with several categories for each theme. Fig 4. 1 presents a summary of these themes and their categories followed by a detailed analysis and discussion of each of them.

Fig 4.1: Themes and categories



4.3.1 Pig farming and income generation

The data showed that pig farming improved small-scale pig farmers' livelihoods through generating income. Therefore, income emerged as a theme during data analysis though the key participants had different views about its role leading to the formation of two prominent categories within one theme. Further, some participants considered small-scale piggery farming as a good source of income for farmers, stating that the sale of pork and or piglets positively impacts on the

households' income. Butchery owners identified different ways which showed that pig farming was generating income, stating that the way in which piggery projects were started and grew were a good sign that pigs generated income. One of them stated that 'One *pig farmer would bring one pig to the butchery but within a short time she was able to bring three or more pigs*' *(P6).*

This view was confirmed by another participant stating that *"There was one piggery farmer who used to keep about four pigs but over time due to high demand for pork, the size of the litter increased to close to 50 pigs" (P7).*

Some key participants saw the income generated from the sale of pork as assisting small-scale piggery farmers to diversify into other means of generating more income for the households. Pig farmers in some cases used income from the sales of pig to buy vehicles used to generate more income, and this was confirmed by one butchery owner:

> *The small scale piggery farmer started as hunter for the market for her pork and she would hire a 4+1 taxis to distribute pork to the butcheries where she sold majority of the meat, but with time she bought her own van and would distribute the meat using it, which on some days she used it as a delivery van in town and I really think she is able to make more money from the new form of business (delivery goods for others) (P6).*

Other key informants who believed that piggery farming contributed to income argued that many farmers diversified into poultry keeping since the two projects are complementary. One street vendor specialising in selling roasted pork said, *"Piggery farmers are able to diversify their income by also keeping poultry with the income obtained from selling pork, we braai both pork and chicken bought from them'. (P9).*

The views were shared by other key participants in the study that under normal circumstances pig farmers raised chicken for sale. The district agricultural officer confirmed that the ministry was helping farmers who were raising different animals for sale including pigs and chicken. Some participants believed that pig farming helped the farmers to diversify their income to crop farming, stating that they used their waste from pig as a manure for their crops; sometimes they sold the waste to their neighbours, hence generating more income from pigs. '*In this community council, pig farmers generate income from selling the waste to other crop farmers and sometimes they use it to improve their crops that they sell or feed the pigs.' (P4).* One of the participants stated:

Some participants believed that piggery farming contributed to income generation through observing what the farmers could do to improve their lives and those of the pigs. They argued that some farmers increased the housing structures (pigsty) to accommodate more pigs, buy seeds and grow crops for selling, even keeping both pigs and poultry. It was also stated that '*Most Piggery farmers also grow vegetables in their yards and use the manure from pigs to fertilise their crops and they are also able to diversify into crop production (P8).*

Sharing the same sentiments, some key participants maintained that pig farming generated income basing themselves on the type of pigs raised. The district livestock officer who disseminates information and training workshops to small-scale piggery producers agreed that most of the farmers were able to realise profit from selling pork and piglets. Following the right feeding and care-taking procedures, they saved their pigs from contamination with dirt where they could easily be attacked by diseases. He mentioned that *"If one Camborough pig produces around 10 piglets, then that would mean the farmer will be able to sell piglets or keep the pigs for six months and slaughter them.''*

The participants stated that small-scale pig farmers generate income from this business could be confirmed by high demand for pork in the country as one participant argued:

> *Some other days the farmer would inform us on a date that the pig will be slaughtered and we would go to her place to get the pork so that it does not finish before we get the meat. Therefore, she did not have stress for payment for basic needs since we usually paid for the pork in full. (P6)*

On the other hand, other key participants felt that pig farming generated income for the small-scale farmers, but stated that certain conditions should be met. For example, one of the participants noted,

> *Piggery farmers require customers who buy their produce (pork or piglets) and pay immediately so that they are able to buy feeds for the growing piglets and the necessary basic needs for the households, that circle needs money in order to make more money for the farmer but majority of clients buy on credit which negatively impacts piggery farming. There is hardly any profit that could be gained from keeping a few pigs in the household yard, the farmers need to be given land where they can build huge structures for pigs so that they supply butcheries in the country, chesanyama street vendors and villagers and supermarkets in order to make profit.'' (P2)*

As the P2 shows here, for pig farmers to generate income, they need immediate cash, land to raise pigs and big structures to keep the pigs.

In addition, they offered that small-scale farmers require a stable market for selling their products on a "pick and pay" basis. However, due to high demands for the quality of pork by supermarkets,

they are unable to meet such targets, thus having their produce either bought by local villagers and local *chesanyama* street vendors on credit. Failure to secure a stable market where people pay immediately for the products stops the production and the livelihood of farmers who depend fully on piggery farming is affected negatively.

The findings of this study relate to the literature where Chazovachii (2012) noted piggery farming in Zimbabwe for assisting farmers with food availability through garden farming and income generation through other non-agricultural activities. Livestock has been considered key to income for one in five people internationally (Livestock Global Alliance, 2016).

4.3.2 Pig farming enhances wellbeing

The second theme derived during data collection was the enhanced farmers' wellbeing, where the key informants expressed their observations and feelings about the impact of piggery farming on the wellbeing of farmers, resulting in an enthusiasm that their lives and those of other community members could improve. Hence, one of the participants observed that:

> *Pig farmers in this village see life differently ever since they took part in piggery farming, their level of thinking is different. These are people who are willing to see change and improvement in the village. When you meet with one of them you can tell that they want to see their products improve. During our villager's monthly meetings "Pitso", they would mention that they want roads within the villages so that they are able to transport the pork and piglets easily to the market. They are anxious people who want to see improvement not only in their lives but in the village as well." (P4).*

This observation was affirmed by P6 who stated that "*there is a pig farmer at Ha Mokhothu whose life has improved, the way she looked and how she presented herself was evident that her standard of living has really improved."*

The positive impact of piggery farming on farmers' wellbeing was noted by many key participants, who maintained that pig farmers were more motivated than other members of the community to do more for the business. They were seeking information, attending workshops and reading to enhance their knowledge. One of the participants testified the observation thus,

> *Those who are successful in this sector often come to the office to seek materials such as books that they could read to become knowledgeable concerning the correct measures of keeping pigs and ensuring that they are healthy and meet the requirements of clients. (P1).*

Other key informants believe that most farmers involved in small-scale piggery farming were women. According to the key participants, women were in a better position to contribute to the wellbeing of households and communities at large. One participant testifying the observation said:

> *There are older women in this village and other nearby villages who got into small-scale piggery farming after they retired. You could tell they are satisfied doing daily activities such as feeding pigs, cleaning pigs and ensuring that they are healthy and ready for the market as the majority of them have built piggery structures in the same yard as their households.' (*P3).

As shown above, pig farming contributed to the health of some members of the community. The same observation was shared by another participant who stated that '*People who have retired,*

especially women, work in small-scale pig farming and live longer than people who do not do anything after retirement.' (P4).

The statement was supported by the District Livestock Officer who asserted that training and supervision of piggery farming was mostly attended by older women who were unemployed, which has shaped the piggery sector as a women's activity in Lesotho. Some participants commended women for enhancing community livelihoods in this way:

> *The other older woman from Lithabaneng brings pork to the butchery at the end of December and I pay her at the beginning of January the following year. She is able to pay for children's school fees and buy school uniforms with the income (P7).*

The same sentiments were shared by other participants who argued that:

> *Families that initially started as struggling when keeping pigs really improved their way of living on several levels, they are able to take children to better schools, buy clothes for children as well as buy groceries (P5).*

Other key participants commended on pig farming for reducing stress among the farmers showing that *"The piggery farmers do not have stress for payment of basic needs which includes buying food for the households and paying for education for the children."(P6)*

The findings cohere with the literature on piggery farming as contributing positively to the livelihood outcomes for many households. For Herrero *et al*. (2012), livestock contributes to food security in several ways. These include straight access to animal source food, cash income from the sale of livestock and their products and increased crop production due to livestock manure used

on gardens. As reviewed in Chapter 2, the findings of this study have observed that the majority of farmers are able to generate income from the sale of pork/piglets.

4.3.3 Pig farming and food security

Most of the key participants confirmed that food security exists among most piggery farmers.

As P6 mentioned,

"*One of the farmers from Ha Mphele was able to keep pigs only during summer days because she felt that the camborough were able to withstand hot weathers better than cold days but with that money she made from the sale of pork she was able to buy a lot of stuff which includes bags of food both for family and for feeding the pigs which would last for a longer period of time. She bought most of the variety of meat from this butcher and it was in bulk that you could see could sustain the household for a long period of time. The mincemeat and chicken pieces that I sell here she would buy.*

P4 also attested that piggery farming has allowed the many people to have meals for their households saying *"The pig manure also is used by both the farmers and their neighbours which assists them to fertilise the soil and produce vegetables in their yards."*

Accessing food is one of the measures of food security. Farmers are able to buy food for their households with the money collected from the sale of pork. Food security refers not only to access to food, but it also refers to a variety of nutritious food (Prosecov& Ivanova, 2007). As one of the participants elaborated, small-scale pig farmers were able to access a variety of nutritious food averting food insecurity. The following illustrates:

*As you can see, this is a butcher and a mini supermarket, I have noticed that after paying them they buy food from the shop and also purchase other meat, chicken or mincemeat from the butcher and they would weigh more kgs which would last them a month or two then that shows that their food security really has improved (*P7). *(Category=food accessibility)*

The majority of participants noted farmers for being able to access food for a longer period of time with the money obtained from the sale of pork or piglets. Such farmers could secure more food for a longer time before having to buy any other groceries. One of the participants stated *"Like I mentioned, most farmers are no longer struggling. You can, therefore, notice that there is money in this sector. Groceries are bought in bulk (P6).*

4.3.4 Pig farming and farmers' vulnerability

Majority of key participants have observed piggery farmers as less susceptible to financial vulnerability because they are able to afford payments for basic needs in their households, from the income obtained from the piggery sector. As such, their standard of living has improved. One participant observed that *"The standard of living has improved for the majority of small-scale producers, those who started off rearing 3 to 5 pigs have been able to increase the number of pigs and this has improved their standard of living." (P4)*

The above statement was also echoed by the chief testifying that pig farmers, unlike other people in the village, were not threatened by educational issues because they managed to pay school fees without much stress. One participant said: *"They are able to pay school fees and transportation for their children and also buy the necessary school uniforms." (P5)*

Most of the participants reported that small-scale farmers could improve their living and quality of life with the sale of pork and piglets. One of the key informants stated:

> *Most of the farmers are able to withstand the price hikes of food because they are able to buy food in large quantities. The money that they obtain from the sale of either pork or piglets is enough for them to take care of the households, which has reduced their vulnerability to lack of food and money to buy essentials that are needed in the households. (P3)*

From the perspective of the majority of key participants, small-scale piggery farmers are able to improve their livelihoods from the sale of pork and piglets when the pigs are at their slaughter weight. This view was confirmed by one of participants who stated *"Piggery production really does help reduce the susceptibility of farmers to poverty and low standard of living." (P1)*

Poverty has been an on-going phenomenon that requires remedy from both the government and other stakeholders to ensure access to food for the people in Lesotho. Omole (2003) mentioned that relative poverty levels are increasing with almost half of the Basotho regarded as poor, the feature which affects the standard of living. The ability of pig farmers to substantially increase their standard of living has impacted on the country.

4.3.5 Farmers' Challenges

During data analysis, one salient theme that emerged which was not predetermined concerned the challenges facing the small-scale pig farmers. The key informants confirmed small-scale piggery farming as contributing to the livelihoods of farmers in various ways. However, there were challenges which faced their livelihoods.

Despite being given 10 camborough pigs, comprised of one soar in Teyateyaneng Urban Council for production and meeting their growing demand for pork, "majority of the small-scale piggery farmers failed to sustain them due to high feeding costs.", the agricultural district offices reported.

Some participants attributed the small-scale pig farmers' failure to meet the demands of the big market around them, as shown below:

> *"There is money in this sector however farmers are unable to provide constant pork throughout the year. There are 5 butchers in town that require pork for their daily clients plus the so many chesanyama street vendors and the small-scale farmers fail to serve all of us." (P8)*

The same sentiments were shared by confirming that the small-scale farmers were inundated with huge demands which were beyond their capacity: *"Farmers are not consistent with keeping and providing us with pork, a week would actually pass without any farmer coming to the shop to provide us with pork (P7).*

Considering the huge market, some participants observed the small-scale farmers as successfully meeting the demands of the market because of the challenges of importing cheap pork from the Republic of South Africa. Others confirmed the challenges of cheap imports, blaming the locally produced pork on the type of meat being sold. For them, the type of breed reared by most of the farmers has not met the customers' needs. One of the participants confirmed as follows *"Majority of farmers rear camborough which does not have fat so most customers do not enjoy it,' (P6)*

The key informants also raised an issue of some farmers who apparently fed the pigs an imbalanced diet for speeding up the slaughter weight. Therefore, pigs were reportedly reared for over six

months before slaughter, resulting in an inedible pork for the clientele. As a result, local butcheries were reluctant to buy pork from them, fearing the cheating by some pork sellers. This challenge was attested in this way:

> *We need pork that is soft; at least a pig should be slaughtered when it is six months old, but with them, it grows as far as a year old. It becomes very hard when we slice it and giving it to our clients is a risk on its own since they might never come back." (P7)*

The inability of piggery farmers to meet the basic requirements of their clientele in terms of the quality of pork provided, has resulted in the country experiencing low GDP. The other reason is that butchery owners and *chesanyama* street vendors have been forced to import pork from South Africa.

4.4 Chapter summary

This chapter has presented qualitative analysis showing key informants as having been purposefully chosen to respond to the questionnaires for this study. Four themes that surfaced during analysis have assisted to respond to the research questions of the study.

The findings from the qualitative data resulted in four themes as predetermined before the study commenced. The findings showed that small-scale farming helped participants to generate income, improve their wellbeing, secure food security and reduce vulnerability, especially to economic shocks. The findings also showed farmers' ability to diversify their income into other activities such as crop production and investing in other businesses than pig farming.

Chapter Five: Quantitative Data Presentation, Analysis and Discussion

5.1 Introduction

This chapter presents the results from the data collected using quantitative approach and methods as a follow-up to the qualitative findings presented in Chapter 4. The chapter aimed at assessing the extent to which opinions expressed by participants in the qualitative data were widespread within a larger sample using Likert Scale questionnaire. Hence, the results are presented following the themes emerging in Chapter 4, adopting the mixed-methods approach for this study. This chapter begins by showing the response rate for the study followed by the socio-demographic characteristics of the sampled pig farmers in TY Urban Council. Following are the results concerning the major themes that emerged from qualitative data analysis concerning the livelihood outcomes under study. This section of the study compares the QUAL findings with the QUAN results. What follows are the results concerning the last research question which aimed to determine whether and how the livelihood outcomes were significantly affected by the demographic characteristics of the sampled population. Besides, the opinions expressed in both QUAL findings and QUAN results associated with the socio-demographic characteristics of the respondents have been assessed.

5.2 Response rate

Using information from the Ministry of Agriculture, the study planned to survey 160 pig farmers. However, only 120 respondents were available to complete the questionnaire, resulting in 75% response rate. A small portion of the sample (25%) did not avail themselves to fill in the questionnaire for several reasons. One pig farmer was absent at home during the survey, one identified farmer would no longer raise pigs; the study was conducted during the COVID-19

pandemic, resulting in restrictions to movement, while some people appeared reluctant to interact with outsiders.

5.3 Participants' demographic profile

This section presents the demographic profile of the 120 participants which includes their gender, age, dependence ratio, marital status and educational attainment among other variables.

5.3.1 Gender of the respondents

The total of 120 piggery farmers were randomly selected for interviews from Teyateyaneng Urban Council where the gender distribution of piggery farmers showed 84.2% females and 15.8% males. Table 5.1 shows distribution of the sample by gender.

Table 5.1 Total Gender of farmers

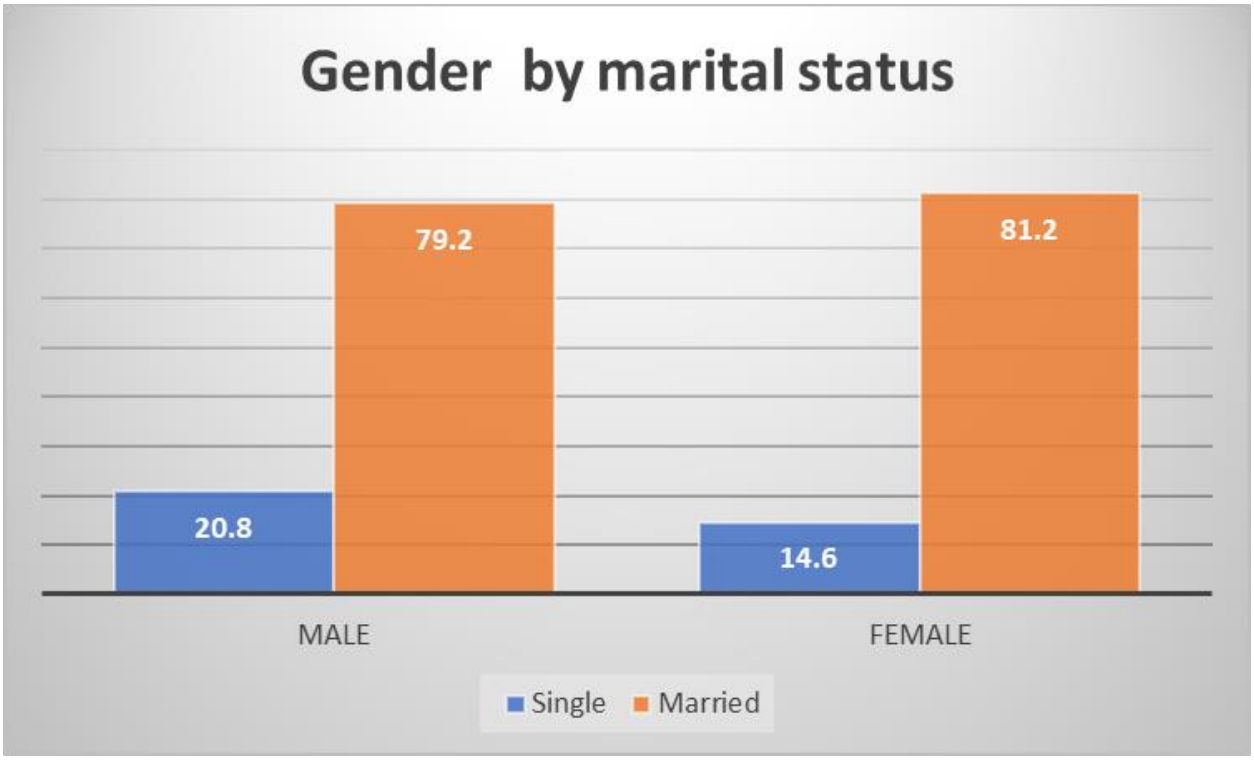
Gender	Frequency	Percentage
Male	**19**	**15.8**
Female	**101**	**84.2**
Total	**120**	**100**

Source: Data June 2022

5.3.2 Marital status of the respondents

The majority that is 81.2% of the small-scale pig farmers were married females who as depicted by the bar chart below **(Figure 5.1),** while only 20 per cent were single. More married males (79.2%) participated in piggery farming than did the single males (20.8%).

Figure 5.1

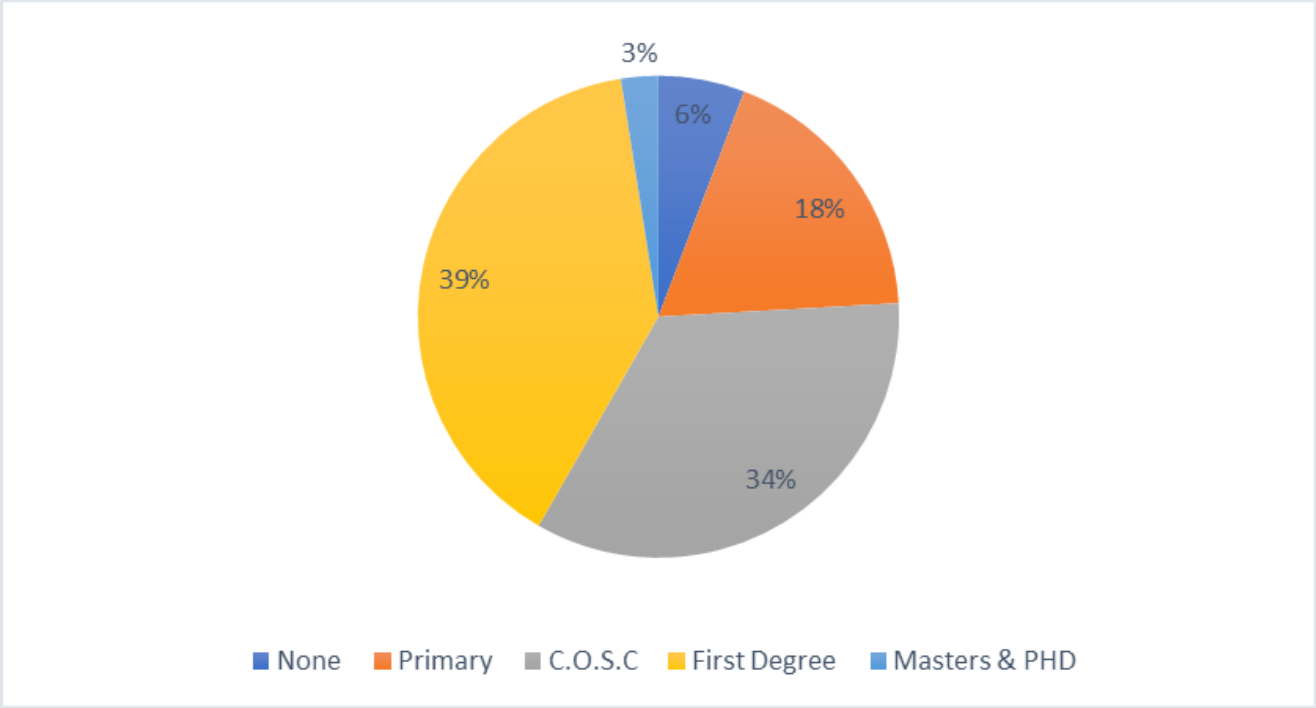


5.3.3 Educational attainment

Education levels of farmers ranged from no education to obtaining the highest qualification at a tertiary level where master's and PhD degrees were obtained. As Table 5.2 shows, the majority of the small-scale farmers had the first degree (39%), followed by those who possessed high school

certificates (34%), while 18% had primary school education. There were few respondents who did not have formal education (3%) and master's and PhD (6%).

Figure 5.2 Respondents' Educational Attainment



5.3.4 Employment status and average monthly income

Majority of the piggery farmers (69.2%) mentioned that they were employed at the time of study, while 30.8% were not engaged in any formal employment. The study investigated the income they were receiving from their formal employment which was categorised as low, middle and high income, as shown in Table 5.2.

Table 5.2 Respondents' income from formal employment

Income Range	Category	% of Farmers
Below M5,000.00	Low Income	17.3
M5,000.00- M10,000	Middle Income	28.7
Above M10,000.00	High Income	54.0

The analysis showed that 12.5 percent of farmers employed were earning low income while 20.8 percent fell in the middle-income range. Fifty-four per cent (54%) of the farmers were found in the category of high income, earning above M10, 000, 00 per month.

5.3.5 Income and expenses from piggery

The participants were asked to express their opinions concerning income and expenses derived and incurred from piggery business. For lack of proper bookkeeping records, they were asked to estimate whether they thought the income and expenses were low, middle or high, using a specified income/expenses range.

The results showed many respondents (62.5%) considered their income from pig farming as high, followed by a small percentage (24.2%) who thought the income was low. The smallest percentage

(13.3%) maintained that the income from pig farming fell within the middle range. Table 5.3 summarises the opinions of the respondents concerning the income received from piggery farming.

Table 5.3 Income

Income Range	**Category**	**Frequency**	**Percentage**
Below M5,000	Low	29	24.2
M5,000-M10,000	Middle	16	13.3
Above M10,000	High	75	62.5
	Total	100	100

When asked about the expenses incurred in managing the piggery business, the majority (87.5%) considered the expenses to be in the middle category, with 10% of them regarding the expenses as high, while the smallest per cent (2.5) maintained that the expenses were low. Table 5.4 shows the responses and their categories.

Table 5.4 Expenses

Expense Range	Category	Frequency	Percentage
Below M5,000	Low	3	2.5
M5,000-M10,000	Middle	105	87.5
Above M10,000	High	12	10.0
	Total	120	100.0

5.4 Contribution of commercial pig farming to farmers' livelihoods

This section presents the findings from the quantitative data and compares them with the qualitative data presented in Chapter 4 to assess the extent to which opinions expressed by the key participants were widespread among the larger sample. Table 5.5 shows the respondents' views concerning the income, using two proxy questions.

5.4.1 Income

Table 5.5

Responses	Strongly Agree	Agree	Strongly Disagree	Disagree
Income from piggery does not help to diversify income	8.3%	34.2%	40.8%	16.7%
Clients pay immediately for pork/piglets	10%	40.8%	45.8	3.3%

From Table 5.5, 42.5% of farmers agreed that income obtained from the sale of pork/piglets does not assist in diversifying income while 57.5% of them disagreed with the negative statement. The findings suggest that the participants considered pig farming to be actually contributing to income diversification. These results cohere with the responses obtained from the qualitative data analysis where the key informants agreed that from their observation income from small scale piggery farming assists farmers to diversify their income. The results show that unlike some data from qualitative findings which suggested that the farmers could not generate income because clients did not pay immediately, about 50.8% felt that clients paid immediately for pork and its products. Therefore, the results confirm findings in the earlier phase of the study. This is consistent with the literature which shows that small-scale pig farmers generate income from this business (Murray, 2001; Prosekov& Ivanova, 2018). However, the findings should be read with care because as the

socio-demographic characteristics of the participants showed, most of the pig farming participants were formally employed suggesting that they could generate income through supporting the pig farming business with their salaries. This was possible with other participants who had no side income. Similarly, the opinions concerning the expenses show that the majority of the respondents (87.5) thought the expenses were not too high but in the middle category, resulting from side income buffering them from the pinch of high production costs.

5.4.2 Well-being

In an attempt to investigate the contribution of piggery farming to farmer's well-being, the two proxy variables were used as in satisfaction derived from piggery farming and creation of wealth. The results showed that 30 percent of the farmers' agreed that there is little or no satisfaction derived from piggery farming while 70 per cent disagreed suggesting that the majority of the respondents felt that pig farming contributed to the farmers' well-being.

Table 5.6

Responses	Strongly Agree	Agree	Strongly Disagree	Disagree
There is little or no satisfaction with piggery farming	2.5%	27.5%	45%	25%
Piggery farming increases wealth	10.8%	56.7	30.8%	1.7%

These findings are, therefore, consistent with the reviewed literature because the majority of farmers perceive their lives as improving, realised by satisfaction with rearing pigs. Carter et al. (2017) study revealed that profitability from pig farming improved the well-being of many households especially with paying for school fees and medical bills.

5.4.3 Food security

Food security, according to the livelihood's framework, is an essential indicator of improved livelihoods. The findings from the Likert scale are presented in Table 5.7.

Table 5.7

Responses	Strongly Agree	Agree	Strongly Disagree	Disagree
Pig farming does not contribute to food security	4.2%	36.7%	39.2%	20%
Piggery farming helps the household to have food available throughout the year	10.8%	59.2%	27.5%	2.5%

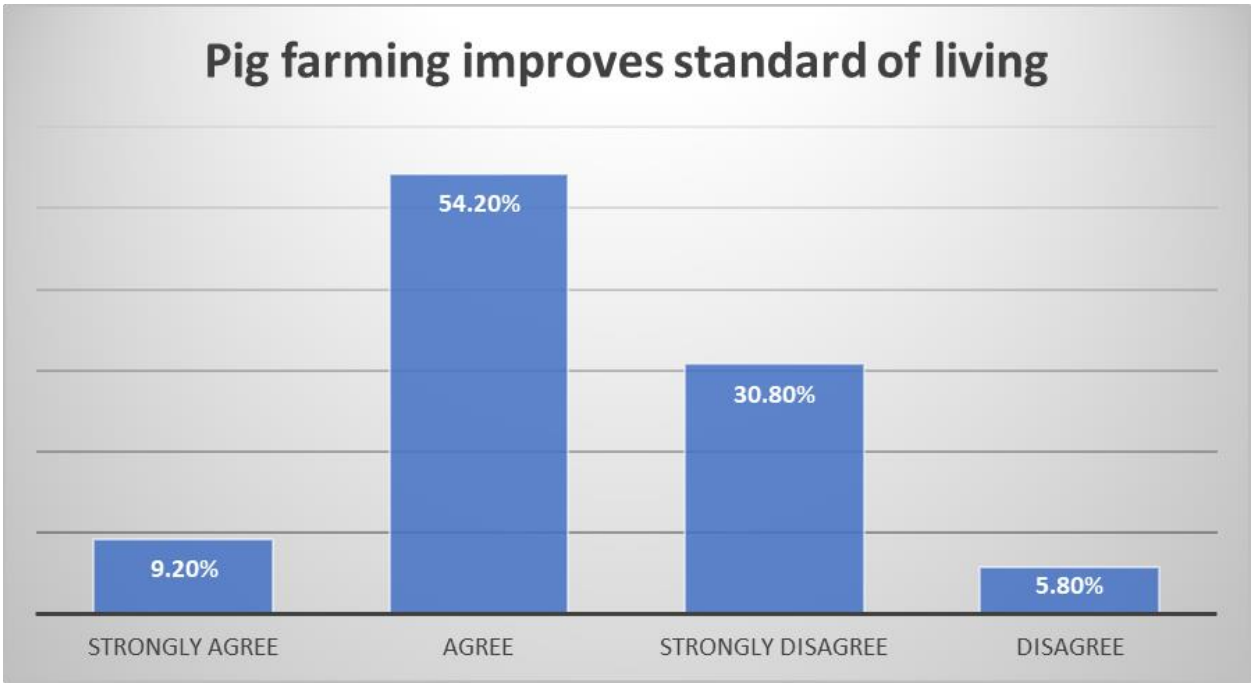
Table 5.7 shows that the minority (40.9%) of farmers stated that pig farming does not contribute to food security while a significant number, 59.1% disagreed with the statement. In an attempt to investigate the contribution of pig farming to food security, 70% of the farmer's saw farming as assisting their households to buy food throughout the year. Only 30% denied that they are able to provide food for their families with income from piggery farming. These results confirmed the responses of key informants where the majority felt that pig farming contributed to food security.

These findings support the literature in which many authors showed that countries that are dominated by livestock production, mostly pigs and poultry, have shown a significant outcome on the prevailing levels of food security (Thornton *et al.*, 2001). Similarly, in Lesotho, livestock, particularly cattle contribute to the farmers' livelihoods (Rantšo & Makhobotloane, 2020).

5.4.4 Vulnerability

With the proxy variable, a standard of living was used in this research to determine whether piggery farming could reduce the vulnerability of farmers. The results showed that 63.4% of farmers agreed that pig farming helped to improve their standard of living while 36.6 percent disagreed. Majority of the key informants (qualitative analysis) emphasised that piggery farmers could provide households with income generated from selling pork and piglets. These results are depicted by the bar chart in Fig 5.3.

Figure 5.3



As Figure 5.3 shows the majority of the participants (63.4%) believed that pig farming contributed to the reduction of vulnerability which was consistent with the findings in the QUAL aspect of the study in which the participants had such categories as less financial stress, ability to pay for social services as in health and education, while being less susceptible to poverty. Scholars who have

used the Sustainable Livelihood framework have shown that animal production reduces vulnerability. In the case of Lesotho, sheep and goats are known to buffer farmers from vulnerability; hence with shocks in the sale of wool and mohair since 2017, livestock farmers have begun complaining about their exposure to all forms of vulnerability (Mofolo &Rethabile, 202; Mokhameleli, 2015).

5.5 Association between livelihood outcomes and demographic characteristics

In this section, the significance of the demographic characteristics, namely gender, educational attainment, marital status and employment will be measured using chi-square to determine any significance or association with the livelihood outcomes. The null hypothesis was tested for each demographic characteristic to determine any significance in the livelihood outcomes, namely income, food security, wellbeing and vulnerability. The designated alpha value (0.05) was employed to test the hypothesis.

Table 5.8

	Demographic characteristic & Chi square values			
Livelihood outcomes	Gender	Education	Marital status	Employment
Income	0.102	0.889	0.016	0.606
Food security	0.598	0.912	0.778	0.315
Vulnerability	0.387	0.763	0.435	0.337
Well-being	0.179	0.141	0.238	0.002

5.5.1 Gender

The cross-tab analysis for the variables assists to determine whether gender has any significant outcome on the contribution of piggery farming to the above-mentioned variables in the table 5.8. The null hypothesis for this study is that gender is not associated with these four variables. These are independent variables, with a chi square test used to test this hypothesis. The results have been

significant if the chi square value is equal to or less than the designated alpha level (0.05) and the null hypothesis would be accepted.

The analysis showed that more females are piggery farmers who also reported being able to gain income from this sector. However, the question remains whether these differences are big enough to conclude that the variables are associated and this is answered by the chi square statistic. In this case, the p values for all the variables (income, food security, wellbeing and vulnerability) are greater than the standard alpha value (0.05). Therefore, we accept the null hypothesis that there is no significant relationship between gender and the variables. The results show that the gender of the farmer does not have any impact on whether the sector could contribute to income, wellbeing, vulnerability and food security.

5.5.2 Education

The above cross tab analysis shows that the chi square p values are greater than the standard alpha value (0.05) for all the variables (Table 5.8). The null hypothesis is that the educational attainment of farmers is independent of the variables (income, food security, wellbeing and vulnerability). With all the chi square values for the variables being greater than the alpha value, the null hypothesis is accepted. This simply shows that regardless of the level of education attained by the farmer, the income that is generated from piggery farming does not depend on the qualification. The farmer who has not attained any level of formal education, who has a COSC or tertiary qualification has equal chances of thriving and making more income in the piggery sector. Therefore, the livelihood outcomes from the contribution of piggery farming are not associated with the educational attainment of the farmer.

5.5.3 Marital status

To measure the significance of marital status on the livelihood outcomes, the chi square test has also been used and the results are shown from the table above (Table 5.8). The null hypothesis asserts that there is no association between the marital status and the livelihood outcomes (income, food security, vulnerability and wellbeing).

It can be noted from the table that the chi square value for food security (0.016) is less than the alpha value (0.05), thus rejecting the null hypothesis. This means that there is association between marital status and the livelihood outcomes. The ability of the farmer to realise income from the piggery sector is dependent on their marital status. The result is significant. However, for the remaining livelihood outcomes, food security, wellbeing and vulnerability, the chi square values are greater than the alpha value, resulting in the null hypothesis being accepted that there is no association between the marital status of the farmer and the three livelihood outcomes (food security, well-being and vulnerability). Machethe (2004) mentioned that agriculture contributes to the livelihoods of farmers in South Africa. As such, investments should be made in the main forces of agricultural growth which involve human capital, agricultural research, biophysical capital formation, and rural institutions.

5.5.4 Employment

In order to determine the significance of farmers who are also employed on the livelihood outcomes, a cross tab analysis was run to find the chi square value. The null hypothesis is that the employment status of the farmer is independent of the livelihood outcomes. From Table 5.8above, the chi square values for income, food security and vulnerability are greater than the designated level of significance, 0.05. Therefore, the null hypothesis is accepted. The results depicted no association between the employment status of the farmers and their ability to generate income from pig farming and provide food for the household. The vulnerability of farmers could be reduced

independently of the employment status of the farmer. However, with the last livelihood outcome, well-being, the results show association between employment status and improved well-being of farmers. The chi square value 0.02 is less than the alpha value 0.05. Thus, the null hypothesis is rejected, implying that there is dependence on the two variables. The well-being of farmers who are also employed has improved.

5.6 Conclusion

This chapter has presented the quantitative analysis of the data that were collected from the small-scale farmers in Teyateyaneng Urban Council. The demographic data of respondents have been presented, giving the background picture of the respondents of the study. The chapter has also presented the results concerning the livelihoods outcomes as depicted from the Sustainable Livelihood framework. Compared to the findings from Chapter Four in line with the mixed-methods approach, the results, to a large extent, have shown the findings from the key participants as widespread within the larger sample. Further presented are the results for the last research question whose objective was to determine whether the opinion expressed both in the QUAL and QUAN phases of the study were associated with any of the socio-demographic characteristics of the respondents. Using the Chi Square test, the results showed no significant association between most socio-demographic characteristics (education, gender, marital status and employment) except the marital status which was significantly associated with income, and the employment status which was dependent on the wellbeing of the target farmers.

Chapter Six: Summary of Key Findings, Conclusions and Recommendations

6.1 Introduction

This chapter presents a summary the key findings and results obtained based on the research objectives and showing how the findings relate or differ to the results. Subsequent to the key findings the chapter presents the conclusion and on the basis of the findings and the conclusion, it presents recommendations.

6.2 Summary of key findings

The study found that pig farming in Teyateyeng contributed to income generation enabling farmers to cater for household necessities and diverse their income which was consistent with other studies reviewed in this work (Gcumisa,2013; Prosecov and Ivanova, 2018)). The data derived from the key informants showed that farmers could make income from the sale of pork and piglets and the findings were largely supported by results from the quantitative phase of the study.

Both sets of data for this study confirmed that small-scale pig farming contributed to food security. As participants in the qualitative phase described different ways in which pig farming contributed to food security like have food throughout the year and having nutritious food, majority (70%) of participants reported being able to purchase food.

The findings showed that pig farming contributed to the wellbeing of the participants making them happy, reducing vulnerability for vagaries of economic shocks. This view on the contribution of pig farming on the wellbeing was widespread within the large sample in the quantitative phase resulting in 70% the participants attributing their satisfaction to keeping piggery.

As the study sat out to determine whether there was a significant association between the demographic variables of age, marital status and education among other, the findings reveal that most variable were not associated with their views on the contribution of small-scale farming and their livelihood outcomes. Only two demographic variables of marital status and employment status were significantly associated with income (0.016) and wellbeing (0.002) respectively.

6.3 Conclusion

The study aimed at determining the contribution of small-scale pig farming to the farmers' livelihoods in Teyateyaneng Urban Council. Based on the findings, the study concludes that production and practices of small-scale commercial pig farming enhanced their livelihoods which was similar to those of other developing countries. The income generated from the sale of pork and piglets assisted the farmers to outsource other means of income diversification including keeping poultry. Many of the households could provide basic necessities for their families, children's school fees, buying food, pay health bills, with vulnerability to external shocks reduced.

The study has also echoed findings of other studies conducted in other countries where small-scale pig farming has positively contributed to livelihoods (Antwi and Seahlodi, 2011; Chauhan, 2016). This was in line with the Sustainable livelihoods framework which affirms farmers are able to withstand external shocks with the assistance and guidance of laws and policies governing a country resulting in increase in income, improved well-being, food security as well as reduced vulnerability (DFID, 2000).

6.4 Recommendations of the study

In what follows are the recommendations of this study:

- There should also be frequent training sessions facilitated by the Ministry of Agriculture for small-scale commercial farmers to ensure that their production meets the requisites of butchery owners and street pork vendors. Some participants complained that farmers were not producing quality pork for the market.
- High feeding costs should be subsidised by the government to reduce the expenses incurred by farmers in pig production;
- The government of Lesotho through the ministry of agriculture should support the small-scale farmers with training on production and marketing skills because this sector seems to contribute to improve livelihoods.

References

Abu Hatab, A., Krautscheid, L. &Boqvist, S. 2021. COVID-19, Livestock Systems and Food Security in Developing Countries: A Systematic Review of an Emerging Literature. *Pathogens,* 10, pp586. Available at: https://doi.org/10.3390/ pathogens10050586 (Accessed on 12/02/2022).

Africa Innovations Institute. 2016. Piggery Production Manual: How to Rear Pigs Using the Deep Litter System (DLS) or Fermented Bed Technology (FBT). *Africa Innovations Institute*, Kampala.

Agricdemy, 2019. Pig Breeds in Nigeria. Available at https://agricdemy.com/post/pig-breed-nigeria (Accessed on 22/02/ 2022)

Akanno, E., Schenkel, F., Sargolzaei, M., Friendship, R. & Robinson, J. 2014. Persistency of Accuracy of Genomic Breeding Values for Different Simulated Pig Breeding Programs in Developing Countries. *Journal of Animal Breeding and Genetics,* 131: 367-378. Obtained from: https://doi.org/10.1111/jbg.12085 (Accessed on: 22/02/2022)

Akhtar, I. 2016. Research Design. *Research in Social Science: Interdisciplinary Perspectives.* 68-84.

Ajala, M.K. &Adesehinwa, A.O.K., 2008. Analysis of Pig Marketing in ZangoKataf Local Government Area of Kaduna State, Nigeria. *Tropicultura,* 26(4), pp 229-239

Anon. 2022. Maps. Obtained from: https://www.worldatlas.com/maps/lesotho (Accessed on: 24/04/2022).

Antwi, M. &Seahlodi, P. 2011. Marketing Constraints Facing Emerging Small-Scale Pig Farmers in Gauteng Province, South Africa. *Journal of Human Ecology,* 36:1, 37-42. DOI: 10.1080/09709274.2011.11906415

Prosekova , A. Y., & Ivanova, S. A. 2018. Food security: The challenge of the present.*Geoforum*, 91, 73–77 Obtained from: https://doi.org/10.1016/j.geoforum.2018.02.030 (Accessed on: 10/01/2022).

AnimalFarmNg. 2018. The benefits of investing in pig farming. Available at: https://www.linkedin.com/pulse/benefits-investing-pig-farming-animalfarmng- (Accessed on 08/02/ 2022).

Bhandari, P. 2021. Control Variables | What Are They and Why Do They Matter? Available at: <https://www.scribbr.com/methodology/control-variable/> (Accessed on: 22/03/2022).

Bigsten, A. &Tengstam, S. 2011. Smallholder diversification and income growth in Zambia. *Journal of African Economies,* 20(5) 781–822.

Braun, V., & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. Obtained from: https://www.doi:10.1191/1478088706qp063oa (Accessed on: 25/02/2022).

Brody, S. 2017. The many advantages of pigs. Available at: https://www.farmersweekly.co.za/animals/pigs/many-advantages-pigs/ (Accessed on: 07/02/2022).

Bryman, A. 2007. Barriers to Integrating Quantitative and Qualitative Research. *Journal of Mixed Methods Research,* 1, 8-22. Available at: http://dx.doi.org/10.1177/2345678906290531 (Accessed on: 05/02/2022).

Nagaratna, B. 2013. Assessing Contribution of Livestock to the Livelihood of Farmers of Western Maharashtra. *Journal of human ecology* . 41(2), 107-112.

Burgess, M. 2020. Bushmen, rustling & the adoption of livestock. Available at: https://www.farmersweekly.co.za/rural-insight/bushmen-rustling-the-adoption-of-livestock/> (Accessed on: 23/01/ 2022).

Carter, A. N., Humphries, S.,Grace,D., Ouma, A.E. & Dewey, E.C. 2017. Men and women farmers' perceptions of adopting improved diets for pigs in Uganda: decision-making, income allocation, and intra-household strategies that mitigate relative disadvantage, *Agriculture & Food Security, 6(18),* 1-24.DOI 10.1186/s40066-017-0095-7.

Caulfield, J. 2019. How to Do Thematic Analysis | A Step-by-Step Guide & Examples. Available at https://www.scribbr.com/methodology/thematic-analysis/ (Accessed on: 13/04/2022).

Chambers, R., and Conway, G. 1992. Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper 296,

Chauhan, A., Patel, H. H. M., Maurya, R., & Kumar, S. 2016. Production System as a Source of Livelihood in Indian Scenario. *International Journal of Science Environment and Technology,* 5(4), 2089-2096.

Chazovachii, B. 2012. Piggery production and the empowerment of rural people in Ward 21 of Gutu District, Masvingo province, Zimbabwe. *Journal of Sustainable Development in Africa*, 14(3), 164-178.

Chiduwa, G., Chimonyo, M., Halimani, T.E., Chisambara, S.R. &Dzama, K. 2008. Herd dynamics and contribution of indigenous pigs in the livelihoods of rural farmers in a semi-arid area of Zimbabwe. *Tropical Animal Health and Production,* 40, 125-136.

Costales, A. 2007. Pig Systems, Livelihoods and Poverty in South-East Asia: Current Status, Emerging Issues, and Ways Forward. Research Report. RR Nr. 07-03, Rome, Italy.

Creswell, W, J. & Plano Clark, L. V. 2018. *Designing and Conducting Mixed Methods Research*. United Kingdom: SAGE.

Cupido, M. 2020. *An Insight into the Livelihood of Small-Scale Pig Farmers in the Western Cape, South Africa*. Stellenbosch University; South Africa

Dang-Nguyen, T. Q., Tich, N. K., Nguyen, B. X., Ozawa, M., Kikuchi, K., Manabe & Nagai, T. 2010. Introduction of various Vietnamese indigenous pig breeds and their conservation by using assisted reproductive techniques. *Journal of Reproduction and Development*, *56*(1), 31-35.

Daniel, E. 2016. The Usefulness of Qualitative and Quantitative Approaches and Methods in Researching Problem-Solving Ability in Science Education Curriculum. *Journal of Education and Practice,* 7(15), 91-100.

Das, G., Hajra, D., Mukherjee, R., Hembram, S. & Roy, B., (2021). Sustainable income generation of the farmers through pig farming: A case study in Terai region of West Bengal. *Journal of Livestock Science*, 12,241-245. 10.33259/JLivestSci.2021.241-245.

Davis, B., Winters, P. Carletto, G. Covarrubias, K. Quinones, E. Zezza, A. Stamoulis, K. Bonomi, G. &DiGiuseppe, S. 2007. Rural income generating activities: a cross-country comparison. ESA Working Paper 07-16. FAO, Rome.

Dawadi, S., Shrestha, S., &Giri, R. A. 2021. Mixed-Methods Research: A Discussion on its Types, Challenges, and Criticisms. *Journal of Practical Studies in Education,* 2(2), 25-36. Available at: https://doi.org/10.46809/jpse.v2i2.20(Accessed on: 02/03/2022).

Department of Agriculture, Forestry and Fisheries. 2019. A profile of the South African pork market value chain. Available at: https://www.dalrrd.gov.za/ (Accessed on: 13/02/2022).

DFID. 2000. Sustainable Livelihoods Guidance Sheets. Department for International Development. Available at: http://www.livelihoods.org/info/guidancesheets.html. (Accessed on :19/07/ 2022).

Di Leo, G. &Sardanelli, F. 2020. Statistical significance: *p* value, 0.05 threshold, and applications to radiomics—reasons for a conservative approach. *EurRadiol Exp*, 4, (18). https://doi.org/10.1186/s41747-020-0145-y

Dzung, M. N. 2014. Pig production and marketing in Vietnam. National Institute of Animal Science (NIAS), Available at: https://www.angrin.tlri.gov.tw/English/2014Swine/p145-152 (Accessed on:19/02/2022).

Eastin, R. & Arbogast, G. 2011. Demand and Supply Analysis: Introduction. Available at: <https://www.cfainstitute.org/-/media/documents/support/programs/cfa/prerequisite-economics-material-demand-and-supply-analysis-intro.pdf> (Accessed on: 29/05/2022).

Eicher, C. K. 1994. African Agricultural Development Strategies. In: Stewart, F, Lall, S and Wangwe, S (eds.). Alternative Development Strategies in Sub-Saharan Africa. London: The Macmillan Press.

Emmanuel, N. 2022. Rwanda: Drones Deliver Swine Semen in Boost to Pig Farming. Available at: https://allafrica.com/stories/202202030461 (Accessed on: 22/02/ 2022).

Ferguson, J. 1985. The Bovine Mystique: Power, Property and Livestock in Rural Lesotho. *Man*, *20*(4), 647–674. Available at: https://doi.org/10.2307/2802755 (Accessed on: 15/02/2022).

Fernando, J.2021. Law of Supply and Demand. Available at: <https://www.investopedia.com/terms/l/law-of-supply-demand.asp.> (Accessed on: 29th May 2022).

Fetters, M., & Freshwater, D. 2015. The 1+1=3 integration challenge. *Journal of Mixed Methods Research,* Vol 9, 115-117.

Fisher. H., & Gordon, J. 2008. Breeding and feeding pigs in Vietnam: assessment of capacity building and an update on impacts. ACIAR Impact Assessment Series Report No. 52, 56pp.

Food and Agriculture Organisation. 2022. Animal production. Available at: https://www.fao.org/animal-production/en/ (Accessed on: 13/01/ 2022).

Food and Agricultural Organization. 2021. Tracking progress on food and agriculture-related SDG indicators 2021. Available at: https://www.fao.org/sdg-progress-report/2021/en/ (Accessed on :08/02/2022).

Gcumisa, S.T. 2013. The untold story of the pig farming sector of rural Kwazulu Natal: A case study of Uthukela District. MSc thesis. Available at: http://uir.unisa.ac.za/bitstream/handle/10500/14146/dissertation_gcumisa_st.pdf?sequence=1 (Accessed on: 20/06/2022).

Gebretsadik, T., Negash, D., Zeleke, B., Berhanu, T., Tera, A. &Zema, T. 2016. A review on swine production system and its status in Ethiopia: Challenges and future Prospectives, *International Journal of Nutrition and Agriculture Research.* 3(2), 93-99.

Giuffra, E., Kijas, M.H., Amarger, O. V., Carlborg, J., Jeon, T. & Andersson, L. 2000. The Origin of the Domestic Pig: Independent Domestication and Subsequent Introgression. *Genetics*, 154(4), 1785–1791.

Godber, O. F. & Wall, R. 2014. Livestock and food security: vulnerability to population growth and climate change. *Global Change Biology*, 20, 3092-3102. Available at: https://doi.org/10.1111/gcb.12589(Accessed on: 07/03/2022).

Government of Lesotho. 2019. Agriculture has Potential to Reduce Poverty-PM. Available at: https://www.gov.ls/agriculture-has-potential-to-reduce-poverty-pm/ (Accessed on: 17/03/ 2022)

Grover, V.2015. RESEARCH APPROACH: AN OVERVIEW. *International Multidisciplinary Research Journal.* 4(8), 1-8.

Hady, A. A. & Lammers, P. 2015. Pig Breeding Systems for Small and Beginning Pig Farmers. Available at: https://porkgateway.org/resource/pig-breeding-systems-for-small-and-beginning-pig-farmers/ (Accessed on 22/02/ 2022).

Hale, M., Coffey, L., Spencer, T. & Pressman, A. 2011. *Small-scale Livestock Production*.NCAT Agriculture Specialists, Available at: https://www.attra.ncat.org. (Accessed on: 14/02/2022).

Halimani, T. E., Muchadeyi, F. C., Chimonyo, M. &Dzama, K. 2012. Opportunities for conservation and utilisation of local pig breeds in low-input systems in Zimbabwe and South Africa. *Tropical Animal Health Production,* 45(1): 81-90.

Hegde, N. 2019. Livestock Development for Sustainable Livelihood of Small Farmers. *Asian Journal of Research in Animal and Veterinary Sciences*, 3(2): 1-17. Obtained from: https://journalajrs.com/index.php/AJRAVS/article/view/30040 (Accessed on: 22/02/2022).

HelpLesotho. 2015. Agriculture of Lesotho. Available at: https://www.helplesotho.org/wp-content/uploads/2015/03/9.-agriculture (Accessed on 26/01/2022).

Hirst, K. K. 2019. The Domestication of Pigs: Sus Scrofa's Two Distinct Histories." ThoughtCo. Available at: https://www.thoughtco.com/the-domestication-of-pigs (accessed on:18/01/ 2022).

Hirst, K. K.2021. Animal Domestication - Table of Dates and Places. Retrieved from: https://www.thoughtco.com/animal-domestication-table-dates-places-170675 (Accessed on: 21/01/2022).

Ho, N., Do, T. L, Tran, D. T. & Nguyen, T. T. 2022. Indigenous pig production and welfare of ultra-poor ethnic minority households in the Northern mountains of Vietnam. *Environment, Development and Sustainability*, 24, 156 -179.

Huyen, L.T.T., Muth, P.C., Markemann, A., Schöll, K. & Valle, A. 2015. Potential for development of a marketing option for specialty local Ban pork of a Thai ethnic smallholder cooperative group in northwest Vietnam. T*ropical Animal Health and Production.* 1-9.

Huyen, L.T.T., Padmakumar, V., Marshall, K., & Deka, R.2017. Pig breeds, breeding systems and supply and demand for genetic materials in Nagaland, India. ILRI Project Report. Nairobi, Kenya: International Livestock Research Institute (ILRI).

Jackson, M., Rewe, T., & Alexander, K. 2014. Evaluation of pig production practices, constraints and opportunities for improvement in smallholder production systems in Kenya. *Tropical Animal Health and Production,* 47. 10.1007/s11250-014-0730-2.

Jansen, D. & Warren, K. 2020. Quantitative Data Analysis 101. Available at: https://gradcoach.com/quantitative-data-analysis-methods/ (Accessed on: 26/04/2022).

Jibowo A.A. 2012. *Essentials of Rural Sociology.* Abeokuta: GbemiSodipo Press Ltd

Jogulu, U. &Pansiri, J. 2011. Mixed methods: A research design for management doctoral dissertations. *Management Research Review,* 34. 687-701. 10.1108/01409171111136211.

Jokonya, O. 2016. The Significance of Mixed Methods Research in Information Systems Research. *MWAIS 2016 Proceedings,* 20. Available at: http://aisel.aisnet.org/mwais2016/20(Accessed on: 12/03/2022).

Kabir, S. M. S. 2016. *Methods of Data Collection. In Basic Guidelines for Research: An Introductory Approach for All Disciplines*. Bangladesh: Book Zone Publication. Available at: https://www.researchgate.net/publication/325846997_METHODS_OF_DATA_COLLECTION (Accessed on: 26/03/2022).

Kagira, J.M., Kanyari, P.W.N., Maingi, N., Githigia, S.M., Ng'ang'a, J.C. &Karuga, J.W. 2010. Characteristics of the smallholder free-range pig production system in western Kenya. *Tropical Animal Health and Production,* 42 (5), 865-873.

Kambashi, B., Picron, P., Boudry, C., Théwis, A., Kiatoko, H. &Bindelle, J. 2014. Smallholder pig production systems along a periurban-rural gradient in the Western provinces of the

Democratic Republic of the Congo. *Journal of Agriculture and Rural Development in the Tropics and Subtropics,* 115 (1), 9–22.

Kimbi, E., Lekule, F., Mlangwa, J., Mejer, H. &Thamsborg, S. 2015. Smallholder Pigs Production Systems in Tanzania. *Journal of Agricultural Science and Technology*, 5, 47-60.

Knoema, 2020. Lesotho - Number of pigs. Available at: https://knoema.com/atlas/Lesotho/topics/Agriculture/Live-Stock-Production-Stocks/Number-of-pigs (Accessed on: 23/01/2022).

Kumar, M., Gupta,J., Radhakrishnan, A. & Vikram, S. 2015. Contribution of livestock production systems towards the sustainable livelihood of the tribes of Jharkhand. *Indian Journal of Animal Sciences,* 85 (5), 519–521.

Kyle, D.2019. Importance of Temperature and Environment for Pig Housing. Available at: https://www.health12online.com/importance-of-temperature-and-environment-for-pig-housing/ (Accessed on 23rd February 2022).

Lekule, P.F. &Kyvsgaard, C. N. 2003. Improving pig husbandry in tropical resource-poor communities and its potential to reduce risk of porcine cysticercosis. *Acta Tropica*, 87, 111-117.

Le Thi Thanh, H., Roessler R., Lemke U. & Zarate A.V. 2005. *Impact of the use of exotic compared to local pig breeds on socio-economic development and biodiversity in Vietnam*. Institute of Animal Production in the Tropics and Subtropics, University of Hohenheim: Stuttgart.

Leroy, G., Baumung, R., Boettcher, P., Scherf, B., & Hoffmann, I. 2016. Review: Sustainability of crossbreeding in developing countries; definitely not like crossing a meadow. *Animal*, *10*(2), 262–273.

Lesotho Country Report. 2005. State of the world's animal genetic resources. Available at: https://www.fao.org/3/a1250e/annexes/CountryReports/Lesotho (Accessed on 21/02/ 2022).

Lesotho Farming Systems Research Project. Program Report. 1986. Washington State University and Lesotho Ministry of Agriculture and Marketing. Pullman, Washington: WSU (Washington State University).

Lesotho Urban Agriculture Report. 2011/2012. Statistical Report No:34:2013. Available at: https://www.bos.gov.ls/ (Accessed on 16/07/ 2022).

Liberatore, S.2016. From giant GM salmon to buffed up Belgian Blue beef: What the animals we eat looked like BEFORE humans began breeding them for food. Available at: https://www.dailymail.co.uk/sciencetech/article-3459168/From-giant-GM-salmon-buffed-Belgian-Blue-cattle-animals-eat-looked-like-humans-began-breeding-for-food (Accessed on 20/01/ 2022).

Livestock Global Alliance [LGA]. 2016. Livestock for sustainable development in the 21st century 2016. Retrieved from: http://www.livestockdialogue.org/fileadmin/templates/res (Accessed on: 14/02/2022).

Lutabingwa, J. &Auriacombe, C.2007. Data Analysis in Quantitative Research. *Journal of Public Administration*,42(6), 528-548.

Machete, J., &Chabo, R.2020. A Review of piggery manure management: generally, across western, Asian and African countries. *Botswana Journal of Agriculture and Applied Sciences*, *14*(1), 17-27. Available at: https://doi.org/10.37106/bojaas.2020.17 (Accessed on: 10/02/2022).

Machethe, C. L., 2004. Agriculture and poverty in South Africa: Can Agriculture Reduce Poverty? Available at: https://sarpn.org/documents/d0001005/P1125-Agriculture-Poverty-Machethe-2004 (Accessed on 06/02/2022).

MacMahon, J. 2020. Africa, Development, Global Poverty, HIV, Lesotho: Factors Affecting Poverty in Lesotho. Available at: https://borgenproject.org/tag/poverty-in-lesotho/ (Accessed on: 25/01/ 2022).

Maddison, A.2003. *The world economy: historical statistics.* Paris, France: OECD.

Mainau, E., Temple, D. and Manteca, X. 2015. *Pre-weaning mortality in piglets.* Available at: https://www.fawec.org/en/fact-sheets/36-swine/116-pre-weaning-mortality-in-piglets (Accessed on: 27/02/ 2022).

Magsasaka, J.2021. Pig Production: Marketing and Transporting of Pigs. Available at: https://www.juanmagsasaka.com/2020/12/pig-production-marketing-and.html (Accessed on :19/02/ 2022).

Makoa, F.1999. Lesotho's Rural Development Policy: Objectives and Problems, *Review of Southern African Studies,* 3 (1): 38-59.

Mario, H., Delia, G., Jemimah, N., Nancy, J., Dolapo, E., Silvia, S., & Mariana, R. 2012. The roles of livestock in developing countries. *Animal: An International Journal of Animal Bioscience.* 7. 1-16.

Marschke, M. J., and Berkes, F.2006. Exploring strategies that build livelihood resilience: a case from Cambodia. *Ecology and Society*,11(1),42. Retrieved from: http://www.ecologyandsociety.org/vol11/iss1/art42/ (Accessed on: 15/02/2022).

Maru Yiheyis T., Davies Jocelyn (2011) Supporting cross-cultural brokers is essential for employment among Aboriginal people in remote Australia. *The Rangeland Journal*,**33**, 327-338. https://doi.org/10.1071/RJ11022.

May, J., Roberts, B.,Moqasa, G. & Ingrid Woolard, I. 2002. Poverty and Inequality in Lesotho. CSDS Working Paper No. 36.

Mbuthia,J.M., Rewe, O.J. &Kahi, K.A., 2015. Evaluation of pig production practices, constraints and opportunities for improvement in smallholder production systems in Kenya.*Tropical Animal Health and Production*, 47, 369–376 .

Meissner, H.H., Scholtz, M.M. & Palmer, A.R. 2013. Sustainability of the South African livestock sector towards 2050 Part 1: Worth and impact of the sector. S. Afr. J. Anim. Sci. 43, 282–297. DOI: 10.4314/sajas. v43i3.5.

Mekuriaw, Y. and Asmare, B. 2014. Assessment of Pig Production and Constraints in Mecha District, Amhara Region, Northwestern Ethiopia. *Advances in Agriculture*, 1-5, Available at: https://doi.org/10.1155/2014/329254 (Accessed on: 27/02/2022).

Mofolo, T. C. &Rethabile, K. M. 2021. Identifying Challenging Barriers to Farmers' Adaptation to Climate Change: A Case of Leribe District, Lesotho. *International Journal of Scientific Advances*, 2(3),246-252. DOI: 10.51542/ijscia.v2i3.4.

Mohakud, S. S., Hazarika, R. A., Sarat S., Durlav P. B., Archana, T., Santanu, T. & Johanna F. L. 2020. The extent and structure of pig rearing system in urban and peri-urban areas of Guwahati,

Infection Ecology & Epidemiology. 10(1), Available at: https://DOI:10.1080/20008686.2020.1711576 (Accessed on: 13/02/2022)

Mokhameleli, S. 2015. Hunger and food security dynamic: an empirical study of the 'Moteng Community Council in Lesotho. *Journal of Public Administration, 50*(2), 299-307.

Mosoti, M. C.2015. The pork value chain a review of the actors and the business opportunities in the sector, in Kenya. Available at: https://agriprofocus.com/upload/Driving_the_pig_Sector-Pork-Value-Chain-Report-1421660756.pdf (Accessed on: 20th February 2022).

Motsamai, B. 2005. State of the World's Animal Genetic Resources: Lesotho Country Report.

Munzhelele, P. 2015. Evaluation of the production systems and constraints of smallholder pig farming in three agro-ecological zones of Mpumalanga province, South Africa, University of South Africa, Pretoria, Available at: http://hdl.handle.net/10500/20992 (Accessed on: 20/02/2022).

Murray, C. 2001. Livelihoods research: some conceptual and methodological issues. *Chronic Poverty Research Centre Working Paper*, (5).

Mutua, F.K., Arimi, S., Oraga, W., Dewey, C. & Schelling, E. 2010. Farmer Perceptions on Indigenious Pig Farming in Kakamega District, Western Kenya. Nord.*Journal of African Studies.* 23, 43-57. Available at: http://www.lrrd.org/lrrd23/7/mutu23144.htm%5Cnhttp://hdl.handle.net/10568/5369.

Neil Adger, W. 2006. Vulnerability, *Global Environmental Change,*16(3), 268-281,ISSN 0959-3780, Available at: https://doi.org/10.1016/j.gloenvcha.2006.02.006. (Accessed on: 21/06/2022).

Neuman, W. L. 2014. *Social research methods: qualitative and quantitative approaches*. Harlow: Pearson.

Njuki, J., Poole, J.,Johnson, N., Baltenweck,I., Pali,P., Lokman, Z. & Mburu, S. 2011. Gender, livestock and livelihood indicators. Available at: https://cgspace.cgiar.org/bitstream/pdf> (Accessed on 06/06/ 2022)

Nsoso, S.J., Mannathoko, G.G. & Modise, K. 2006. Monitoring production, health and marketing of indigenous Tswana pigs in Ramotswa village of Botswana. *Livestock Research for Rural Development.* 18 (9): 125

Ocampo, L.M.,Leterme, P. &Buldgen, A. 2005. A survey of pig production systems in the rainforest of the pacific coast of Colombia. *Tropical Animal Health Production,* 37: 315-326.

Omole, A. D. 2003. Poverty in Lesotho: A Case Study and Policy Options. *Lesotho Social Science Review,* 1-20

Onyekuru N.A., Ukwuaba I.C. & Aka E.O. 2020. Economics of piggery enterprise in Nigeria: a case study of Udi Local Government Area of Enugu State, Nigeria. *Agro-Science,*19 (2), 6-12. DOI: https://dx.doi.org/10.4314/as.v19i2.2

Otte, J., Costales, A., Dijkman, J., Pica-Ciamarra, U., Robinson, T., Ahuja, V. & Roland-Holst, D. 2012. Livestock sector development for poverty reduction: An economic and policy perspective Livestock's many virtues. Rome, Food and Agriculture Organization.

Perkins, D. D. 2010. Empowerment. In R.A. Couto (ed.), political and civic leadership: a reference handbook. Thousand oaks, CA: SAGE.

Perkins, D. D., & Zimmerman, M. A. 1995. Empowerment theory, research, and application. *American Journal of Community Psychology*, 23, 569-579.

Pim, A. V.1935. Financial and Economic Position of Basutoland. Report of the Commission appointed by the Secretary for State for Dominion Affairs, His Majesty's Stationary Office: London.

Puteh, F., Azman, O. &Mohd H. 2017. Quantitative Data Analysis: Choosing Between SPSS, PLS and AMOS in Social Science Research. *International Interdisciplinary Journal of Scientific Research*,3(1), 14-25.

Rametse, N. & Shah, H. 2012. Investigating Social Entrepreneurship in Developing Countries. World Review of Business Research, 3(2), 94-112.

Rantso, T. &Makhobotloane, M. 2020. The Contribution of Lesotho Dairy Products to the Livelihoods of Dairy Farm Households in Maseru and Berea Districts in Lesotho. *International Journal of Rural Management,* 16(3), DOI:10.1177/0973005220930383.

Ryan, E. B., Fraser, D. & Weary, D. M. 2015. Public Attitudes to Housing Systems for Pregnant Pigs. PLoS ONE 10(11): e0141878, Obtained from: https://doi.org/10.1371/journal.pone.0141878 (Accessed on: 17/02/2022).

Saraswat, L. B.2006. Piggery. Available at: http://124.124.221.9/bitstream/123456789/429/1/Piggery%20-%20formatted.pdf (Accessed on 24/02/2022).

Seeiso, T. M. &McCrindle C.M.E. 2009. An investigation of the quality of meat sold in Lesotho. *Journal of the South African Veterinary Association*,80(4), 237–242.

Sharma, L. S. &Vanlalmalsawma. 2017. Marketing of Pig in Mizoram: A Study on Select Districts. 9. 11-33.

Sibongiseni, T. G., James, W. O. & Mary, M. M. 2016. Pig Farming in Rural South Africa: A Case Study of Uthukela District in KwaZulu-Natal. *Indian Journal of Animal Research*, *50*(4), 614-620.

Smith, H. M., Meehan, C. L., Justine, M., Hisakawa, N., Dasher, S.H. & Camarillo, D.J., 2014. Pig Housing: Designing a Swine Habit. Available at: https://anrcatalog.ucanr.edu/pdf/8480.pdf (Accessed on 23/02/2022)

Staples, R. R. & Hudson, W. T. K. 1938. An Ecological Survey of the Mountain Area of Basutoland. Crown Agents, London.

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M. & de Haan, C. 2006. Livestock's long shadow: environmental issues and options. Rome, Italy: FAO.

Strategic Plan for Agriculture and Rural Statistics for Lesotho (2019/20-2023/24). Available at: https://www.bos.gov.ls/ (Accessed on 28/01/2022).

Strom, G., Djurfeldt, D. A., Boqvist, S. A., Sokerya S. S., et al. 2017. Urban and peri-urban family-based pig-keeping in Cambodia: Characteristics, management and perceived benefits and constraints. *PLoS ONE,* 12 (8), Available at: https://doi.org/10.1371/journal.pone.0182247 (Accessed on: 25/02/2022).

Sulla,V., Zikhali, P. & Mahler, D. G. 2019. *Lesotho Poverty Assessment : Progress and Challenges in Reducing Poverty (English)*. Washington, D.C.: World Bank Group, available at: https://documents.worldbank.org/curated/en/387071576240590486/Lesotho-Poverty-Assessment-Progress-and-Challenges-in-Reducing-Poverty (Accessed on: 14/01/2022)

Suri, M. 2012. *Pork meat in India. New Delhi*, India: Botschaft.

Sushil, P., Sushi, K., & Lok Raj, J. 2012. *Small Scale Livestock Farming:* Solution to Poverty. AHTCS Souvenir.

Swart, H., Kotze, A., Olivier, P.A.S. &Grobbler, J.P. 2010. Microsatellite-based characterization of Southern African domestic pigs (Sus scrofa domestica). *South African Journal of Animal Science,* 40(2): 121-132.

Tadesse D., Singh H., Mengistu A., Esatu W., & Dessie T. 2013. Study on management practices and marketing systems of village chicken in East Shewa, Ethiopia. *African Journal of Agricultural Research*, 8(22), 2696-2702.

Tan Siew, H., Zainal, A. M., Eddie, C. F. C. & Mad, N. S. 1989. Government Incentives and Comparative Advantage in Livestock and Feedstuff Sectors in Malaysia, Vol. II. Consultancy report to ADB. Kuala Lumpur: ISIS.

Tanga, T. P. 2007. Social Grants and the Fight Against Poverty in South Africa,*Lesotho Social Sciences Review*, 11 (1 & 2).

Taylor, S. C. 2013. *Validity and Validation.* United States of America: Oxford University Press

Teddlie, C. &Tashakkori, A. 2009. Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Techniques in the Social and Behavioral Sciences. Thousand Oaks, CA Sage.

Terrell, R. S. 2012. Mixed-Methods Research Methodologies. *The Qualitative Report*, 17(1) 254-280. Obtained from: http://www.nova.edu/ssss/QR/QR17-1/terrell.pdf (Accessed on: 02/02/2022).

Thorne, S. 2000. Data analysis in qualitative research. *Evidence Based Nursing*, 3, 68–70. DOI:10.1136/ebn.3.3.68.

Thornton P. K. 2010. Livestock production: recent trends, future prospects. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, *365* (1554), 2853–2867. Obtained from: https://doi.org/10.1098/rstb.2010.0134 (Accessed on: 05/02/2022).

Thys, S., Mwape, E.K., Lefèvrea, P., Dorny, P., Phiri, M.A., Marcottye, T., Phiri, K.I. & Sarah, G. 2006. Why pigs are free-roaming: Communities' perceptions, knowledge and practices regarding pig management and taeniosis/cysticercosis in a Taenia solium endemic rural area in Eastern Zambia. *Veterinary Parasitology*, 22, 33–42.

Tlali, L.T. & Musi, M.L. (2022). Effects of COVID-19 on Ecotorism in Lesotho: A Thematic Analysis of Challenges, Coping Strategies and Lessons Learned. African *Journal of Hospitality, Tourism and Leisure*, 11(1), 190-207. DOI: https://doi.org/10.46222/ajhtl.19770720.220

Tracey, K. &Menkeh, I. M. 2018. The Effect of Housing Systems on the Welfare of Pigs in Santa Sub-Division in the North West Region of Cameroon. *Journal of Environmental Issues and Agriculture in Developing Countries*, 10(1), 2141-2731.

Turner, S. T. 1978. *Sesotho farming: the condition and prospects of agriculture in the lowlands and foothills of Lesotho*. PHD. University of London, School of Oriental and African Studies (United Kingdom)

Turner, S. 2001. Livelihoods in Lesotho. Available at: https://sarpn.org/documents/d0000204/P211_Livelihoods_Lesotho_April%2001.pdf (Accessed on 16/07/2022).

Vecerek, V., Voslarova, E., Malena, M. &Bedanova, I. 2015. Mortality in Pigs Transported for Slaughter. *Journal of Agricultural Engineering and Biotechnology*. 27-31. 10.18005/JAEB0301004.

Volkmann, C. K., Tokarski, K. O., & Ernst, K. 2012. *Background, Characteristics and Context of Social Entrepreneurship*. In Volkmann, C. K., Tokarski, K. O., & Ernst, K. (Eds.) Social entrepreneurship and social business (pp. 3-30). Springer Verlag.

Warren, K. 2020. Qualitative Data Analysis Methods 101: The "Big 6" Methods + Examples. Available at:https://gradcoach.com/qualitative-data-analysis-methods/ (Accessed on 29/11/ 2021).

Wang, W., Zhang, C., Guo, Y. &Xu,D. 2021. Impact of Environmental and Health Risks on Rural Households' Sustainable Livelihoods: Evidence from China. *International Journal of Environmental Research and Public Health.* 18(20).

Weka, R., Bwala, D., Adedeji, Y., Ifende, I., Davou, A., Ogo, N., & Luka, P. 2020. Tracing the Domestic Pigs in Africa. In G. Kušec, & I. D. Kušec (Eds.), Tracing the Domestic Pig [Working Title]. IntechOpen. Available at: https://doi.org/10.5772/intechopen.95077(Accessed on: 22/01/2022).

Whelen, J. &Msefer, 1996. Economic Supply and Demand. Prepared for the MIT System Dynamics in Education Project. (Department Memorandum No. D-4388).

World Bank. 2007. World Development Report 2008: Agriculture for Development. Washington, DC. © World Bank. Obtained from: https://openknowledge.worldbank.org/handle/10986/5990. (Accessed on: 23/02/2022).

World Bank, 2017. Livestock. Available at: https://thedocs.worldbank.org/en/doc/548561534213533128-0050022018/original/EBA17Livestock.pdf (Accessed on: 03/02/ 2022).

World Bank, 2021. Poverty Overview. Available at: https://www.worldbank.org/en/topic/poverty/overview#1(Accessed on: 01/02/ 2022).

Yin, R. 2009. Case Study Research: Design and Methods, 4th Edition. London:SAGE Publications

Zhaohai, B, Jun, Z, Zhibiao, W, Xinpeng, J. & Lin, M. 2019. Socio-economic drivers of pig production and their effects on achieving sustainable development goals in China. *Journal of Integrative Environmental Sciences,* 16:1, 141-155. DOI:10.1080/1943815X.2019.1671463

The Appendix

QUESTIONNAIRE

SECTION A: Personal Information

1) What is your Gender?

€ Male

€ Female

2) What is your Age?

3) What is your marital status?

€ Single

€ Married

€ Divorced

4) What is your highest qualification attained?

€ None

€ Primary

€ C.O.SC

€ First Degree

€ Masters and PHD

5) Is the farmer having side employment?

€ Yes

€ No

6) If working, what is the average monthly salary?

Below M5000

M5000-M10 000

Above M10 000

7) Is the farmer the household head?

€ Yes

€ No

8) How Many members are in the households?

€ <5

€ >5

9) How long have you been engaged in piggery farming?

€ Below 5 years

€ Above 10 years

Section B: Question Guide

Research question Income

11. Pig farming contributes to income

€ Strongly Agree

- € Agree
- € Strongly Disagree
- € Disagree

What is the average Income? Money you generate from the sale of pork and or piglets/pigs? IN A YEAR ON AVERAGE,

- € Below M5000
- € M5000-M10000
- € Above M10000

Average expenses?

- € Below 50000
- € M5000-M10000
- € Above M10000

11.A Income from piggery does not help to diversify income

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree

11.B clients pay immediately for pork/piglets

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree

Research question well being

12. There is little or no satisfaction one gets from the rearing pigs

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree

Pig farming increase wealth

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree

Research question food security

13.Pig farming does not contribute to food security

- € Strongly Agree
- € Agree

- € Strongly Disagree
- € Disagree

13.A Piggery farming helps the household to have food Available throughout the year

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree

Research question: Vulnerability

14. Pig farming reduce farmers' vulnerability

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree

14.A .A Piggery farming helps the household to have food Available throughout the year

- € Strongly Agree
- € Agree
- € Strongly Disagree
- € Disagree