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CHARACTERISTICS OF PIGS UNDER COMMUNAL PRODUCTION SYSTEMS IN RESOURCE-POOR FARMING AREAS OF VHEMBE DISTRICT IN LIMPOPO PROVINCE

By

KHATHUTSHELO ROBERT MATHEGU

Dissertation submitted in the fulfillment of the requirements for the Degree

MASTER'S IN RURAL DEVELOPMENT

in the

Centre for Rural Development and Poverty Alleviation
School of Agriculture, Rural Development and Forestry

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DECLARATION

I, **KHATHUTSHELO ROBERT MATHEGU**, do declare that this dissertation submitted for the degree **MASTER'S IN RURAL DEVELOPMENT** is my own independent work that has not been submitted before to any institution by me or anyone else as part of any qualification.

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Dedication

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ABSTRACT

Although pig production systems have been characterized, there is inadequate information on the production status of indigenous pigs in the smallholder sector; especially in South Africa. This study sought to address this problem through characterizing smallholder pig production systems in Limpopo Province. The main purpose of this study was to investigate the socio-economic and biological characteristics of smallholder pig production systems. A total sample of 100 respondents, representing households which kept pigs at the time of the study, spread over six village areas was drawn. Data were collected from the respondents through the use of structured questionnaire. Weighing of piglets was also conducted and heart girth measurements were recorded as well.

The results show that most producers were above the age of 45 years. The elderly farmers have their own way of production practices and cannot easily accept new innovations aimed at improving pig production. The results demonstrate that indigenous pigs farming play an important role in supplying meat for households' consumption (48 %) and providing cash (41 %) when such a need arises. Pigs were raised within the vicinity of the homestead and management was responsibilities of women and children. These findings could be attributed to the fact that keeping pigs in rural areas is not considered as an economic enterprise and there is a need to shift the minds of producers to consider this kind of farming as another way for them to earn an income.

There were many constraints reported as limiting factors in raising pigs. Lack of knowledge and unavailability of quality feeds were amongst the constraints mentioned. Most respondents (49 %) had had no formal education whilst the level of education of 30 % of producers was predominantly of primary. The lower level of education amongst resource-poor farmers raising pigs could have a negative impact towards acceptance of any new method that could improve the production systems. Record keeping and growth rate measurements were not practiced in the study areas.

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1 CHAPTER 1 GENERAL INTRODUCTION

1.1 Introduction

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Agricultural activities have become important alternative means of supplementing family income in rural areas of South Africa (Ngqaleni and Makhura, 1995). More than a third of rural households continue to engage in agricultural production, making it the third most important livelihood tactic used after remittances and wages from low-skilled jobs (Machete, 2004). In South Africa, African people in particular practice smallholder agriculture (Ortmann and Machete, 2003). As a result, the term smallholder agriculture is often used when referring to the farming that is practiced by African people in the country (Wenhold, Faber, van Averbeke, Oeletse, Jaarsveld, van Rensburg, van Heerden and Slabbert, 2007). Land, as one of the agricultural production factors, is limited and rural people are forced to raise livestock in their homesteads. The same yard is utilized for crop production, especially during rainy seasons.

Domestic animals or livestock are an integral part of the farming systems in tropical countries. They play many roles, which include supplying household products and providing inputs for crop production (Saadullar and Saad, 1998). Gryseels, Groenworld and Kassam (1997) estimated that 76 % of poor people in developing countries resided in rural areas. On

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the other hand, Delgado, Rosegrant, Steinfeld, Ehui and Courbois (1999) estimated that two-thirds of the rural poor were livestock keepers. The animals are raised under traditional systems of management, for example feeding them based on locally available resources. Individual households own the animals and maintain them mostly under a scavenging system with limited provision of housing, feeding and health care. These often indigenous breeds of animals are more tolerant to diseases and environmental stresses than exotic breeds (Saadulah and Saad, 1998).

Poverty-stricken livestock-keepers use small mammals and poultry more for food than larger species. Small mammals such as pigs are more prolific, have lower requirements in terms of capital and maintenance costs and are less risky to keep. They are also easier to sell or dispose of where there are no means of preservation or easy access to markets (Holness, Patterson and Ogle, 2005). Cattle, poultry, goats, sheep, donkeys and pigs are some of the animals that are commonly kept in rural areas of sub-Saharan Africa. This study focused on pigs.

Pig-raising is an important livestock industry in many countries. Conservation of local breeds is a tropical issue whenever the development of animal production systems of smallholder farmers is discussed (Hall, 1992). This has become vital after realizing the importance of local indigenous pig breeds as assets and a means of improving livelihoods of resource-poor farmers (Mhlanga, 2002; Drucker and Anderson, 2004).

Indigenous pigs are well adapted to tropical conditions, local production circumstances and environments, and are less susceptible to common diseases and parasites such as ascaridiosis

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(Zanga, Chimonyo, Kanengoni, Dzama and Mukaratirwa, 2003) as well as heat stress (Holness et al., 2005) or sunstroke (Barnes and Fleicher, 1998). Holness et al. (2005) further reported that indigenous pigs were better adapted to harsh environments and poor management systems. The pigs are more mobile and better equipped to scavenge. In addition, they can survive long periods of feed and water deprivation (Anderson, 2003). These characteristics contribute to hardiness and survivability when crossed with exotic breeds.

Indigenous pigs, unlike the imported genotypes, are less reliant on external inputs and are, therefore, potentially part of a sustainable agricultural system for resource-poor farmers. They are generally hardy, and can survive and reproduce on a low plane of nutrition (Holness, 1991; Mashatise, Hamudikuwanda, Dzama, Chimonyo and Kanengoni, 2005). An improvement in pig productivity, especially in rural areas, could improve the livelihoods of the resource-poor farmers (Hall, 1998). Based on these arguments, indigenous pig production can, therefore, be considered as one of the most important poverty eradication enterprises in rural areas.

1.2 Farming systems

Livestock systems that have evolved in any particular location are a function of the agro-ecological conditions and farming systems (Duckham and Masefield, 1970; Spedding, 1975; Jahnke, 1982). Climatic, edaphic and biotic factors determine whether cropping is feasible and the types of crops that can be grown. These, in turn, determine the link with livestock

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through the quantity, quality and distribution of feed resources throughout the year (Devendra, Morton, Rischkowsky and Thomas, 2005).

Nestel (1984) described the types of farming systems on a regional basis. Later, Wilson (1995) used a farming system approach to classify crop-animal systems. Sere and Steinfeld (1996) used the agro-ecological zones described by the Technical Advisory Committee (TAC, 1994) and provided a comprehensive description of global livestock production systems using quantitative statistical methods. On the other hand, the International Livestock Research Institute (ILRI, 2000) broadly classified livestock systems into three groups, namely the grassland-based systems, mixed crop-livestock systems, and industrial systems, which are implied in Sere and Steinfeld (1996), and used in the toolbox of the Livestock, Environment and Development (LEAD) Initiative (LEAD, 2003). In response to the Millennium Development Goals, the annual report of Livestock Production Programme (LPP) re-classified production systems according to the specialization of resource-poor farmers, viz. landed producers, crop/livestock farmers and small stock keepers, landless urban livestock keepers, and pastoralist and transhum ants (LPP, 2000).

Thornton, Kruska, Henninger, Kristjanson, Reid, Atieno, Odero and Ndegwa (2002) reported that rural landless systems were mainly found in South Asia, China and Indonesia, and also in some countries in sub-Saharan Africa. In these farming systems, landless rural households often keep poultry and pigs. The species kept depend mainly on traditional food preferences, availability of capital and (increasingly) market demand and opportunities (Devendra *et al*, 2005). These systems prevail in rural areas of Vhembe District wherein rural-poor farmers keep their pigs and poultry in their homesteads. People living in these rural areas are under

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the leadership of chiefs since land is held in tribal trust. They keep their pigs at the back of their yards.

Indigenous pig farming systems in rural areas of Vhembe District fall under the first two categories of the major farming systems as identified by Eusebio (1980), which are scavenging and backyard systems. Eusebio (1980) identifies four major systems of raising pigs in many developing tropical countries. These systems include scavenging, backyard, medium-sized units and large-scale commercial farming systems. Under scavenging systems, pigs are let loose day and night to fend for themselves. Indigenous or upgraded strains of pigs are predominantly used in this system because they are more tolerant to low-quality feeds. Also, the pigs can be tolerant to some parasites such as *Ascaris* and *Lungworm*. In general, the pigs are marketed according to the financial needs and status of the owner rather than with regard to their weight.

The backyard system of raising pigs is found in most villages and suburban areas where a family may keep up to three pigs on its homestead. Pigs are kept in an elevated bamboo or other simply constructed sty. In some instances, they are tethered with a rope around the heart girth in the yard or elsewhere. Reproductive performance of the sows is poor because they receive minimum care and feeding management. The litter size at farrowing averages 8-10 piglets. Half of them survive to weaning at two months of age. Although indigenous pigs predominate, crosses between indigenous and exotic breeds can be found in this system of production throughout the developing world (Holness, 1991). Pigs managed within this system depend on kitchen waste with occasional supplements of rice bran or maize by-

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products. The pigs are marketed indiscriminately, mainly taking financial needs of the family into consideration.

Medium-sized pig units refer to production systems in which the size of the herd ranges from 20 to 50 head of all ages. The producer uses commercial feeds mostly as well as kitchen left-overs. These are never sufficient to sustain the feed requirements of the pigs. Large-scale commercial pig farms commonly integrate their operations from feed-grain production or feed manufacturing, pork production and processing of products to marketing. These operations may involve 600-1200 pigs of all ages.

1.3 Research problem

Although pig production systems have been characterized, there is inadequate information on the production status of indigenous pigs in the smallholder sector, especially in South Africa. Ramirez and Mota (2000) suggested that smallholder systems must be studied in greater detail so as to provide more information on levels of productivity and limitations to achieving higher rates of production. Also, because there is inadequate scientific data concerning reproduction rate and production traits (Els, 2002), it is difficult to assist farmers to solve their problems. According to Preston and Margueitio (1992), emphasis is often placed on transfer of technologies by the industrialized countries to developing countries without first assessing local constraints. In this respect, Dolberg (1995) pointed out the need for carrying out scientific studies that seek to describe and understand the current smallholder farmer practices or production systems first. The information generated would then be used to identify weaknesses that require research, instead of simply promoting externally generated

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technologies. Thus, this study sought to address this problem through characterizing smallholder pig production systems in Limpopo Province. The study was confined to Vhembe District of the Province.

1.4 Justification of the Study

The farming systems prevailing in the rural areas of Vhembe District Municipality, Limpopo Province, where this study was undertaken are categorized within the scavenging and backyard systems. Pigs are kept in sties during the rainy season and released to fend for themselves during the dry season months. Socio-economic and socio-cultural dynamics within the communities govern these farming systems. The farming systems and other land uses may have a negative influence on the performance of pigs, thereby reducing the benefits derived from keeping them. Therefore, it is important to develop a knowledge base that helps understand these farming systems in order to craft intervention strategies and practices that may stabilize and sustain indigenous pig production in the rural areas.

Promotion and modernization of indigenous pig production systems may reduce poverty in rural areas. The South African Government is streamlining development initiatives into the objectives of provincial and local government, in particular Local Municipalities. The knowledge base that this study created will help local municipalities to take into cognisance the realities of resource-poor farmers. Such knowledge will inform developmental initiatives through integrated development planning (IDP) and local economic development (LED) strategies. It is also imperative that such development be noted on the Growth and

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Development Strategy of Limpopo Province. In this respect, the information will help the Department of Agriculture to develop more appropriate extension services for smallholder pig farming systems.

1.5 Research Objectives

The main objective of this study was to investigate the socio-economic and biological characteristics of smallholder pig production systems. Specifically, this study addressed the following objectives:

- To find out the economic and social roles of indigenous pigs for rural households; and
- To assess the production characteristics of indigenous pigs; and
- To identify the constraints to indigenous pig production under traditional farming systems.

1.6 Hypothesis

The main research question that this study sought to address was: what are the characteristics of smallholder pig production systems in rural areas of South Africa? Studying the characteristics of the smallholder pig production systems in Vhembe District of Limpopo Province would inform intervention strategies needed to improve the efficiency and productivity of indigenous pigs that the resource-poor farmers kept.

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2 CHAPTER 2 REVIEW OF LITERATURE

2.1 Introduction

During the colonial era, and for a variable period after depending on the country and region, there were two dominant production systems in much of Africa. The first one was the commercial production system that comprised different scales of animal production on medium-sized to large farms with fairly high levels of inputs in terms of feed, veterinary drugs and vaccines, and genetically improved breeds. The state provided some financial support to farmers in the form of loans for the construction of dipping facilities, access to vaccines and remedies at government-subsidized prices, and public veterinary services (Perry, McDermott and Randolph, 2004).

Perry *et al.* (2004) described the second production system as the peasant sector, which was often in geographically distinct areas known as tribal trust lands. These evolved into traditional, communal or smallholder sectors. They are low-producing, often subsistence-oriented systems that rely on the state for the provision of veterinary services. In general, these are provided at no cost to the farmers. In the former Venda homeland, the government of the day built dipping facilities and also provided dipping chemicals to cattle farmers at no cost. Perry *et al.* (2004) reported that provision of veterinary services to smallholder farmers was done for many reasons, including both political and technical. A principal concern was the belief that infectious diseases could spread from the peasant sector into the more commercially-oriented enterprises. The responsibility of governments for the welfare of the poorer sectors of society was also an important driving force. However, the measures that

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government took in terms of disease control or veterinary services did not cover small stock animals such as pigs.

Ajala, Adesehinwa and Mohammed (2007) described smallholding pig production as peasant farming system or semi-intensive wherein animals were confined during the rainy season and allowed to scavenge in the dry season. Pigs are kept in sties during rainy seasons in order to prevent them from destroying crops because the same land is utilized for crop production during rainy seasons. This is often called the backyard production system.

Backyard pig production plays an important role in the smallholder farming systems in the tropical countries. They are a major source of cash income. Penrith and Thomson (2004) reported that animals, particularly in arid and semi-arid regions of sub-Saharan Africa, were important as a food source and income. This confirms a report by Steinfeld and Mark (1997) who noted that low-input pig production had both income-generating and socio-cultural functions and was driven by the availability of farm resources.

In order for indigenous pig farming to be a positive force for poverty eradication, a better understanding of the role of animals in the livelihoods of the poor is required. It is assumed (Lemke, Kaufmann, Thuy, Emrich and Zarate, 2006) that keeping improved pig breeds yields higher cash revenue due to pigs' higher biological performance and resulting superior output, although this implies an economic risk especially for resource-poor farmers due to higher input requirements. Chiduwa, Chimonyo, Halimani, Chisambara and Dzama (2008) suggested that if farmers had adequate access to resources, pig production potential could improve, thereby reducing poverty and increasing the socio-economic value of indigenous pigs to rural livelihoods.

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2.2 Pig Breeds Indigenous to Africa

In many countries in Africa, pigs have not been characterized into specific breeds, and are variously referred to as 'indigenous', 'local' or 'unimproved' (Holness, 1991). The situation is further confused in some areas by interbreeding with imported exotic strains (Holness, 1991; Darfour-Oduro, Naazie, Ahunu, Aboaye, 2009). Although this is the case, pigs that are indigenous to South Africa have been classified by Mason and Maule (1960) into Windsnyer and Koelbroek. The *Windsnyer* type is a long-nosed, razor-backed pig. It is also found throughout Zimbabwe and in some parts of Mozambique and Zambia. On the other hand, the *Koelbroek* is a short fat animal with a short snout and dished face, which appears to be restricted to South Africa.

The *Koelbroek* is the best known indigenous breed which is predominant in rural areas of South Africa. It is extremely hardy and survives by scavenging outside huts or homesteads. This makes the pig ideal for rural areas where intensive farming is not possible. Intensive farming involves larger herds (20-30 sows), higher quality buildings with concrete floors providing greater protection and hygiene, and feed grown or purchased specifically for the piggery (Holness *et al*., 2005); which the recourse-poor farmers in rural areas cannot afford. They lack capital to invest in improved pig production.

The *Windsnyer* is more common in the northern parts of the country. It closely resembles the description of ancient Egyptian breeds. They are small and have bristles forming a distinct mane. Like many of the domestic animals they have a large colour variation, including black, reddish-brown, brown, black and white or spotted. Some young pigs even have longitudinal stripes, which are typical of the young bush pig.

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The name *Windsnyer* (wind-cutter) is derived from its shape. It is narrow-bodied, long-nosed and razor-backed. Just like the *Kolbroek*, this pig is very hardy and scavenges for its food. It can convert food with a low nutrient content efficiently, which enables it to survive on cereal by-products of brewing. The pig is an excellent mother and is associated with very few piglet deaths. In Zimbabwe, where the breed is more common, the meat is reported to be better than that of imported breeds (Eusebio, 1980). Payne (1990) also referred to a breed named *Bantu* pig. This is probably a descendent pig introduced from Asia and Europe by Europeans.

The *Mukota* pig is one of the indigenous breeds found in Zimbabwe. It has been considered particularly well adapted to the prevailing environmental conditions (Holness and Smith, 1974) and survives under tropical low input smallholder production conditions (Chimonyo, Dzama and Bhebhe, 2006). They are much more able to utilize agricultural by-products (Kanengoni, Dzama, Chimonyo, Kusina and Maswaure, 2002; 2004) and are less susceptible to parasites (Zanga *et al*., 2003).

Domestic pigs are found throughout the forest areas of West Africa. Two well-known breeds are: (a) *Bakos*i, which is found in Cameroon; and (b) *Ashanti Dwarf*, which is found in Ghana (Epstein, 1971). Barnes (1994) reported that the *Ashanti Dwarf* was the predominant pig of Ghana and formed 50 % of the national pig population. The two breeds, viz. *Bakosi* and *Ashanti Dwarf*, vary somewhat in colour but are usually black. They are not very fecund, grow slowly and are considered to be of Iberian ancestry (Epstein, 1971). These pigs are hardy and some (including the *Ashanti Dwarf*) are trypanotolerant. It has been suggested that the Portuguese introduced them from the Mediterranean region. According to Payne (1990), trypanotolerant pigs had a more ancient ancestry.

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2.3 Composition of the Herd of Pigs

Smallholder production systems are characterized by small litter sizes, no or minimal inputs, low outputs and periodic destruction of animals by diseases. Litter sizes average 5-6 pigs per household (Paul and Saadullah, 1991). Producers dedicated to this husbandry usually have one fattening pig to several sows (Mota, Bento, Penalva, Pombo and Dieguez, 1995). The keeping of a few pigs could be attributed to the fact that there are many constraints or challenges that dissuade producers to keep more than what they cannot manage. However, these producers found it important to have a sow that would continue to produce. Only piglets would be marketed.

Most rural households keep a few pigs. Among the rural people in South Africa, pig rearing is less common than keeping poultry (Wenhold *et al.*, 2007). In the Eastern Cape Province, about 56 % of households reported keeping approximately two pigs at a time (Bembridge, 1984; Steyn, 1988; De Lange, 1991). In the southern Kaduna area of Nigeria, Ajala *et al.* (2007) reported that 52 % of respondents in their study had less than four adult pigs compared to 29 % who had 4-6 pigs. The mean adult herd size was 2.9 ±1.6. Table 2.1 shows the distribution of pig farmers by herd size. The mean pig her size in semi-arid areas of Zimbabwe was reported to be 3.3 (Chiduwa *et al.*, 2008). These authors reported that the pig herd size was deliberately kept low because of feed constraints, in particular during the dry season since pigs shared the same feed resources with humans. Mashatise *et al.* (2005) argued that early culling of pigs in rural areas resulted from limited feed resources.

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Table 2.1 Distribution of pig farmers by herd size in Southern Kaduna area of Kaduna State, Nigeria

Herd size	Frequency of respondents	Proportion (%) of respondents
1-3	156	52
4-6	87	29
7-9	57	19
Total	300	100

Source: Ajala *et al.* (2007)

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A survey carried out in Xochimilco region of Mexico with the goal of understanding the social, technological and economic aspects of backyard pig production showed an average of eight animals per producer (Losada, Neale, Vieyra, Soriano, Rivera, Cortes and Grande, 1995). Slightly more than half of pigs (52 %) were used for breeding although fattening occupied an important place in the system (48 %). The number of boars in the region was larger than expected. This was a direct reflection of the small size of herds per producer and their preferences to have their own boars for breeding than hiring them (Losada *et al.*, 1995). The number of animals per unit of production was concentrated within the range of 1-5 (more than 100 owners). Some producers reported the presence of 66 productive animals (Losada *et al.*, 1997). In instances where producers preferred to keep boars in their herds, servicing of sows could be done in-house unlike in villages wherein mating took place when pigs were released from sties.

Herd sizes were usually restricted according to the potential of farmers to provide feeds. They could be increased if this limiting factor was dealt with. The herd sizes could be increased in the event where there was adequate feed supply. Therefore, it was vital for smallholder farmers to own enough arable land and water supply for irrigation purposes throughout the year. This required additional labour input in producing and providing feeds to animals.

2.4 Herd Management and Social Features of Backyard Pig Production

Management has an overriding influence on the profitability or otherwise of a pig herd. The producer must strive to integrate all the considerations relating to the well-being and productivity of his/her animals with those relating to cost-effectiveness (Holness, 1991).

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Payne (1990) indicated that successful management of pigs in any part of the world depended primarily on intelligent planning based on knowledge of the biology of the pig. In most tropical countries, especially in the past, indigenous producers did not attempt to obtain maximum productivity from their pigs. Rather, they managed them primarily as scavengers. With good management, pig production can play an important economic role in an integrated farming system (Bembridge, 1987). Holness et al. (2005) suggested that when pigs moved from scavenging systems of production into some form of simple pens or housing, the producer would have the means to begin managing his/her animals and small changes or improvements in the system could lead to significant increases in productivity.

Modern pig management includes feeding, housing, care and control of diseases and other well-planned practices essential for increasing efficiency in production. In most developing tropical countries, especially in remote areas, because pigs are raised as scavengers, the least effort is expended in ensuring proper management practices in an attempt to secure maximum productivity (Eusebio, 1980). Individual households own the pigs and maintain them especially under scavenging systems with little or no inputs for housing, feeding or health care. Although collecting feed and raising animals are male-dominated activities, females play a vital role in monogastric animal production activities. Furthermore, children also play a major role in raising pigs (Paul and Saadullah, 1991). Management is largely the responsibility of women and children. It represents only a secondary activity for men. Males value large animals, especially cattle. As a result, ownership and management responsibilities of pigs in rural areas are carried out by women (Scoones, 1992; Mashatise *et al.*, 2005; Chiduwa *et al.*, 2008). In most households in rural areas, women play a vital role in family

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nutrition and farming activities. This might be due to the fact that most households are women-headed or because men seek jobs in indu strial areas or towns.

A survey was conducted to characterize the keeping of pigs in the backyards of urbanized areas of Iztapalapa in eastern Mexico City. The results indicated that the occupation of pig producers included domestic work (75 %), salaried work (15 %) and various types of official work (10 %) (Losada *et al*., 1997). The producers had attained predominantly primary (64 %) and secondary (23 %) education.

Nsoso, Mannathoko and Modise, (2006) reported that only 25 % of secondary school leavers participated in pig farming in Ramotswa village of Botswana. It was also argued (Nsoso, Mosweu, Malela and Podisi, 2004a; Nsoso, Monkhei and Modise, 2005; Nsoso *et al*. 2006) that young people should be attracted into farming because they were the potential future farmers. Currently, the South African Government is promoting similar views with the intention of ensuring that youth and women play important roles in agricultural activities. Promotion and acknowledgement of pig farming by school leavers and unemployed graduates is expected to increase agricultural production and improve community welfare as well as rural livelihoods in the country.

2.5 Housing Pigs under Backyard Production Systems

Buildings serve both to restrain pigs and protect them from being hurt. At different stages of their development pigs have unique environmental and physical needs. Thus, pig houses come in greatly varied structural designs. The pig needs a warm and dry area in which to lie and another one in which to feed. It must excrete, move about and have its freedom. The

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building must allow man to provide feed, handle the stock and remove excreta, preferably automatically. It is important that the building be constructed at least cost (Whittermore, 1980). Thus, reducing the extra costs to be incurred on building materials and utilize locally available materials and household labour is vital.

Traditionally, pigs are kept in one of two ways. They are either penned in small enclosures made from wooden poles planted closely together and fed the household scrap. Alternatively, they are on free range where they scavenge for their food. In the countryside in many tropical countries pigs are housed in an elevated battery or pigsty. The house should be made from cheap, readily available materials. In general, raising pigs in this type of housing is cheap and easy.

According to Nsoso *et al.* (2006), indigenous Tswana pig farmers provided shelter for their animals either built from concrete or a combination of wood and corrugated iron sheets. Most of the farmers reported that they provided shelter during the night for the pigs to escape low night temperatures and attacks from dogs. Chiduwa *et al.* (2008) supported this, explaining that under rural conditions where housing facilities were poor or even non-existent, piglets were usually exposed to the vagaries of weather, rain or predation.

Depending on the number of animals and their function (for example fattening and breeding) the number of pigsties may be increased (Losada *et al.*, 1997). Even though most producers in tropical countries let their pigs wander and scavenge with no attempt to secure maximum productivity from them (Eusebio, 1980), most of them keep their animals in pigsties permanently. Quite often, producers house their boars separately from the rest of the pigs.

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Sows and growing pigs are kept together. Cleaning of the yard is done, on average, three times a week, and most producers (88 %) throw away the excreta with only a few (12 %) using it as a form of organic manure (Losada *et al.*, 1997). Nsoso *et al.* (2006) reported that the most common way of cleaning the sties in Botswana was the use of shovels to remove manure, without any disinfection to kill off disease-causing pathogens and parasites. Cleaning of pig sties, in this case, was mostly done after the rains and not as regularly as the farmers should maintain reasonable standards of hygiene. The animals, in particular piglets, are susceptible to diseases due to the contamination of the floors where pigs lie and consume their feeds. According to Kassai (1999), the most relevant general measure is careful mechanical cleaning, which entails removal of faecal matter and bedding contaminated with parasite eggs, hosing of the floors and walls of feeding troughs.

Ajala *et al.* (2007) identified three types of pig houses in southern Kaduna in Nigeria. Various types of housing materials were used depending on scale of production (size of holding). Three types of pig houses identified were mud-brick walls with thatched roof and rammed earth floor type, the cement-brick walls with zinc roof and concrete floor type and the burnt-brick walls with zinc roof and concrete floor type. Most farmers (62 %) used mud-brick walls with thatched roof type of housing while 30 % of them used cement-brick walls with zinc roof. The remaining 8 % used burnt-brick walls with zinc roof and concrete floor (Ajala *et al.*, 2007). This is linked to the affordability of farmers and has nothing to do with the proper housing structure for the animals.

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2.6 Feeding Management

Type of feed and method of feeding greatly influence feed efficiency, growth rate, breeding efficiency, carcass quality and the general health of pigs. The choice of feeding period for pigs in commercial production systems is based entirely on nutritional and economic considerations (Institut National de le Recherché Agronomique (INRA) 1984; English, Fouler, Baxter and Smith (1988).This is not considered in indigenous pig production systems. As reported earlier, the feed resource base for pigs is mostly scavenging in small farms and consists of household waste, fruit by-products, roots and tubers and small amounts of grains, grain by-products and anything edible found in the immediate environment (Saadullah and Saad, 1998). Under traditional management, pigs were provided with weeds, maize by-products, kitchen wastes and traditional beer residues as feeds and were not supplemented with protein source. Holness (1999) reported that despite high fibre content (15 %), low protein and great variety, brewing by-products were widely used in small-scale pig production systems, especially in Africa.

Research on locally available, no-conventional feed resources and their potential value as pig feeds is inadequate (Ly, 1993; Lekule and Kyvsgaard, 2003). Efforts have been put into utilizing non-conventional feedstuffs for pigs, including legume tree leaves (Halimani, Ndlovu, Dzama, Chiminyo and Miller, 2005) and maize cobs (Chimonyo *et al.*, 2006; Chimonyo and Dzama, 2007). It is imperative to understand the nutritional value of all plants fed to indigenous pigs. There is a need, therefore, to determine the nutritional value of plants that indigenous pigs consume. Further studies focusing on these plants may reveal the nutritional status of the plants and inform the supplementation method worth following.

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2.6.1 Effect of stocking rate and feeding space on growth and feed conversion

In Table 2.2, Lavers and Ferguson (2000) reported that there were no significant differences between the main effects of feed bins per pen and the number of pigs per pen on any production characteristics. They concluded that feeder space and numbers of pigs per pen had no significant effect on feed intake and growth because pigs adapted to their conditions by adjusting their behaviour.

Pigs eat in order to satisfy nutrient requirements for potential growth. However, it is evident that pigs kept in groups do not consume as much food as those kept singly. Thus, the former fail to meet their requirements (Morgan, 1996). Lack of significant differences between the groups would suggest that the larger group compensates for the reduced space by feeding for a longer period, especially at night (Walker, 1991).

Individual pigs within large groups learn to adapt to these constraints by adjusting normal patterns of behaviour. Rural pigs, when confined in sties, are fed in groups without special care provided to piglets and probably pregnant sows. There is no individual feeding and pigs have to compete for the available feeds as in most cases feeds are only provided once in a day.

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Table 2.2 Effect of the number of feeder bins and pigs per pen on food intake (ADFI), average daily gain (ADG) and feed conversion ratio (FCR) in growing pigs

Bin Numbers	Numbers of pigs per pen	ADFI (kg/day)	ADG (kg/day)	FCR
1	7	1.66	0.767	2.164
1	13	1.59	0.732	2.172
2	7	1.58	0.727	2.173
2	13	1.47	0.686	2.143
3	7	1.59	0.728	2.184
3	13	1.55	0.728	2.129
4	7	1.64	0.751	2.184
4	13	1.61	0.702	2.293

Source: Lavers and Ferguson (2000)

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2.6.2 Alternative feeds for the backyard pig production system

A world shortage of cereal grains is predicted. This is due to the competing needs for the expanding human population and diminishing food producing capacity of the earth's surface (Brown and Kane, 1994). A major priority is to develop livestock feeding systems which do not depend on cereal grains (Preston, 1995). Chikwanha, Halimani, Chimonyo, Dzama and Bhebhe (2007) highlighted the need for identifying locally available feed resources. The lack of information on changes in nutritive value during the growing season, when the bulk of feeds are available, hampers the development of appropriate conservation strategies to maintain or produce pigs across the dry season, when both feed quantity and quality are low.

Considerable progress has been made in the use of non-cereal energy-rich feeds such as cassava (Machin and Nyvold Solveig, 1991), molasses (Preston, Macleod, Lassota, Willis and Velasquez, 1968) and sugar cane juice (Sarria, Solano and Preston., 1990). It is important to identify locally available non-conventional feed resources (for example weeds) for pigs and characterize their nutritive value, including amino acid profiles. A balanced and optional proportion of amino acids are required for efficient protein deposition in the pig, along with the supply of energy (Grala, Verstegen, Jansman, Huisman, van Leeuwen and Tamminga, 1999; Kyriazakis and Wittemore, 2006).

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2.6.2.1 Cassava

Some researchers (Job, 1975; Tewe, 1982 and Iyayi, 1994) have confirmed the suitability of cassava for pig feeding, and the potential of its meal as a good substitute for maize meal for all classes of pigs. Cassava flour and peels could serve as a source of energy because the nitrogen free extract is high and can compare favourably with that of maize. The crude protein content of leaves and tender stems is high, being about 23 %. It is rich in vitamins and its amino acid profile can compare favourably with that of soya bean meal (Khajarern S, Khajarern J.M, Kitpaint and Muller, 1997). Therefore, cassava can be utilized as a source of energy for pigs. In countries where cassava is in abundance pig farmers could use it in pig feeding systems.

2.6.2.2 Feeding *Trichanthera gigantic* with rice by-products

In Colombia and Vietnam, farmers supplement rice by-products with foliage of *Trichanthera gigantic* in diets of growing and lactating pigs. Sarria, Villavicencio and Orejuela (1991) reported that the foliage of *Trichanthera gigantic* could be used to replace up to 30 % of the protein in diets of pregnant sows with significant reduction of feeds costs. The use of fresh leaves of *Trichanthera gigantean* as a supplement to traditional diets for lactating and growing pigs resulted in substantial saving in feed cost with no loss in performance.

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2.6.2.3 Sugar cane

By-products of the sugar cane industry in the form of molasses have been widely used as a cereal substitute in livestock feeds. Sugar cane fractionation to provide feed for monogastric and ruminant animals has been advocated by Preston (1980; 1988) as an alternative to the use of cereal grains. The use of fresh juice as the energy source in pig diets was demonstrated in Mexico by Mena, Elliott and Preston (1981; 1982) and is now the basis of commercial pig production systems in Colombia and other tropical countries (Sarria *et al.*, 1990). Schumacher, Elliot, McMeniman and Griffiths (1986) reported that pigs fed raw sugar diets had superior live weight gains, dressing percentages and feed conversion efficiencies, while backfat thickness was significantly less compared to those fed a conventional cereal-based diet. In rural areas of Limpopo, sugarcane is mostly harvested for human consumption. However, rural dwellers might be lacking knowledge or information relating to the fact that by-products can be utilized as a source of energy for pigs.

2.6.2.4 Water spinach

In Cambodia and throughout Southeast Asia, water spinach has been cultivated for human food and is also fed to pigs and other animals. The fresh stem of water spinach, as reported by Men, Ogle and Van Son (2000), have in dry matter terms, a crude protein content of 20-30 % and ash concentrations of about 12 % (Gohl, 1981). According to Ly, Samkol and Preston (2002) and Prak (2003), water spinach is a protein-rich forage which can replace part, or the whole of fish or soybean meal.

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Chhay and Preston (2006) found that a 50:50 mixture of cassava leaves and spinach supported much higher growth rates of pigs than when the cassava leaves were the only source of supplementary protein. Earlier, Chhay and Preston (2005) reported that there was a synergistic positive effect on growth performance of pigs when water spinach was combined with fresh cassava leaves. Malavanh and Preston (2006) indicated that water spinach and sweet potato leaves appeared to have the same nutritive value when used to supplement a basal diet of cassava root meal and rice bran for growing pigs. It is therefore recommended that producers have to utilize the sweet potato leaves for protein supplementation. The plants are planted mostly for human consumption as sweet potato roots are being consumed by humans.

2.6.3 Motivation for alternative feeds

Livestock owners in most production systems fail to feed their animals adequately throughout the year. In some countries the quality of feed is low during certain times of the year, for example the dry season and during drought periods. In other countries, the quality of feeds available is poor. It is worth noting that in both these cases, livestock fail to obtain adequate and balanced nutrients (Swanepoel, Stroebel, Otterman, Weeks and Turner, 2000). Preston (1995) suggested that the future feed resources in small farms for monogastric animals in the tropics should not be cereals. Instead, locally available feed resources that can be produced on the farm with comparative advantage in sustainable, non-subsidized production systems should be used. This feeding system is recommended to resource-poor farmers because they cannot afford the commercial feeds.

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2.7 Growth and Development of Pigs

In practical terms, growth is measured as the increase in body weight with time, and is largely dependent on the amount of food or total nutrient intake (Holness, 1991). However, there are major differences in food intake among the different breeds of pigs. These affect their growth response per unit of food ingested. When selecting pigs for high growth rates in order to improve biological efficiency, a larger mature size is a critical criterion. Equally important as rate of growth is how the pig develops (Holness, 1991). Body conformation is hereditary and can therefore be passed over to offspring, which will also influence growth of the piglets. Only those feed nutrients that are digested can promote growth, body maintenance and production of milk. The digestion of feed nutrients is influenced by disease, parasites and/or physiological disturbance in the digestive tract. Often such disturbances result in poor growth (Eusebio, 1980).

Most smallholder farmers wean their pigs naturally, that is after about 56-60 days (Scherf, 1990). Indigenous sows can produce enough milk to support fast growing piglets. Thus, the low weaning weights of indigenous pigs cannot be attributed to inadequate supply of milk but reflects their inherent characteristics of slow growth. The slow growing indigenous pigs can, therefore, be used where the farmers do not have the objective of attaining fast growth rates, for example in some rural areas where the animals are mainly kept to provide meat for household consumption (Chimonyo, Kanengoni and Dzama, 2001; Kanengoni, Dzama, Chimonyo, Kusina and Maswaure, 2002).

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It is a common practice in pig production to increase the number of piglets/female/year and reducing the interval between farrowings through early weaning of the animals (Koketsu and Dial, 1997; Koketsu, Dial, Pettigrew, Xue, Yang and Lucia, 1998). However, the productive cycle in the sow can also be reduced during the lactation period (Mota, Alonso and Ramirez, 1999) by establishing pregnancy during nursing, without affecting the prolificacy of the dam or performance of her litter (Mota, Alonso, Mayagoitia, Trujillo, Valencia and Ramirez, 2002). This means that piglets will continue to suckle while the mother is pregnant, thus reducing the productive cycle and achieving a greater number of farrowings per female per year (Kirkwood and Thacker, 1998), and improving company profit (Becerril, Mota, Alonso, Ramirez, Berruecos, Mendez and Rubio, 2000; Mota, Becerril, Alonso and Ramirez, 2000).

The techniques used to reduce the weaning to oestrus interval include a reduction of litter size several days before weaning (Stevenson and Britt, 1980; Stevenson and Davis, 1984), or split weaning, when weaning the heavier half of the litter 2-3 days before weaning the remainder (Cox, Britt, Armstrong and Alhusen, 1983; Henderson and Hughes, 1984; Kunavongkrit, Rojanasthien and Ogle, 1985; Riley, Edwards, Simmins, Shepherd and Blade, 1985).

High ambient temperature adversely affects several aspects of female reproductive activity, including sexual behaviour and weaning to oestrus intervals. For example, seasonal effects have been observed on the rate of growth, development and attainment of puberty of exotic gilts reared in the humid tropics of Nigeria (Steinbach, 1976) and Australia (Tomes and Nielsen, 1979). Gilts born before the beginning of the cool rainy season gained weight faster and had their first oestrus when they were both heavier (81kg) and younger (224 days) than those born at the onset of the hot season (70 kg and 256 days, respectively). Also,

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primiparous exotic sows lactating during the hot season have a longer interval between weaning and mating than do those lactating during the cool season (Cox *et al.*, 1983; Clark, Komkov and Tribble, 1986). High ambient temperatures during lactation cause a decrease in the frequency of pulse of lutenizing hormone, which is responsible for the delay in re-mating after weaning (Barb, Estienne, Kraeling, Marple, Rampacek, Rahe and Sartin, 1991). Also, Barb *et al.* (1991) suggested that a low nutrient intake during the hot season and not high ambient temperature per se might be the cause of poor fertility.

Unsatisfactory weaning weights in the tropics and a negative correlation between weight gain and ambient temperature has been reported for exotic breeds, suggesting a direct or indirect effect of climate on milk yield in heat-stressed sows (Steinbach, 1971). Exotic sows exposed to high ambient temperature during the last few weeks of pregnancy and lactation produce less milk than their counterparts kept in thermoneutral conditions (Black, Mullan, Lorschy and Giles, 1993). The same authors detected an interaction betw een diet and milk production.

Els (2002) indicated that piglets had a slow growth rate between birth and weaning but this increased significantly between weaning and six months of age. Towards 12 months of age the growth rate slows down again. Further, he reported that season of birth had a significant influence on mass at different ages (Table 2.3). This knowledge is lacking in resource-poor smallholder farmers. It has been observed that farrowing in smallholder pig production systems occurs throughout the year. This shows that mating occurs randomly.

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Table 2.3 Summary of birth-, weaning- and 6-month weights of piglets (kg) born between April 1997 and April 2000

	Birth		Weaning		6-Months	
	Summer	Winter	Summer	Winter	Summer	Winter
Boars 1997/98	2.16	1.36	12.02	9.45	39.43	50.96
Boars 1998/99	1.21	1.41	16.7	10.08	52.79	41.41
Boars 1999/00	1.54	-	14.89	-	-	-
Sows 1997/98	1.56	1.32	9.69	8.38	42.98	58.00
Sows 1998/99	1.06	1.38	16.53	9.00	59.54	40.62
Sows 1999/00	1.44	-	14.68	-	-	-

Source: Els (2002).

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Chiduwa *et al.* (2008) reported that changes in incidence of farrowing throughout the year reflected seasonal patterns in the breeding of indigenous pigs. As farrowing is most frequent during the rainy season, Chiduwa *et al.* (2008) suggested that it was necessary to evaluate the survivability and growth performance of the piglets to enhance pig production potential and efficiency in rural households. Significant weight differences occurred between sexes and between seasons across years. No apparent reason could be provided for the heavier weights of gilts at 6 months of age.

Average daily gain (ADG) differed significantly between sexes and season, emphasizing the influence of season of birth on growth (Els, 2002). Season of birth has been reported (Deka, Goswami, Mili and Saikia, 2002; Phokan, Laskar, Aziz and Goswani, 2006, Prasanna, Prakash, Gupta and Mahender, 2009) to have a highly significant effect on litter weight at weaning as piglets born during rainy season recorded higher litter weight at weaning. Nandakumar, Rajan, Mathews and Jeeva (2003) found that summer-born litters were heavier at weaning.

The higher litter weight at weaning of pigs born during the rainy season appeared to be due to favourable environmental conditions during post-natal growth (Prasanna *et al.*, 2009). The higher rate of farrowing during the rainy season suggested that mating took place during free-ranging period. Giving birth during the rainy season is convenient for farmers since there is usually enough feed resources available.

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Litter size influences weight at different ages of animal pig (Els, 2002). Table 2.4 and Table 2.5 show the relationship between weights of piglets and age in an evaluation study to determine the reproduction and production potential of indigenous pigs (Els, 2002). Prasanna *et al*., (2009) reported that litters born during the rainy season recorded a higher litter size at birth and weaning. In general, season influences the litter traits through factors such as ambient temperature, relative humidity and availability of feed.

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Table 2.4 Average Daily Gain (ADG) (kg/day) of piglets born between April 1997 and April 2000

	ADG (Birth-Weaning)		ADG (Weaning-6-Months)	
	Summer	**Winter**	**Summer**	**Winter**
Boars 1997/98	0.176	0.144	0.245	0.371
Boars 1998/99	0.276	0.154	0.291	0.344
Boars 1999/00	0.195	-	-	-
Sows 1997/98	0.145	0.126	0.297	0.443
Sows 1998/99	0.276	0.136	0.347	0.341
Sows 1999/00	0.191	-	-	-

Source: Els (2002)

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Table 2.5 The influence of litter number on weight at different ages (1997-2000)

Litter Number	Birth		Weaning		6 Months	
	Summer	Winter	Summer	Winter	Summer	Winter
1. Boar	1.08	0.95	15.51	8.03	50.88	52.27
Sow	1.29	0.99	14.04	8.82	43.91	46.52
2. Boar	1.61	1.31	19.84	12.16	-	48.33
Sow	1.12	1.28	16.78	11.02	-	46.98
3. Boar	1.53	1.68	3.87	16.50	55.28	47.33
Sow	1.62	1.78	15.38	15.36	57.25	38.20
4. Boar	1.15	1.49	17.58	14.66	-	36.50
Sow	1.18	1.90	16.18	13.57	-	36.00
5. Boar	1.50	-	18.50	-	-	-
Sow	1.34	-	15.60	-	-	-

Source: Els (2002)

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2.8 Influence of season on reproductive and growth performance of pigs in the tropics

Season influences reproduction efficiency in pigs. During the summer months, there is complete cessation of cyclicity in wild pigs (Mauget, 1988). In domestic sows, during summer months, the intervals from weaning to first oestrus and/or to conception are longer, and the proportion of sows that cycle within 30 days is lower (Legault, Dagorn and Tatsu, 1975; Hurtgen and Leman, 1980; Love, 1981). Under hot summer conditions, pregnant or lactating sows eat less, lose more weight, which tends to lower birth weights and litter sizes (Brooks, 1991). In addition, boars are thought (Brooks, 1991) to be less fertile under hot summer conditions.

High environmental temperatures have negative effects on animal performance, especially in pigs (Heitman, Kelly and Bond, 1958; Holmes, 1974; Close and Stanier, 1984; Fuller, 1985). In this species, a significant interaction between ambient heat and level of feeding affects growth performance (McCracken, 1973; Close, Mount and Brown, 1978). In the tropics, season has a significant influence either on feed consumption and milk production of sows or on the number of pigs born alive (Stansbury, McGlone and Tribble, 1987; Prunier, Braganca and Dividich, 1997). Feed supply during the rainy season, when pigs are confined, is mostly inadequate as it depends entirely on the availability of feeds, especially the kitchen garbage. Insufficient feed supply to lactating sows has negative impact on milk production for piglets, which then leads to a steady decline in the condition of the sows as a result of suckling. Supplementation of quality feeds to lactating sows must be considered in order to improve the pig production systems in rural areas.

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Summer infertility continues to reduce overall reproductive performance and economic efficiency in pig herds in South Africa and elsewhere. Investigations focusing on lower reproduction performance (Pruner, Quesnel, Braganca and Kermabon, 1996; Gaustad-Aas, Hofmo and Karlberg, 2004) have shown that virtually every aspect of male and female pig reproduction is adversely affected during summer. Several studies (Love, Klupeic, Thorton and Evans, 1995; Peltoniemi, Love, Klupeic and Evans, 1997a; Bassett, Bray and Sharpe, 2001) indicate that the levels of the follicle stimulating hormone and luteinizing hormone, the most important hormones affecting fertility follow clear seasonal patterns. The levels of these hormones decrease in summer and increase in winter.

During the warm season, a reduction in death rate at two days of age and 1.2 % increases in number of weaned pigs were observed in the tropical areas of France, as compared to the cool season. There was no modification in the weaning weight of pigs. The warm season has moderate positive effects on reproductive traits of pigs (Stansbury et al., 1987). Yet housing facilities for pigs in rural areas expose pigs to all changes of weather.

Therefore, cold and rainy weather could be detrimental to piglets, thereby increasing death ratio. Under commercial pig production systems, cold weather is considered as the major cause of piglet mortality, especially where infra-red lamps are not provided (Kyriazakis and Wittermore, 2006). Rain has a drastic influence on piglet mortality in smallholder farming (Ncube, Dzama, Chimonyo, Kanengoni and Hamudikuwanda, 2003; Chimonyo, Dzama and Bhebhe, 2007), as it appears that piglets exposed to rain are easily attacked by diseases (Chiduwa et al., 2008). Protection of piglets from rain is therefore important. Pig houses must

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be roofed properly and water should not be allowed to enter the houses. This helps avoid water-logged floors.

2.9 Productive performance in pigs

Pigs in smallholder production systems have low levels of production because lack knowledge on how to manage them (Ramirez, 1997). Smith (1993) reported that at the fourth lactation the sow is ready to be culled because it would no longer be economical to keep her. Mota et al. (2000) supported this. These authors analyzed data from 25 family pig farms located in the Ayotzingo community in Mexico and found that the average number of females per producer was 6, with a range of 2-12 sows. The productive life was relatively short with 84 % of the sows farrowed only three times (Table 2.6).

Litter size at birth decreases with the number of parities. Chabo, Malope and Babusi (2000) indicated that litter size at birth of Landrace and Duroc declined in the fifth farrowing, suggesting that sows need to be culled at this stage. Friendship, Wilson, Almond, McMillan, Hacter, Pieper and Swaminathan (1986) and Chimonyo, Dzama and Bhebhe (2006) indicated that sows were expected to have their highest reproductive performance from parity 5 to 6.

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Table 2.6 Sow distribution by parity in Ayotzingo, Mexico

Parity	Number of sows	Proportion (%)
1	48	32.0
2	62	41.3
3	16	10.7
4	9	6.00
5	10	6.66
6	5	3.33

Source: Mota *et al.* (2000)

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Mota *et al* (2002) reported that out of the 150 sows and litters they studied 93 % showed poor body conditioning at weaning (Table 2.7). This might be the main cause of the delay to first oestrus after weaning. The average interval from weaning to conception of 43.6 days was only slightly longer than the interval from weaning to first oestrus. This suggests that the problems were not because the sows did not conceive but that they took longer to express oestrus. The outcome was an extended interval between farrowings of 203 days, equivalent to 1.8 farrowings per sow per year (Table 2.8). Presumably, this is the most important indicator of reproductive performance, which could mainly be traced to inadequate nutrition. However, this is an economic issue in which the cost of additional or more balanced feed must be set against potential benefits in terms of piglets produced per sow per year.

The most important reproductive and production-related parameters of backyard pigs have been explained by Losada *et al.* (1995). Mean age for first service of sows was in the range of 180-210 days and only a minor proportion of producers reported that they increased the age at first service, claiming to get an improved reproductive response from the sow.

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Table 2.7 Productive performance of the backyard sows in Ayotzingo, state of Mexico

Litter performance (n =190)	**Mean**	**SD**
Piglets born alive	9.09	2.75
Stillbirths	2.12	2.03
Litter weight at birth (kg)	11.6	3.89
Individual weight at birth (kg)	1.32	0.26
Piglets weaned	7.02	2.41

Source: **Mota *et al.* (2000)**

n = number

SD = standard deviation

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Table 2.8 Productive performance

Performance indicator (n = 150)	Mean	Range
Weaning to oestrus (days)	38.5	22-49
Weaning to conception (days)	43.6	22-51
Lactation (days)	545.6	39-52
Number of abortions	2	-
Life span (number of parities)	2.24	1-6
Fertility (%)	76	62-79
Interval between furrowing (days)	203	175-217

Source: Mota *et al.* (2002)

n = number of pigs

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The number of services per conception does not necessarily mean problems with fertility of the sows because there is a general trend to give the female two services when mating as a process to ensure a larger number of piglets at birth. Producers revealed that the mean length of lactation of 46-60 days was not appropriate for good development of the piglets at weaning. In fact, this has become the standard method to finish lactation, which contrasts with the improved management system often based on live weight reached by the piglets (Losada *et al.*, 1995).

The productivity of pigs, under any production system, is dictated and limited not only by their genetic potential but also by environmental conditions (nutrition, temperature and photoperiod) which pertain (Kidder and Manners, 1978; Mather, 1991). The interaction between these factors defines their reproductive performance, growth characteristics and carcass quality. In sub-Saharan Africa, nutrition is rarely adequate to maintain optimum reproductive efficiency. Nutritional factors (i.e. plane of nutrition, changes in live weight, and absolute live weight and lifetime trends in live weight) are critical determinants of porcine growth and reproduction (Kidder and Manners, 1978; Mather, 1991). In order to maintain optimum reproductive efficiency in smallholding, emphasis must be on providing nutritious feeds and good management.In general, productivity in indigenous pigs was reported being low (Holness *et al.*, 2005). However, this is assumed to be strongly affected by the environment, particularly intermittent feed supply. Average performance figures derived from data from Africa, where pigs were well-managed, and an example of performance statistics for Asian pigs, are shown in Table 2.9.

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Table 2.9 Average performance figures for well-managed indigenous pigs in Africa and Asia, as comparative figures for exotic pigs raised in commercial units in the tropics

	Africa indigenous	Asia indigenous	Commercial exotics
Number of piglets born per litter	7.5	8.3	10.5
Pre-weaning mortality (%)	<5	20.5	11.0
Weaning weight (8 weeks) (kg)	7.9	8.0	18.0
Live-weight gain from weaning to slaughter (kg / day)	0.42	0.50	0.65
Food conversion rate (kg feed / kg live-weight gain)	4.10	4.50	3.20

Source: Holness *et al.* (2005)

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With poor levels of management it is difficult to keep mortality rates below 10–15 %. The pre-weaning mortality of less than 5 % for indigenous pigs in Africa appears low (Holness *et al.*, 2005). Also, Table 2.9 shows some comparative figures of exotic pigs raised in commercial units in the tropics.

2.10 Factors affecting reproductive performance

Reproductive traits such as litter size, litter weight and survival rate to weaning have more economic importance than other swine traits (Yen, Isler, Harvey and Irvin, 1987). This implies that producers must pay more attention to the improvement of litter size at birth and mothering ability.

Reproductive rate, especially litter size, is one of the most economically important traits in pig production. Increasing the number of pigs weaned per sow will increase economic returns for pig producers with minimal additional inputs (Rothschild, 1998). Currently, litter size varies from approximately 2-20 pigs, averaging 9 to 11 pigs per litter. This depends on the breed under consideration. Phenotypic standard deviations vary between 2.5 and 3 pigs, and heritability is 10-15 % (Johnson, Nielsen and Casey, 1999). Therefore, sufficient genetic variability exists to increase litter size. Yen *et al.* (1987) reported that mid-parity sows produce heavier litter weights and greater litter size than parity one and older (>6) parity sows.

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2.11 Factors Influencing Pig Survival

In general, 4-10 % of the total number of pigs born die during farrowing, and 12-30 % of live-born pigs die before weaning. Pig survival from onset of farrowing until weaning has genetic and environmental components. Lower feed intake of sows at high ambient temperature has been related to lesser weight and higher mortality of piglets at weaning (Stansbury *et al.*, 1987; Prunier *et al.*, 1997). This has to be a consideration to pig farmers if these family pig production systems are to be improved. Although feed supplementation is not practiced due to limited resources and, in some instances, lack of knowledge, feeding balanced feed to pregnant and lactating sows has good results as they produce healthier offspring.

With respect to the factors influencing pig survival, Randall, (1977); Hoy, Luther, Puppe and Wahner, (1997) and Le Dividich, Noblet, Herpin, Milgen and Quiniceu, (1998), estimated that breeding values may, among others, be related to birth weight, process of farrowing, early postnatal pig behaviour, or the ability to stabilize body temperature after birth. Birth weight is considered to be one of the most important factors influencing pig survival. In general, farrowing survival and postnatal survival increase with increasing birth weight (Sharpe, 1966; Leenhouwers, Lende and Knol, 1999).

Heavier piglets at birth have significantly higher weaning weights. This is expected because piglet birth weight is genetically highly correlated to other subsequent weight traits. Piglets of higher birth weights consume more milk per suckle than their lighter littermates and this could be the major reason why heavier piglets outgain lighter ones (Dzama, Mungate,

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Mandisodza and Shoniwa, 1999). Higher birth weights and weaning weights imply that the chances of survival of the piglets to maturity are enhanced. Although in smallholder farming systems farmers are not being informed about the day-to-day activities in a production cycle of pig production, it is important for them to realize that proper management of sows is necessary in order to intensify the production systems. Sows that are being taken care of produce heavier piglets thereby increasing the chances of survival.

2.12 Constraints to indigenous pig production

Minimum input in terms of labour and feed characterize the keeping of pigs in rural areas. Holness *et al.* (2005) reported that pig production in rural areas was characterized by frequent feed shortages. Chiduwa, Chimonyo and Halimani (2008) reported that resource-poor farmers in Chirumanzu district of Zimbabwe were forced to keep their pig herd sizes low because of feed constraints. This was the case particularly during the dry season since the pigs shared the same feed resources with humans. Sows and piglets were not adequately cared for.

In order to improve pig production under traditional systems, constraints and possibilities must be identified and addressed. Many authors have indicated several constraints to pig production in small farms in tropical countries. Saadullah and Saad (1998) mentioned, amongst others, problems of high cost of handling and collection, lack of managerial and technical skills to utilize the feeds *in situ* and lack of institutional support. The following factors are also associated with low production: access to economical technology for better utilization of local resources, non-availability of feed resources (quality and quantity), uneven income distribution which limits growth in demand to a small farm segment of the

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population, environmental constraints, particularly urban piggery, and intense competition for land resources which push up the cost structure for animal production.

Els (2000), in his study conducted in Namibia focusing on the production potential of indigenous pigs, indicated that there was no scientific data on reproduction rate and production traits. For this reason, it was difficult to assist farmers to solve their problems. Further, he indicated that due to views expressed by foreign consultants, local farmers were under the impression that their indigenous pigs were inferior and not suitable for pig production. Also, information concerning levels of productivity in family pig farms is lacking. In order to have a wide vision of farm productivity, the producer needs a record containing all the information required for such an evaluation. In general, backyard pig owners do not have records that let them quantify animal production. Moreover, rarely do they have access to technical support to guide them in this task (Fickers, 1991).

It is reported that disease control is a challenge in traditional production systems because there is no ready access to veterinary services (Penrith and Thomson, 2004). The challenge lies in how to practically apply control measures given the lack of resources and information. Lack of vaccines and drugs affects pig productivity (Chiduwa *et al*, 2008), but the inherent resistance of indigenous breeds of domestic livestock diseases endemic to the region should not be under-estimated as a means of disease control (Masiga, 1998).

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2.13 Role of Pigs in Rural development

Apartheid involved incentives, laws and institutions that favoured large farms and discriminated against smaller, labour intensive farming systems (Lipton and Ellis, 1996). Apartheid also gave large scale white farmers privileged access to natural resources, financial and agribusiness facilities, and rural infrastructures, while black areas are still suffer severe backlogs on all the above listed (Perret 2001). The basic orientation of rural development policy during the homeland era was predicated on the promotion of family farming units of various kinds. Therefore emphasis on family farming as the key to both poverty eradication and development is nothing new in South Africa.

Cousins (1996) reported that livestock are a source of potential assets to rural households because of their participation in the rural economy. Low input, small-scale livestock husbandry remains a primary land use option in rural areas over most of southern Africa (Behnke, 1985; Cousins, 1994; Shackleton, Netshiluvhi, Geach, Balance and Fairbanks, 2002). It has been argued that small stock animals, such as pigs, are only kept for their meat and the short term monetary returns they generate on sale (Dercon, 1998; Sieff, 1999). It has been reported that poor people earn a higher income from livestock than the wealthy Delgado *et al.*, 1999). This is due to the fact that poor people are involved in agricultural activities and such activities are the only source of their income. The rich people and the working class in most instances relocate to urban areas.

Farming is carried out with the goal of the improving the economic and productive efficiencies of the pigs. Low-input pig production has both income-generating and socio-

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cultural roles and is driven by the availability of local resources (Steinfed and Marck, 1997). In North Vietnam, it was reported that pigs contributed 9-41 % of the total income of pig keeping smallholder households (Le Cog, Jésus, Nham and Binh, 2002). In Nigeria, Ajala, Adesehinwa and Bawa (2006) reported that pig raising served as an investment alternative and source of additional income espe cially among women.

Although pig keeping is considered as a secondary enterprise (Ajala, Adesehinwa and Mohammed, 2007), it can play an important role in many rural households that do not have any means of survival. Measures to improve pig farming systems in rural areas have to be taken. There is considerable potential for developing production as pigs are versatile at consuming by-products and kitchen wastes. Ellis, Easter and Wolter (1997) reported that the ability of indigenous pigs to convert waste and by-products from the human food chain into a range of valuable produ cts is one of the advanta ges of keepin g them.

World pork consumption increased by 27 % between 1997 and 2005, with total global pork consumption for 2005 being more than 93 million metric tons (MT). Liberation of trade worldwide has resulted in significant increases in global trade in pork. It has become increasingly essential to be competitive in the global market, as this can contribute significantly to the profitability of country's pork production enterprises (Y oung, 2005).

In South Africa, the National Departm ent of Agriculture (NDA) reported that the pig industry has contributed 4.63 % to the gross value of livestock production of R26 925 308 000.00 in 2003 compared to sheep and goats (5.99 %), and cattle (21.3 %) (NDA, 2005). The South African pork exports to other African countries, the far East and the European Union reached

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0.35 tons in 2004 and imported over 20 000 tons of pork the very same year, with ribs constituting close to 60 % of imports (SAMIC, 2005). It can therefore be concluded that raising pigs in line with the market requirements could open opportunities for resource-poor farmers in rural areas.

2.14 Summary of Review of Literature

The economic and social roles of indigenous pigs have been defined in the literature. A common understanding of researchers is that social patterns of producers in the smallholder farming systems have an impact on pigs' management. Most producers are reported being illiterate. These producers raised their pig traditionally. Pigs were managed as scavengers making it difficult for them to monitor and manage the animals. There are two important roles of raising pigs in rural areas identified in literature. Pigs are important as a source of food and income.

Although the production systems are characterized with many constraints, smallholder farmers continue to raise these animals. Research findings on indigenous pig production are similar in that animals are being managed by women and children and they are well adapted to tropical conditions and local production conditions. Smallholder farmers experience limitations due to limited resources, i.e. feeds, appropriate housing structures and disease control measures. Housing, health and nutrition are interrelated and therefore necessary to provide proper clean housing structures.

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Inadequate feed supplies limit the number of herd sizes by resource-poor farmers. The average number of pigs kept is 3. Increasing the herd size will demand more feed supply thereby increasing family labour. Indigenous pigs depend mostly on scavenging for feeds, which happen immediately after crop harvest. Shortage of feeds during rainy season, when pigs are in sties, is a major concern to smallholder farmers. The source of feeds is household wastes. It has been reported that one of the advantages of keeping rural pigs is their ability to convert waste and by-products from the human chain into a range of valuable products. When feeds are supplied to pigsties, a practice of survival of the fittest becomes a norm. It seems as pigs are able to adapt their nutrients requirements to the availability of feeds.

There are strong suggestions by researchers to get alternative feeds for pigs as they compete with human beings. The population increment will result into shortage of food and motivation for alternative feed sources for pigs cannot be ignored. Research on locally available feed resources and their potential value as feeds for pigs has to be conducted.

In order to improve the production systems of indigenous pigs, proper management is required. Sows have the economic value and should be properly monitored and fed, more especially during pregnancy. Giving birth to healthy and heavier piglets increases the chance of piglet survival. Most researchers agreed that indigenous pigs are more productive and with adequate feed supply, monitoring and management, these animals could give two litters per annum.

Weighing pigs could assist in monitoring growth. The probability of accessing weighing scales in rural areas is minimal. It is important to keep records on growth and performance of animals. Attempts should be made to assist the resource-poor farmers in taking growth

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measurements of their animals. This will also assist them in identifying fertile animals to keep, informed by the progeny history, and the ones to cull.

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3 CHAPTER 3 ECONOMIC AND SOCIAL ROLES OF INDIGENOUS PIGS FOR RURAL HOUSEHOLDS

3.1 Introduction

In African societies indigenous livestock play important social, spiritual and economic roles (Chavunduka, 1976). The function of livestock in Africa is multiple, with their economic and social importance depending on the production system (Jahnke, 1982). It is estimated that over 65% of the rural population participates in livestock-related activities. Livestock are of economic importance, contributing, on average 14-30% of the agricultural Growth Domestic Product (FAO, 2006; 2007; NEPAD, 2006; UNSTAT, 2006). The roles that indigenous pigs play in rural households cannot be ignored.

There is no literature that clarifies the socio-economic values of indigenous pigs in South Africa. However, it is always assumed that pigs under communal production systems are mostly kept for cash income and provision of meat. Smallholder farmers depend on their animals when an urgent financial need arises. Money accrued from the sales of pigs is utilized towards attending to an emergency need in a family.

A major motivation for pig production in developing countries is more likely to be a massive global increase in demand for food and animal fuel due to increased population growth, urbanization and income growth. It is expected to stretch the capacities of production and distribution systems. The livestock revolution as coined by Delgado, Rosegrant, Steinfeld, Ehui and Courbois (1999), has implications for a complex series of interrelated processes and

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outcomes in production, consumption and economic growth. Farming systems in rural areas have to be linked to the world economy. Smallholder pig farmers should be included into the high-value agricultural markets. It is important, however, to address the meat quality standards of the pigs raised under traditional management. Proper interventions such as training by various institutions are necessary in order to improve these farming systems with an objective of food security and economic growth. There is need for providing incentives to smallholder farmers in order to encourage them to shift to improved production practices.

Most of the resource-poor farmers raising pigs in Botswana were unemployed depending on the sale of traditional beer, odd jobs and keeping poultry (Nsoso *et al.* 2006). The social features of pig production revealed that the activity was associated with other systems of cattle and poultry production (Losada *et al.* 1997). In small-scale farming, livestock is important not only as a source of food, investment and transport, but also for its cultural value. Acquisition of pigs was mainly through assisting other women in feeding their pigs (Chiduwa *et al.* 2008), acquired their foundation stock from the market and gift from others (Ajala *et al.* 2007).

3.2 Materials and Methods

3.2.1 Description of the study area

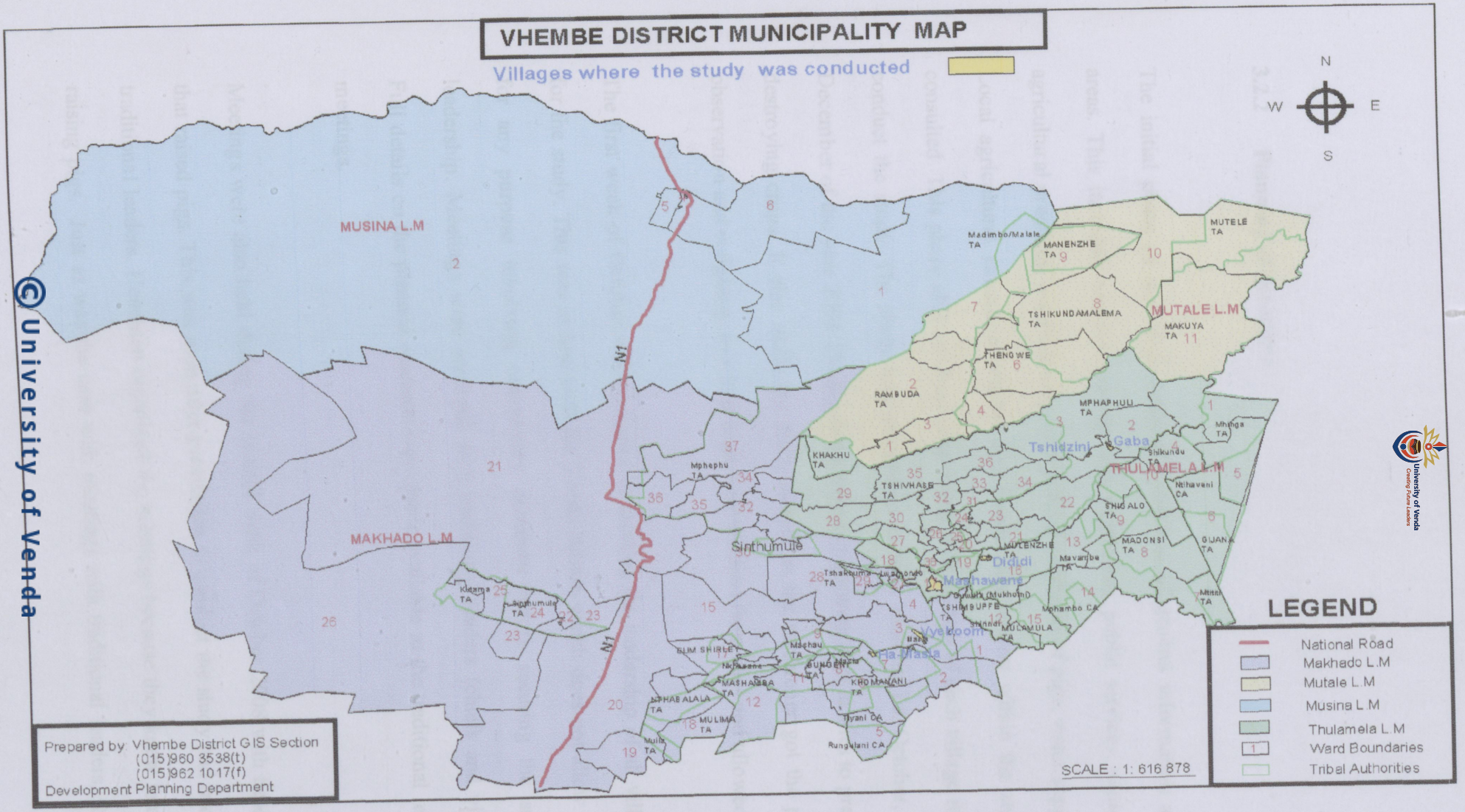
This study was carried out in six villages, namely Dididi, Gaba, Tshidzini, Mashawana, Masia and Vyeboom. These villages are found in Vhembe District of Limpopo Province,

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South Africa. Dididi, Gaba, Tshidzini and Mashawana fall under Thulamela Municipality; whereas Masia and Vyeboom are located within Makhado Municipality. The annual rainfall in the far north of Limpopo Province (including the study areas) ranges between 700–1000 mm. The climatic conditions in the study areas can be described as warm to hot in summer (mid-October to Mid-February) and cool to cold in winter (May to July). Soils are, in general the sandy loam to heavy red clay types with flat areas dominated by steep areas (hillocks). These areas have been planned for residential purposes under chiefs. Pig sties are also located on residential sites.

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Fifure 3.1. Vhembe District Map showing the study areas.

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3.2.2 Planning of the study

The initial phase of the study involved collection of general information about the study areas. This included weather reports, soil, vegetation, public services, settlement patterns, agricultural practices, pig sheltering, and general condition of pigs, water supply and quality. Local agricultural extension officers and community leaders within the study areas were consulted. This phase also involved negotiating with leaders of each village for permission to conduct the study. The study was undertaken in three months; i.e. October, November and December of the year 2008. During these months pigs were kept in sties to prevent them from destroying crops. It also made the study simple as the researcher got the pigs in sties for observation and weighing. In winter pigs were released from sties and allowed to roam freely.

The first week of October was dedicated to meeting the leadership of all villages earmarked for the study. This was in line with the Venda culture which does not allow visiting villages for any purpose involving community members before securing the support of local leadership. Meetings were arranged with traditional leaders (chiefs and village headmen). Full details on the planned research were made available to the traditional leaders during the meetings.

Meetings were also held during the second week of October 2008 with heads of households that raised pigs. This was soon after permission to conduct the study had been granted by the traditional leaders. Headmen organized the meetings because they knew families involved in raising pigs. Just as was the case with meetings with traditional leaders, the purpose of the

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study was clearly explained to the heads of households. They agreed to participate in the study.

3.2.2.1. Sample and sampling procedures

A list of pig owners in each of the study areas was compiled. This constituted the sample frame. Village headmen organized pig owners in their areas to participate in research meetings. Three hundred and thirty (330) pig owners in total attended the meetings, during which lists of pig owners in the villages were generated. During the meetings problems and expectations of the pig owners were discussed. The opportunity to listen to pig owners' problems and expectations was necessary because questionnaires were to be administered with a selected few.

Out of the total sample of 330 households, 100 households were selected for the questionnaire survey. The total number of farmers who attended the meetings in every village was divided by the total number of pig owners (330) in all five villages. Therefore, 30 % of households in each village were randomly sampled. The households randomly sampled were twenty-six (26) out of eighty-five (85) who attended the meeting in Vyeboom village; eighteen (18) out of sixty (60) in Dididi; twenty (20) out of sixty-six (67) in Gaba; twenty-two (22) out of seventy-four (74) in Mashawana; and fourteen (14) out of forty-five (45) in Masia.

After the process of sampling was completed, the contact details and physical addresses of the selected households were recorded for future arrangements. Representatives of selected

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household heads were elected so that they could assist with locating those sampled for questionnaire administration and weighing of pigs.

3.2.2.2. Sample procedure

The random sampling (the lottery method- picking numbers out of the bag) as described by the (FAO, 1990) was used. It entailed numbering pieces of paper equal to 30 % of the number of the identified pig owners and mixing them with unmarked papers. The papers were placed in a bag. Each pig farmer was requested to pick a paper from the by inserting his or her hand in the bag while looking away or with eyes closed. This exercise was conducted in all six villages. In Vyeboom the meeting took place inside the local community hall. In the other villages, meetings were held within the premises of local primary or secondary schools. Those who picked marked papers represented the study sample. Baily (1987) reported that in order to be effective and to make those targeted for interviews feel at ease where applicable and necessary to do so, the interactive research method should be used.

The snowball method was also used. In this method the pig owners interviewed helped the researcher by pointing out other pig owners who could provide information needed for the study. The snowball research method was used when measurements were taken. This happened in cases wherein the randomly sampled households knew the pig owners who were not part of a survey who had piglets that were born when the study was in progress. Weight and heart-girth measurements on the newly born piglets such piglets became part of the study as well. Hundred (100) households were selected and interviewed in this study.

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3.2.3 Data collection and analysis

According to Chambers (1996), the most common method of formal rural research is the questionnaire survey. In this study, information was collected using a structured questionnaire (attached as Appendices A). The questionnaire was designed to gather information on personal characteristics, socio-economic and socio-cultural methods and practices followed in raising indigenous pigs as well as constraints to indigenous pig production. Household heads were interviewed individually.

The descriptive research to obtain the general overviews of people involved in pig farming and observations on natural behavior of pigs were conducted. The researcher and the team of enumerators visited the household heads in their homes. Direct observations were also made during questionnaire administration. This approach helped the research team to make observations on the type of housing as well as the well-being of the pigs.

The developed questionnaire took 30-40 minutes to complete, with six weeks being spent to complete the data collection. A team of enumerators under the leadership of the principal researcher administered the questionnaire. The enumerators had previous experience of administering questionnaires. However, in order to ensure that good quality data were collected, the principal researcher checked the completed questionnaire on a day-to-day basis. Also, the research team reflected on experiences in data collection every day. After collection, data was stored in MS Excel software package before processed into output. The Statistical Package for Social Scientists (SPSS, 1997) was used to analyze the data collected

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using questionnaires. A descriptive statistics was conducted to compute frequencies on variables. Frequency tables were generated indicating multiple responses and percentages.

3.3 Results

3.3.1 Socio-economic analysis for resource-poor farmers

The purpose of the socio-economic assessment was to build an understanding of socio-economic status of the resource-poor farmers who raised pigs in the study areas. This socio-economic information serves as a background to planning and intervention processes. Deducing the socio-economic situation of resource-poor farmers will assist in getting to know the economic and social roles of indigenous pigs to these farmers.

3.3.1.1 Demographic characteristics of pig producers

Most of the households were headed by males (64 %). The household structures were composed of married couples that constituted 63 %, widowed (26 %), single (6 %), and divorced and separated constituted 4 % and 1 %, respectively. Most producers of pigs in the study areas were 65 years of age and above. Ages of heads of households members who reared pigs in some villages of Vhembe District have been presented in the figure 3.1.

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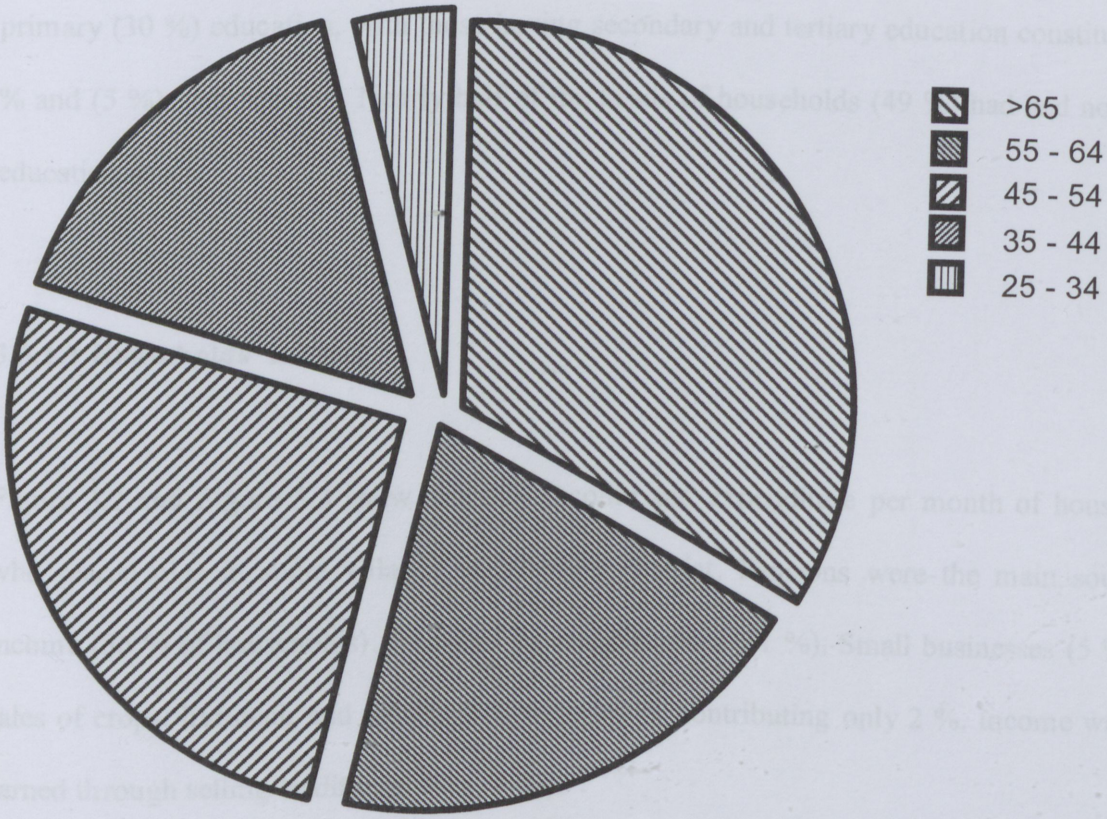


Figure 3.1 Ages of heads of households who reared pigs in some villages of Vhembe District

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3.3.1.2 Education profile

The resource-poor farmers' education levels were low. Approximately, one-third had primary (30 %) education, with those having secondary and tertiary education constituting 16 % and (5 %), respectively. Nearly half of the heads of households (49 %) had had no formal education at all.

3.3.1.3 Households' income

Figure 3.2 and Figure 3.3 show monthly income and expenditure per month of households who reared pigs in some villages of Vhembe District. Pensions were the main source of income (56 % of households), followed by wage earners (31 %). Small businesses (5 %) and sales of crops, livestock and remittances were minor contributing only 2 %. Income was also earned through selling traditional beer (4 %).

Most of the households earned R601-R1000 (34 %) and R201-R600 (28 %) per month. These two categories included pensioners and those who occupied lower positions in their areas of occupation. The income level of R2000 plus constituted 17 %, and other income levels were R200 and below (6 %), within the range of R1001-R2000 (4 %), whilst 11 % reported not receiving monthly income. These results are shown in Figure 3.2.

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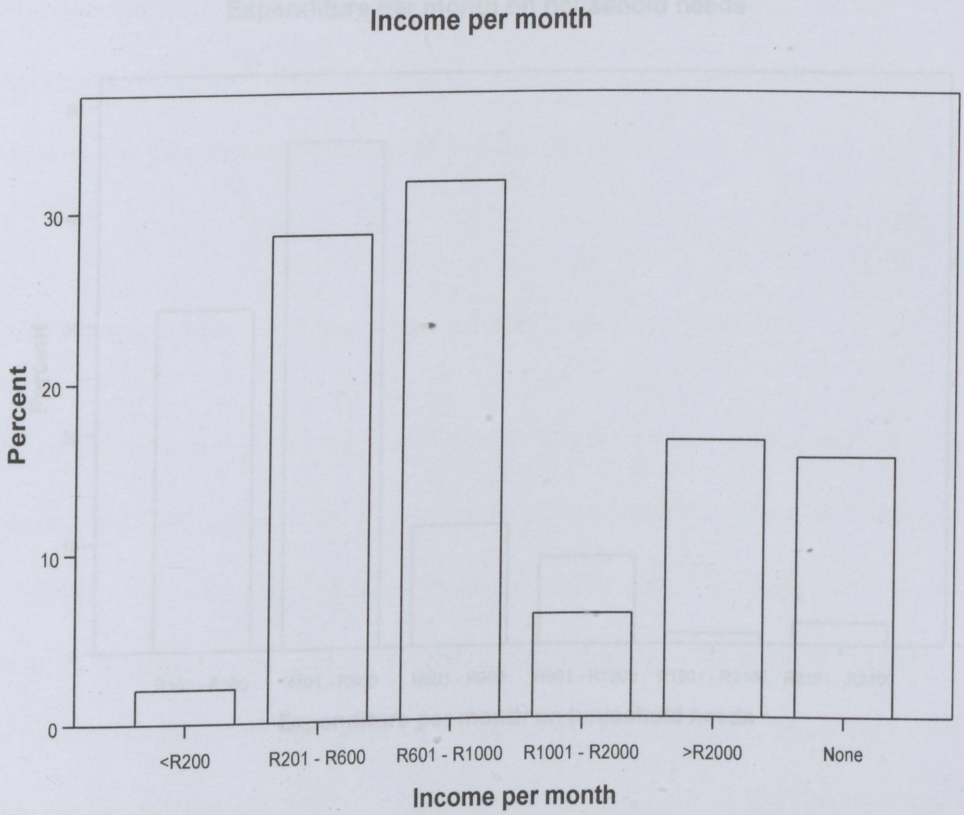


Figure 3.2 Monthly income of households who reared pigs in some villages of Vhembe District

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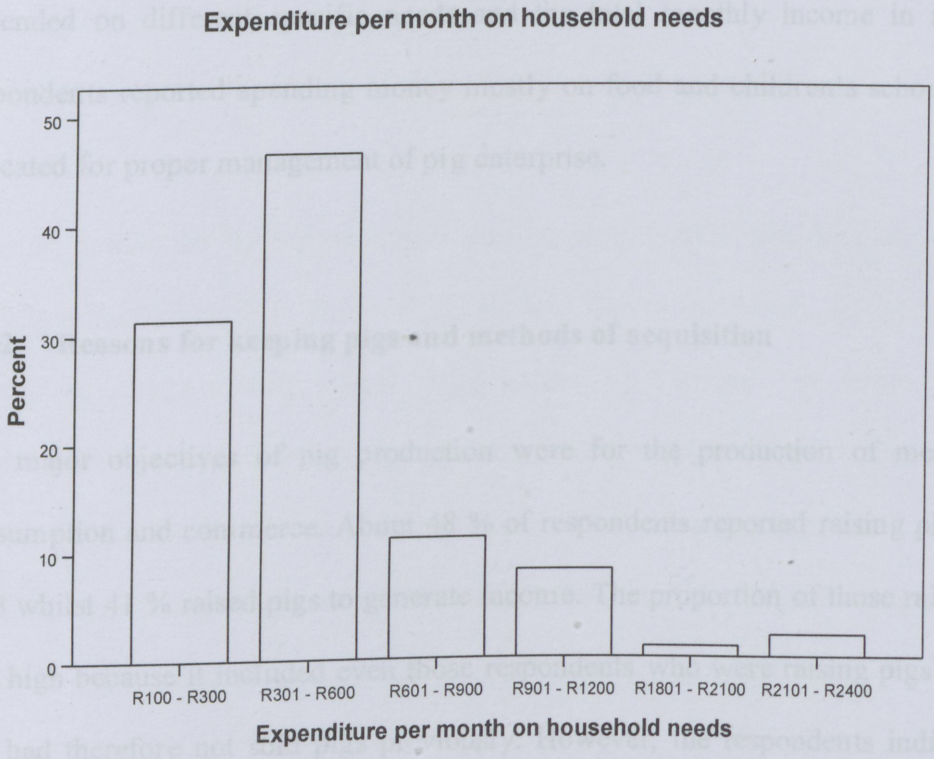


Figure 3.3 Monthly expenditure by households who reared pigs in some villages of Vhembe District

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The monthly expenditure varied from household to another (Figure 3.3). Expenditure depended on different specific needs and the total monthly income in a household. The respondents reported spending money mostly on food and children's school fees, with none allocated for proper management of pig enterprise.

3.3.2 Reasons for keeping pigs and methods of acquisition

The major objectives of pig production were for the production of meat for household consumption and commerce. About 48 % of respondents reported raising pigs as a source of food whilst 41 % raised pigs to generate income. The proportion of those raising pigs for sale was high because it included even those respondents who were raising pigs for the first time and had therefore not sold pigs previously. However, the respondents indicated having the intention to sell pigs in order to generate income. Some of the respondents did not know the reason behind keeping the pigs. There were those producers reported raising pigs for as long as they had pigs or because it was a hobby or raising pigs for pleasure (10.0 %), and 1 % inheritance.

A significant proportion of producers acquired pigs because they have worked for them (56 %) with others purchasing the pigs (31 %). Other means of acquisition mentioned include gifts (6 %), borrowing (5 %) and 2 % inheritance. Although pigs were raised as a source of food, 40 % of producers do not eat pork because of cultural beliefs (25 %), religion (33 %), and health problems (20 %). Twenty-two percent of respondents provided no reason; they just have not eaten pork since birth.

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3.4 Discussion

3.4.1 Demographic characteristics of indigenous pig producers

The pig production by resource-poor farmers in the study area was carried out within the homesteads of producers. The analysis showed that most households were being headed by males, though there were others being headed by females. The larger proportion of the households structures were composed of married couples. However, it was found that all structures of households were involved in pig farming. Raising pigs was not limited to certain category on the household structures. Single mothers also regarded pig raising as another means to raise income to their families.

Most producers were above the age of 45 years. The elderly farmers had their own way of production practices and would be difficult to easily accept new innovations aimed at improving pig production. These findings were consistent with those of Ajala *et al.* (2007) and Nsoso *et al.* (2006), where similar phenomena were reported. It is important to attract young people who have education and skills into the system. Young people are potential future famers and recognizing their role in family pig production at earlier stage may stimulate their curiosity in taking agriculture as a career linked to rural development.

Households' members present for interviews were dominated by females (74 %). This was advantageous because women are people who can provide full information about household activities, including taking care of the pigs. It also led to conclusion that pig raising in the study areas was practiced by women as in most cases it was reported that men had migrated

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to towns to seek employment. In cases where elderly men were around, their focus was with large livestock, such as cattle. Chimonyo *et al.* (2007), Scoones (1992) and Mashatise *et al.* (2005) reported similar findings in Zimbabwe. This agrees with Fickers (1991) who reported that time spent by men on households activities was limited as they spend much of their time outside seeking for economic support to run the family. Ellis (1993) indicated that off-farm market dominates household s work incentives and labour allocations.

These findings could be attributed to the fact that keeping pigs in rural areas was not considered as an economic enterprise and there is a need to shift the minds of producers to consider this kind of farming as another way for them to earn an income. It is also important to involve young people into farming in order for them to assist with necessary skills. This is in agreement with the study by Nsoso *et al.* (2006) who suggested that young people and secondary school leavers should be attracted into farming because they are future potential farmers.

3.4.2 Education profile

The level of education of the resource-poor farmers was predominantly of primary (30 %) with most of producers (49 %) had had no formal education. A significant proportion of producers (5 %) had post metric degree or diploma. This was in consistent with the survey of Losada *et al.* (1997) for backyard pig production in Mexico as well as what had been reported by Nsoso *et al.* 2006 in Botswana. These authors reported similar education levels, which was predominantly primary and secondary with other producers reported being illiterate.

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The age group had no influence in the herd size. This was in contrary to what has been reported by Ajala *et al.* (2007) wherein significant difference in herd size across age group was noted. These authors reported that age affects production of pigs. From the analysis on demographic characteristics of pig farmers in Nigeria, the age group of 21 - 30 years had a mean pig herd size of 3.02, whilst the group above 60 years had 2.52. These authors concluded that young farmers can easily bear the risk of accepting new innovations aimed at improving pig production.

The lower level of education amongst resource-poor farmers raising pigs could have a negative impact towards acceptance of any new method that could improve the production systems. However, as young people were being involved in the production system, they can be used to transfer new ideas to the elderly households' members. In cases where trainings and workshops are planned, young people from all households should attend to assist the elderly implement the outcomes. In addition, those producers reported having tertiary qualifications have to play mentoring roles so that they transfer skills to other producers.

3.4.3 Households income and expenditure per month

Most of resource-poor farmers were unemployed and depended on government pension and sales of traditional beer and other remittance. Old-age pension was the greatest contributor to household income. This was in contrast with the findings by Machete (2004). The author reported that farming was the most important source of income for poor rural households in

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South Africa. Wages was the second source of household income followed by small business. Contribution from the sales of crop and livestock to the household income was minimal – about 2 % of total household income was generated from the sales of crop and livestock. It has been difficult to get correct households financial information, as it is considered culturally inappropriate for elderly people to reveal their financial information to a young person.

Households' expenditure was informed by the households' income and limited to food and school fees for children. On a positive side, these resource-poor farmers were sending their children to school. Therefore, should the younger school going children continue with their education and complete their post-secondary studies in the next few years, chances of getting employment will expand and thus increases the household income. Education will stimulate the curiosity of learning and understanding the complexity of raising animals though they might not take the agricultural field, as farming does not necessary need a specific qualification. It is imperative to conduct a study to determine the willingness of youth in taking agriculture as a career. Agriculture is a focal point to rural development. Attracting youth into agricultural activities is very crucial.

3.4.4 Reasons for keeping pigs by resource-poor farmers and methods of acquisition

The primary objective for keeping pigs by resource-poor farmers was for meat production for households' consumption. Penrith and Thomson (2004) reported that pigs, particularly in arid and semi-arid regions of sub-Saharan Africa, were important as a food source and income.

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Pigs were sold when a need that required money emerged. Delgado (1984) indicated that indigenous pig production system was regarded as an inexpensive alternative for the production of meat, fat and economic support of the family, becoming essential in times of financial hardship. The findings of this study agrees with a report by Losada *et al.* (1997) that pig production has been oriented towards the production of meat, and collaterally speaking has been aimed at obtaining economic resources for emergencies. This confirms a report by Steinfeld and Mark (1997) who noted that low-input pig production had both income-generating and socio-cultural functions and was driven by the availability of farm resources.

The resource-poor farmers in the study areas reiterated on their indigenous knowledge in that fats extracted from the boiled meat can be utilized to treat flue, heal throat sores, and also an effective lubricant to clean ears. These were the general socio-cultural beliefs by the Venda speaking people associated with pigs, rather than other domestic animals such as goats and cattle. Some of the farmers even produced bottles filled with fats extracted from meat at the time of cooking. Evaluation of this belief has to be measured though. This might have been a motivating factor to those who keep pigs but indicated not eating pork. Factors mentioned for not eating pork, however, were cultural and religious oriented. Members of the Zion Christian Church and other congregations considered pork as a taboo.

There are cultural and socio-economic values attached to domestic animals. Cultural belief attached to goats was that they are being slaughtered during cleansing ceremony after burial of a family member. Apart from the economic gain from the sales of cattle, they were used for payment of the bride price. This has been a symbol of high value compared with other small stock.

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There was no specific market where the producers sell their animals. The marketing approach relied on local people who approached producers for the purchase, and thus mostly happened during holidays when there were social gatherings. Pig producers generated money through the sales of weaned piglets for slaughter and to a minor extent for breeding. These piglets were purchased mostly when they were three months of age or older than that.

Most producers had worked for the pigs that they were in their possession. Similar findings were reported by Chiduwa *et al.* (2008), where most women reported that they acquired their stock through assisting other women who had pigs. The type of work mentioned was the provision of kitchen wastes to pig owners to feed their pigs. The pig owners then pay back by a piglet(s) to a person after the sow gave birth.

3.4.5 Conclusions

This study gives effect to the outcome of the socio-economic assessment conducted with the resource-poor farmers. It is therefore important to have an understanding of their social and economic status, as these will directly be under pressure if not taking long to change. This study tried to capture through the findings from the survey, to explain certain categories and the key issues identified that should be considered during planning phases for necessary intervention. The farming systems prevailing in the rural areas were seemingly governed by the socio-economic and socio-cultural dynamics within the communities.

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Keeping indigenous pigs, as well as other stock, in the study areas was linked to cultural or traditional lifestyles. Culturally or traditionally raising stocks is mostly considered as having assets, but not linked to the wider economy. There are various values traditionally attached to indigenous pigs of their products. The lard or fats, when liquidified or heated, are the strong medicine to treat flue, heal throat sores, and also an effective lubricant to clean ears, though not scientifically verified or experimented.

Pig owners in the study areas were characterized by limited resources, both financially and materially. They mostly depended on social grants for a living. With little financial support to the families, pig producers found it difficult to invest some money in pig production. Although the support for pig production was not convenient, indigenous pigs demanded less with regard to their maintenance. Their biological factors make them adapted to survive under harsh environmental conditions, with low production costs. The fact that indigenous pigs are characterized by low maintenance requirements, which makes them suitable to be raised in rural areas, keeping them can be considered as one of the opportunities to alleviate poverty.

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4 CHAPTER 4 PRODUCTION CHARACTERISTICS AND EFFICIENCY OF INDIGENOUS PIG PRODUCTION SYSTEMS IN SMALLHOLDER FARMING AREAS

4.1 Introduction

Measuring and specifying efficiency for pig farms should consider number of production factors and management. Labour requirements and availability of feed limit the number of animals kept by resource-poor farmers. Pig production in smallholder farming areas is characterized by low input cost and animals are being raised under poor management. Indigenous pigs are adapted to the smallholder environments and keeping them is appropriate for resource-poor farmers because they can be fed on fibrous feeds, such as maize cobs (Kanengoni *et al.*, 2002; Ndindana, Dzama, Ndiweni, Maswaure, and Chimonyo, 2002). Input demand of indigenous pigs in smallholder farming areas is low because of unavailability of funds to purchase supplement feeds. About 80 % of households in the rural areas earned incomes that were below the poverty line (Monde, van Averbeke, Ainslie, Ntshona, Frazer and Belete, 1997; Monde 2003). It has been reported that rural people in South Africa rely on external economic activities, especially state grants for a means of living, which contribute more than 90 % to household income (Van Averbeke, Bediako and Barret, 1998; Frazer, Monde and Van Averbeke, 2003).

Indigenous pigs are known to be of small body size with poor reproductive efficiency. Phookan *et al.* (2006) argued that there is a ground to believe that considerable improvement in production efficiency could be achieved through adoption of scientific breeding, feeding

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and management practices. That should be informed by the proper assessment of the production potential of indigenous pigs both as pre breed and in crossbreeding. The concept of adding value to indigenous pigs conservation through promotion and utilization of unique products and traits should be applied to this breed (Ramsay, Smuts and Else, 2000; Jaume and Alfonso, 2000). This will ensure its survival because farmers would be more willing to conserve a breed that has got present value or future perceived value (Nsoso *et al*. 2006).

Rural pig production was characterized by numerous constraints that vary among households (Muchadeyi, Sibanda, Kusina, Kusina and Makuza, 2005). This was due to differences in biological, social and economic factors that influence production methods (Chiduwa *et al*. 2008). These constraints were probably common in smallholding farming. A study by Chiduwa *et al*. (2008) revealed that inadequate feed supplies constrained pig production in Zimbabwe. Chikwanha *et al*. (2007) suggested that attempts should be made to identify locally available feed resources. The authors further reported that the lack of information on changes in nutritive value during the growing season, when the bulk of the feeds are available, hampers the development of appropriate conservation strategies to maintain or produce pigs across the dry season, when both feed quantity and quality are low. In Nigeria, Ajala *et al*. (2007) reported that feeding was most frequently mentioned by smallholders' farmers as a limiting factor to the desire to increase the herd sizes.

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4.2 Materials and Methods

4.2.1 The study area and sampling procedure

Growth monitoring and measurements of pigs were conducted in Vyeboom village, under Makhado Local Municipality. The village was chosen for the study primarily because the majority of the households are involved in pig production. Six families chosen at random in the village were selected for the purposes of monitoring the growth of the piglets over a period of two months. The snowball method was also used when taking measurements. In this method the pig owners interviewed helped the researcher by pointing other pig owners he or she knew who could provide information needed for the study. This happened in cases wherein the randomly sampled households knew the pig owners who were not part of a survey who had piglets that were born by the time of study. In order to get measurements on the newly born piglets such piglets became part of the study as well.

4.2.2 Data collection and analysis

The researcher and the team visited the households' for growth measurements. The growth pattern of the indigenous pigs was considered to be slow due to the type of feeds that are given to them. Indigenous pig owners know nothing about the biological factors as the other factor that contributes to the slow growth of their animals. Knowledge of animal husbandry and proper management by indigenous pig owners are the fundamental factors to improve the farming systems. The financial gain out of raising indigenous pigs is not fully achieved.

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Piglets were weighed every two weeks from the months of October to November 2001. The Proc Mixed Procedure of SAS (1999-2000) was used to determine the weights of all the piglets. The system was used because the management of pigs prevailing in rural areas was the same.

Data on constraints to indigenous pig production under traditional management systems were collected from pig owners using a structured questionnaire (Appendices A). Details on the administration of questionnaire have been provided in chapter 3. Each pig owner was requested to list down two major constraints that hampered improvement of their farming systems.

4.3 Results

4.3.1 Composition of the herd

The number of animals per family ranged from 1-3 (43 %), 4-6 (31 %), 7-11 (18 %), 12-16 (6 %), and 20 (2 %). There was a high proportion of sows (59 %) in this study. Sows were the most acquired sex so as to be used for breeding. Boar formed 21 % of the herd, followed by piglets (20 %).

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4.3.2 Reproductive efficiency of indigenous sows

Indigenous sows and sows under communal production systems are believed to have good mothering ability. In this study, 81 % of respondents indicated that their sows produce one litter per annum, and 19 % reported their sows producing two litters per annum. One litter per annum was the result of only one service per annum. Els (2000) indicated that smaller litter size is expected because these animals have never been selected for improved litter size. The number of piglets per litter reported was in a range of 6-8 plus (82.2 %) and 2-6 (17.8 %).

4.3.3 Housing

The system of housing consisted of pig sties where animals were kept mostly in summer. The wall of most of the pig sties found in the study areas consisted of wood materials (77 %), followed by zink (11 %), brick (7 %) and to minor extent stone (5 %). The respondents indicated that they keep their pigs in sties during the ploughing seasons and then released after the harvest period. This was to prevent them from destroying crops.

All pigsties were rectangular. The building material purchased was a function of the available financial resources. The floors of the pig sties were not in concrete, making animals susceptible to diseases. The pig sties were unroofed.

Pigs were housed together without any separation by sex. Depending on the number of pigs, the number of pigsties may be increased. The pigsties were located on the corner of the

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household yard or at the back of the house. It has been observed that indigenous pig farming systems is characterized with the low cost pigsties building materials. Pigsties were water-logged making conditions not conducive to piglets as they might be susceptible to water-born diseases.

Cleaning of pigsties involved removing manure and mud (67 %) during the rainy season. Only 4 % used water with disinfectant for cleaning. Twenty-nine percent of the respondents reported raising pigs without cleaning their pig sties.

4.3.4 General management

Management of pigs was mostly done by women and children. All respondents reported that they do not keep records of their pigs. There was no measurement taken for growth weights from birth to market. The ultimate type of care of the pigs was concentrated on the provision of food only. It is not common with indigenous pig owners to invest towards improving the standard and management of their pigs. This was mostly due to the issue of insufficient resources.

The sows were naturally mated throughout the year. Most producers (65 %) kept their pigs in the sties during summer and released them in winter, although other producers (35 %) reported keeping their pigs in sties throughout the year. Though pigs were kept in sties throughout the year, the producers practiced uncontrolled mating as males and females were kept together.

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Uncontrolled mating (82 %) was the preferred method of mating. The respondents reported using the method of controlled mating (18 %), mostly buy a boar from a neighbour the time they detected that their sows were in oestrus. The sign mentioned in detecting oestrus period was when a sow climbed another sow.

Attention given to pigs by producers, as indicated in Figure 4.1, was not that much convincing. Many respondents reported spending about seven hours per week (36 %) to care for the pigs, with 13 % not even spending an hour. Time was spent to drop food in the sties. No attention was given to the feeding level.

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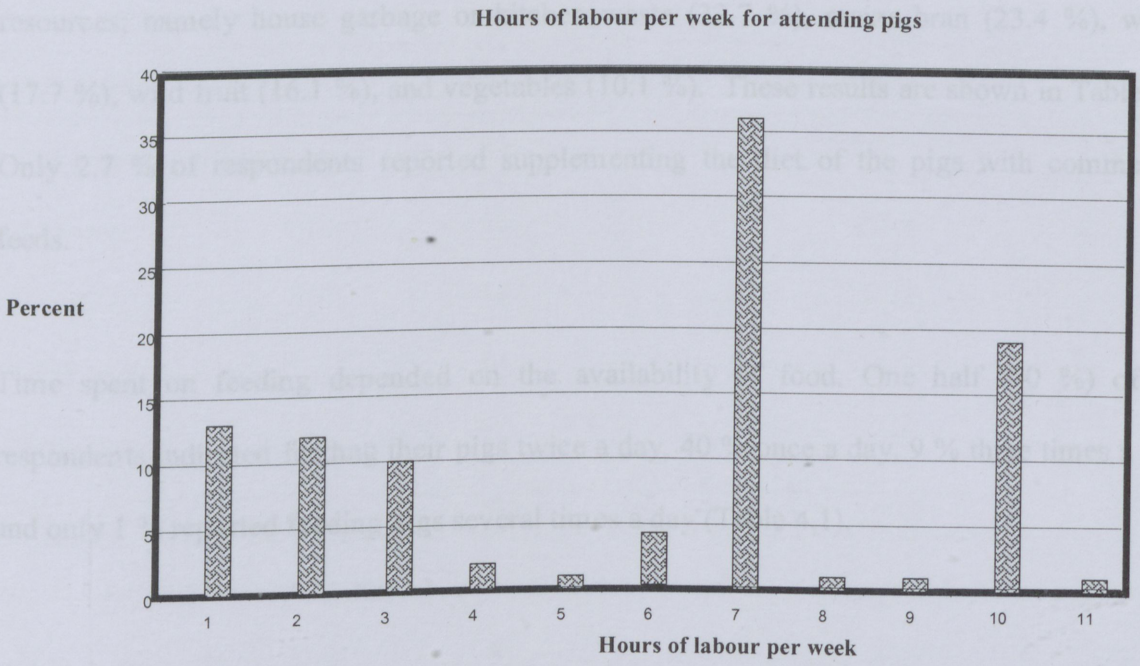


Figure 4.1 Attention (hours of labour) given to pigs per week in study areas

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4.3.5 Systems of feeding

The system of feeding indigenous pigs by resource-poor farmers was based on local resources; namely house garbage or kitchen waste (32.7 %), maize bran (23.4 %), weeds (17.7 %), wild fruit (16.1 %), and vegetables (10.1 %). These results are shown in Table 4.1. Only 2.7 % of respondents reported supplementing the diet of the pigs with commercial feeds.

Time spent on feeding depended on the availability of food. One half (50 %) of the respondents indicated feeding their pigs twice a day, 40 % once a day, 9 % three times a day, and only 1 % reported feeding pigs several times a day (Table 4.1).

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Table 4.1 Feed compositions and time spent feeding the pigs

(a) **Ingredients**	**Number of responses**	**Percentage (%)**
Kitchen waste/Garbage	81	32.7
Maize bran	58	23.4
Weeds	44	17.7
Wild fruit	40	16.1
Vegetables	25	10.1
Total	**248**	**100.0**
(b) **Time spent in feeding/day**		
Once	40	40.0
Twice	50	50.0
Thrice	9	9.0
Several times	1	1.0
Total	**100**	**100.0**

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The farming systems of indigenous pigs' production involved every member of the family and to some extent the neighbors. Members of the family were the ones took care of the pigs. Ninety-seven percent (97 %) of the respondents indicated that labour distribution on feeding pigs was done by members of the family, whereas 3 % feeding labour was done by the neigbours. Neigbours did feed the pigs in order to be rewarded with a piglet after parturition. Feeds provided by neighbours were mainly kitchen waste and rotten fruit such as paw-paw.

The provision of food was done when pigs were in sties, that was in summer. Summer has been reported to have a bad impact on pig conditions as they lose weight. Reasons mentioned for weight loss, as indicated in Figure 4.2, included lack of sufficient and nutritious food (83.7 %) and suckling (3.2 %). Twelve percent of respondents did not indicate any factor, whereas 1.1 % sited to the internal parasites.

Though the producers did not keep records for their pigs, they seem to have several reasons for pigs gaining and loosing weight. The parameters mentioned are not the same. Basically season reported playing an important role on the conditions of indig enous pigs.

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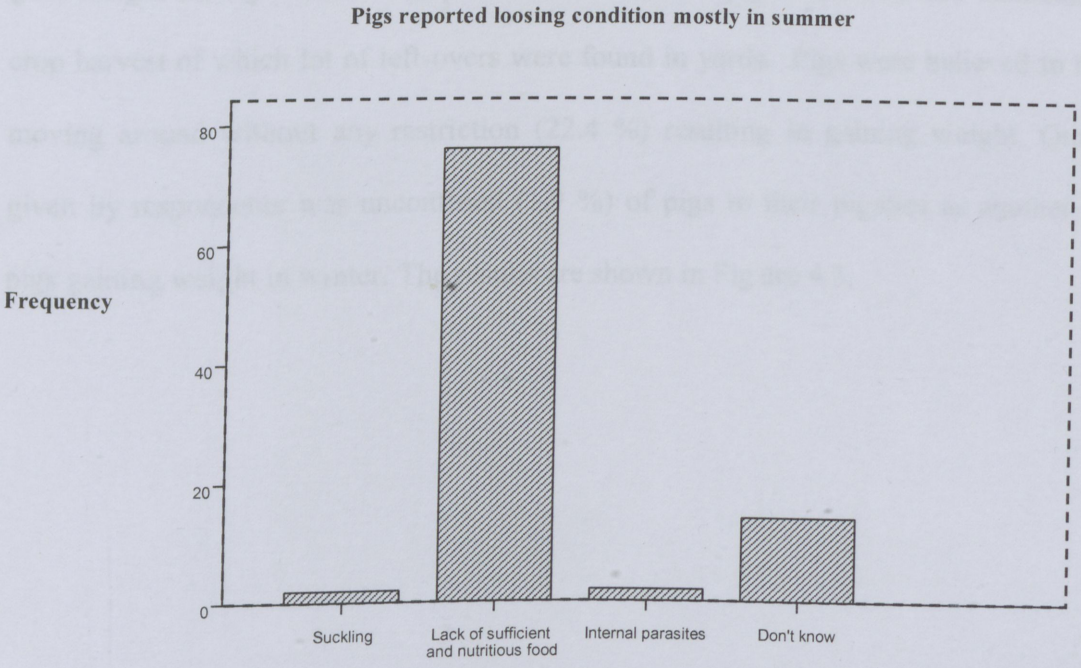


Figure 4.2 Reasons mentioned for pigs to loose weight by resource-poor farmers in the study areas

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In winter pigs were released from sties and fond food for themselves. Therefore, free range had been reported by most respondents (75.7 %) as the most contributing factor for pigs to gain weight during winter. It had been indicated that pigs were released immediately after crop harvest of which lot of left-overs were found in yards. Pigs were believed to be happily moving around without any restriction (22.4 %) resulting in gaining weight. Other reason given by respondents was unconfined (1.9 %) of pigs to their pigsties as another reason of pigs gaining weight in winter. The results are shown in Fig ure 4.3.

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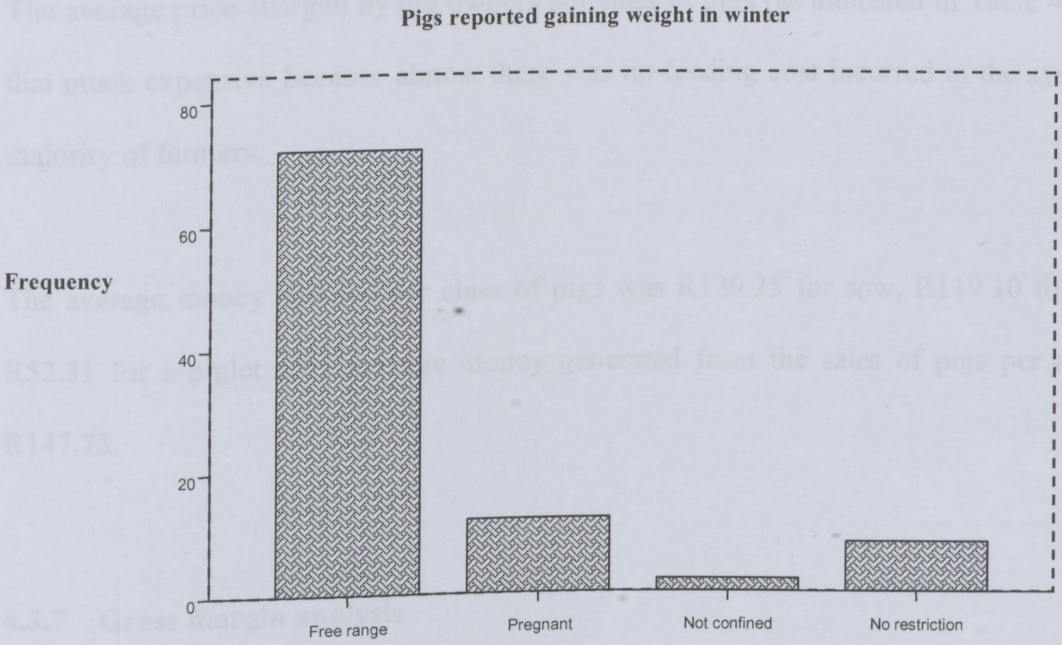


Figure 4.3 Reasons mentioned for pigs to gain weight by resource-poor farmers in the study areas

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4.3.6 Marketing

The average price charged by pig owners per class of pigs (as indicated in Table 4.2) was not that much expensive because almost there was no feeding cost incurred in the system by the majority of farmers.

The average money charged per class of pigs was R139.25 for sow, R119.10 for boar, and R52.31 for a piglet. The average money generated from the sales of pigs per annum was R147.73.

4.3.7 Gross margin analysis

Table 4.3 shows the gross margin analysis of the family. Feed cost was the major component of the production cost. During the survey, it was found that most farmers feed their pigs from household food wastes. Pig owners did not spend money on feeds as the main source of food was kitchen wastes. Commercial feed supplement was rarely found. If commercial feeds were supplied, the cheaper feed materials were preferred. That can only happen once in the production cycle as shown in Table 4.3. The cost of feeding accounted about 22 % of the variable costs.

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Table 4.2 Average price in Rand charged per class of pigs and money generated from sales of pigs per annum

(a) Class of pig	N	Minimum	Maximum	Mean	Std. Deviation
Sow	53	50	400	139.25	76.179
Piglet	54	0	100	52.31	16.040
Boar	50	30	300	119.10	61.592
(b) Money generated from sales of pigs/annum	81	0	1200	147.73	4.337

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Table 4.3 Gross margin analysis for a Sow unit with one litter per year and twelve (12) piglets

Item	Number	Total Value (R)
Income		
Weaners	12	720
Total income		**720**
Less sows purchased		
Less boar purchased	2	160
Total gross income		**560**
Variable costs		
Feed		66
Total variable costs		**66**
Gross margin		**434**

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Feed supplementation was the only variable cost incurred in the study area. The veterinary services were considered to be more expensive and unaffordable. Other variable costs, which are semen cost, gilt genetic cost component, labour cost, and veterinary services costs were not incurred by the resource-poor farmers in the study area.

4.3.8 Production parameters

Table 4.4 shows the production parameters of indigenous pigs. Unlike the exotic breeds, indigenous breeds gave birth and weaned lighter litters. The average litter size at birth was 6. The period from birth to weaning was longer (eight weeks) in indigenous pigs.

Pig mortality was low in this study. The average number of piglet mortality was three for previous year (a year prior to this study). Mortality was caused by the crushing of piglets by the sow due to inappropriate designs of pig sties, high temperatures causing stresses, and drowning of piglets in the mud when floors were water-logged. The most common sicknesses well-known by pig producers and reported as the ones affecting the new born piglets were diarrhea and pneumonia.

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Table 4.4 Production parameters

Parameters	Average kg / period
Litter size at birth	6
Litter weight at birth (kg)	7.32
Litter size at weaning	4.5
Litter weight at weaning (kg)	21.69
Survival rate (Birth-Weaning) (%)	93.4
Mortality (%)	6.6
Weaning age (weeks)	8
Litters per year	1

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4.3.9 Constraints to indigenous pig production under traditional farming systems

All interviewed farmers (100 %) mentioned that unavailability of feed was the major constraint to pig production in rural areas. Most farmers indicated that if a support in a form of quality feed could be provided, pig production could be improved. They also mentioned matters relating to ample space for production so that they could practice integrated farming. In an integrated farming system there is a close association between crops and pigs. Indigenous pigs rely mostly on the farm produce such as maize and pumpkins.

Producers mentioned that market unavailability (89 %) was a constraint to their farming systems as there were no proper markets where they can sell their pigs. Selling of pigs was mostly in cases where consumers approached them and the price was negotiable. Other constraints mentioned included lack of knowledge (83 %), poor housing structures (92 %) and diseases (59%).

Diseases were regarded as serious threats to pig farming. Only 4 % of respondents indicated they were getting assistance from Animal Health Officers. A large number of pig owners (94 %) did not know the diseases that attacked their pigs. However, pneumonia and diarrhea were regarded important. No one indicated how they treated diseases.

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Table 4.5 Constraints to pig production in some villages of Vhembe District

Problem	Number of responses	Percentage (%)*
Farming knowledge	83	83.0
Feed	100	100.0
Housing	92	92.0
Diseases	59	59.0
Market	85	85.0
Others	3	3.0

*Table observations > 100% due to multiple responses

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Many respondents (83 %) indicated that they did not receive any advice at all. A few farmers (12 %) reported getting advice from other pig owners and some family members. Only a small proportion of respondents (4 % and 1 %) received advice from extension and animal health officers. Family members were reportedly advising the pig owners.

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Table 4.6 Mentioned sources of advice by interviewed farmers

Source of advice	Percentage (%) n=100
Extension officer	4.0
Animal Health officer	1.0
Other pig owners	10.0
Other family members	2.0
No getting any advice	83.0

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4.4 Discussions

4.4.1 Composition of herd

The average number of pigs per household was three. A decade ago, Bembridge (1984); Steyn (1988); and De Lange (1991) reported an average number of two pigs in a survey conducted in the Eastern Cape Province of South Africa. Similar pig holdings have been reported for Limpopo Province (Barber, 1996; Khoza, 2003) and in southern Kaduna area of Nigeria (Ajala *et al.* 2007). In Zimbabwe, Chiduwa *et al.* (2008) reported the mean pig herd size to be 3.3. As reported by Chiduwa *et al.* (2008), resource-poor farmers had no choice but to keep their herd size low because of feed constraints, in particular during the dry season since pigs shared the same feed resources with humans.

The findings of the survey revealed the willingness of the pig farmers in rural areas to increase the number of pigs kept. The limitation was because of unavailability of resources to support the pigs, rather than preferences of keeping poultry as reported by Wenhold et al. (2007). These results suggest that resource-poor farmers in rural areas were not planning or concentrating on increasing the numbers of pigs. The reason of such a small number might be the affordability of the families in terms of maintenance.

Pigs kept by producers were of the indigenous type, though there was an element of cross-breeding. The resource-poor farmers in the study areas preferred to keep sows than boars. The number of boars was lower than expected. These findings are contrary to those reported by Losada *et al.* (1995). The authors reported that most producers in Mexico preferred to

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keep boars than sows due to producers' preference to have their own boar for breeding than hiring them. In this study it was considered not important to have a boar in a household herd as no controlled mating takes place in the system. Mating occurred naturally when pigs were released from sties just after crop harvest.

4.4.2 Reproductive efficiency of indigenous pigs

The production potentials were the same as reported by Els (2000). In this study sows farrowed on average once a year. The furrowing once a year was attributed to the fact that mating was not planned as it occurred naturally when pigs were released from sties. Similar findings were reported by Chiduwa *et al.* (2008). Els (2000) reported that indigenous sows can produce two litters per annum with improved management and nutrition, and weaning at eight weeks of age.

Weaning of piglets also occurred naturally without interference from pig owners. This was the same with the findings by Nsoso *et al.*, 2006; Mashatise *et al.* (2005) and Scherf (1990) who reported that smallholder farmers wean their pigs naturally. Most of the interviewed famers reported that the piglets were weaned by the age of three (3) months. This was very difficult to confirm, and requires further assessment. Other researchers (Mashatise *et al.*, 2005; and Nsoso *et al.*, 2006) reported that weaning took place at about 120 days of age or 4 months.

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Ingenious pigs can reproduce on low plane of nutrition and poor management. According to resource-poor farmers, the most common litter size was in a range of 6-8 plus. This was in consistent with the surveys of Nsoso *et al.* (2006) for indigenous pigs in Botswana where most common litter size reported was 5-8 piglets per sow farrowing.

4.4.3 Pig housing and husbandry

Indigenous pigs were kept in small sties built of wood collected from bush trees and raised under a scavenging system during winter or immediately after crop harvest. Therefore keeping them in sties was to prevent crop damages. These pig sties were hardly cleaned resulting in pigs eating food and drinking water contaminated with droppings, and therefore susceptible to diseases. There was no separation of pigs by age or sex; the animals were just kept together in a sty with higher probability of old pigs crushing piglets. The number of pig sties increases with an increase with the number of pigs. The higher the number of pigs kept in one sty the more the pressure resulted from feeding and confinement. The restriction of animals from behaving naturally may lead to behavioural problems and aggression (Barton Gade, 2002). Warriss *et al.* (1983) and Beattie *et al.* (2000) suggested that pigs housed in a barren environment might be more susceptible to stress, which may affect the quality of pork. However, the management of conventional systems is more efficient in terms of controlling diseases and treating individual animals (Berton Gade, 2002).

The confinement of pigs to sties in summer had a negative impact on pigs as it affected their conditions badly. Because there were no enough food provided by the pig owners or family

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members, pigs lose more weight due to feeding pressure and stress. If pigs' conditions started to bother the owners, farmers reduced pig numbers by hiring sows or gilts to neighbours or relatives who get a piglet(s) after parturition as a reward. Winters was advantageous to pigs as they were released from sties and started searching for food or scavenge. It was at this period where some improvements, such as weight gain, were noticed. The advantage of free-range was that these animals had more freedom to express natural behaviour patterns. As such, pigs are less likely to behave aggressively and may be less susceptible to stress which may result in a better pork quality (Beattie *et al*., 2000). However, the control in the environment in free-range systems is much more difficult with regard to the control and treatment of animals for diseases (Barton Gade, 2002).

4.4.4 General management

Management was done by women and children and mostly focused on feeding. Fickers (1991) indicated that the backyard pig production farming system is known as family pig farming because it is handled by women and children. The management responsibilities and ownership of pigs in rural areas were carried out by women. Similar findings were reported by Scoones (1992); Mashatise et al. (2005) and Chiduwa et al. (2008). Involvement of women in family nutrition and food security deserves attention.

Quisumbing, Meinzen-Dick and Smith (2004) reported that women played a major role in attaining household food security. Women's engagement in food security attainment started with producing food and managing natural resources (Brown, Feldstein, Haddad, Pena and

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Quisumbing, 2001) as well as managing children and providing a proper nutritional balance for households. Children are also involved in providing feeds whilst pigs are in sties. Therefore, women and children are engaged in productive activities in these farming systems.

Pigs were not given enough concentration, as various stages or phases of their life needed specific attention. For instance, the nutritional needs of pigs vary at the different phases of life. If enough time is devoted towards taking necessary care for the pigs, it would be easier for pig owners to identify problems and notice changes with their animals. It is important to supply enough food when pigs are in poor condition and supplement rations with extra feeds during winter to pregnant and lactating sows need to be realized or practiced. Many authors recommend ad libitum feeding of the sow during lactation. Neil (1996) reported that a high plane nutrition fed ad libitum during lactation improves the ability of sows to come into oestrus after weaning.

Though mortality has been indicated not a problem as can be concluded, pig producers were not taking any monitoring measures to identify the cause of the death if a pig died. There was no diagnosis of the dead animal to find out the problem, which then helps in taking precaution measures to other animals not to be affected by the same disease.

A challenge with pigs under communal production systems is that pig owners do not put efforts in giving necessary support to their animals. Although mating occurred naturally when pigs were released from sties, it is good to trace the animals in order to identify those who are pregnant. Littering management is thus an important part of pig production because if good care is ensured to pregnant sows, they will produce healthy piglets. The survival of piglets the

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first few days after birth is highly dependent on the condition of the sow, and thus milk production of the sow (Els, 2000). It also goes further to involve the pig producers in making sure that piglets are allowed to suckle as much as possible for them to receive enough protection.

4.4.5 Systems of feeding

The system of feeding involved every member of the family and to some extent the neighbours. Indigenous pigs were mostly fed kitchen wastes with none feed supplementation provided. Several researchers (Castillo, 1988; Conejo and Mejorada, 1990; Losada *et al.*, 1995) also reported that indigenous pigs usually are fed with kitchen wastes, grain such as maize, wheat by-products, and alfalfa and frequently scavenge on available grazing. Losada *et al.* (1997) reported that system of feeding of indigenous pigs maintains a regional domestic link. The animals were found in a scavenging immediately after crop harvest. The similar findings was reported by Saadullah and Saad (1998) that feed resource base for indigenous pigs is mostly scavenging in the small farm and the feeds consist of household wastes, fruits by-products, roots and fibers, and small amount of grains, grain by-products and anything edible found in the immediate environment.

4.4.6 Marketing

The main objectives of indigenous pigs farming in the study areas were oriented to households' consumption and selling of piglets when the need for money arises. Delgado

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(1984) reported that backyard pig production is considered as an inexpensive alternative for the production of meet and for the economic support of families in times of financial hardships. This has been confirmed by Berdugo (1987) who indicated that economic urgency was considered a very important parameter which in fact has been suggested as the foundation of backyard pig production system. Conejo (1993) echoed similar findings when reported that the importance in the communities where indigenous or backyard pigs are raised is two fold, as a source of food and fattened pigs sold to help the family economy.

There was no any specific market reported by pig owners to sell their animals. The location for selling animals was the producer's house. The majority of buyers were individuals who approached farmers for purchase. The animals were sold most for slaughter for meat and to minor extent for breeding. The demand increased when there were social gatherings, usually during holidays.

The most sold class of animals reported was a piglet. This class of animals was preferred mostly because customers buy them to slaughter for meat. The standardized procedure for selling was based on the age of the piglet. The preferred marketing age was three months of age. Losada *et al.* (1997) reported that indigenous pig farmers' standardized procedure for selling pigs was by guessing the live weight of the animals.

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4.4.7 Gross margin analysis

Gross margin analysis is used to evaluate the financial performance of the enterprise. The gross margin analysis is the difference between the total income and the total variable costs of an enterprise and it measures what the enterprise is adding to the overall farm profit (Rasmussen, 1982). Pig keeping in the study areas was characterized by minimum inputs in terms of labour and feeds. The only variable cost incurred was for the purchase of commercial feed supplements, which accounted about 22% of the variable costs. Other variable inputs such as labour, transport, marketing, veterinary services, etc were not incurred in this study. The gross margin analysis, as informed by the farming systems in the study areas, suggests that those who sell their pigs were getting the profit.

4.4.8 Comparison of Pigs under communal production systems and Commercial Sow Productivity

Litter weights at birth and at weaning were smaller in the pigs raised under communal production system than in the commercial pigs. Chabo *et al.* (2000) reported that weaning age, lactation, food intake, parity, and season and litter size are the possible factors affecting average pig weight at weaning. Litter size at birth, as well as the growth rate, of pigs under communal production systems was low compared to that of commercial pigs. Els (2000) indicated that indigenous pigs or pigs raised under communal production systems have low growth rate and deposit fat quickly as a survival mechanism for them to fend food for themselves. Poor quality of food consumed by pigs under communal production systems had

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a negative impact on the growth rate of the animals. This is because increase in body weight is largely dependent on the amount of food or total nutrient intake as reported by Holness (1991)

There was no consideration of breeding time and the season of birth in communal production systems as that is always the case with commercial farming. Season of birth plays a significant role in influencing the weight at different ages. Piglets born during rainy season reported having highly significant effect on litter weight at weaning (Deka et al., 2002; Nandakumar et al., 2003; Phokan et al., 2006; Prasanna et al., 2009).

These pig producers in the study areas did not indicate taking any necessary precautions needed on piglets at birth. Disinfections of the umbilical cord at birth in prevention of diarrhoea or any form of injection to prevent piglets' anaemia and other related diseases were not practiced.

Though weighing pigs in rural areas is considered most expensive by the resource poor farmers, its justification cannot be overruled. Weighing animals provide the basis in terms of aligning resources that will assist in improving the productivity in animal husbandry. Mohammed and Amin (1996) reported that measurements of various body conformations are of value in judging the quantitative characteristics of meat and are helpful in developing suitable selection criteria. Knowing the live weight of an animal also assist producers in determining the correct market value and also meet the world demand of qualitative products. Live weight has been reported being important and economic in beef cattle as well by

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Nesamvuni, Mulaudzi, Ramanyimi and Taylor, (2000), but it is seldom measured in rural areas due to lack of scales.

Piglets of white colour weighed more than those of black colour. This was because of the crossing of the Indigenous Pigs and the Large Whites. White piglets were the offspring of such crossing and weighed more than the black piglets of the indigenous breed. The influence of the Large White in the study areas was steadily improving bearing good results though it was not from the intention of resource poor farmers as they lacked knowledge regarding breeding selection.

The measurement of productivity and performance of indigenous pigs or pigs under communal production systems was difficult because there was no record keeping or handling facilities to ensure regular direct observation. Record keeping is important in order to monitor the production indicators and causes of diseases so that necessary precautions should be done. Production parameters for indigenous pigs are not clearly defined, as it is with the commercial sector. This is because the objectives of keeping pigs by the resource-poor farmers are not necessarily for commercial purposes and that the farming system also faces constraints in terms of limited resources.

4.4.9 Constraints to indigenous pig production under traditional farming systems

The majority of respondents reported lack of knowledge on pig production as the main constraint. It was reported that production levels in rural pig production systems were low

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because farmers lacked knowledge (Ramirez (1997). Without proper knowledge, management remains a problem. With good management pig production can undoubtedly play an important economic role (Bembridge, 1984). Farmers in rural areas do not keep records on production as well as sales records (Nsoso *et al.*, 2006). Farming systems of indigenous pigs are not linked to the extension services of the government. Therefore, these resource-poor farmers are keeping their pigs without any valuable advices from experts. The extension services and advisory roles that the Department of Agriculture played could fill the knowledge gap. It was observed that the Limpopo Department of Agriculture in Vhembe District did not have a plan in place on how best to support smallholder farmers so that they could improve their pig production systems. The Department of Agriculture has to develop the capacity development programme to assist resource-poor farmers gain skills required in improving pig production in rural areas. This agreed with the suggestion by Garforth, Sukumaran and Kisauzi (2005) who reported that knowledge was important to smallholder farmers and could be gained only by being exposed to information.

Farmers could not even keep records on production characteristics of their pigs as a result of lack of knowledge. Training was suggested as the only way to impart knowledge. Farmers considered training to be important because they realized that there was potential for improving indigenous pig production systems.

These farmers indicated that there was no market and it was sometimes difficult to get a customer at the time they wanted to sell their pigs. Lack of market or inadequate marketing opportunities, as reported by (Fickers, 1991; Conejo and Ortega, 1995), poses a challenge to indigenous pig producers. Farmers indicated that they were de-motivated from considering

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raising pigs as an enterprise to generate income as they will fail to get customers as there was no proper market.

Unavailability of feeds during some parts of the year was reported to be a limiting factor for farmers and thus they could not increase their pig herd sizes. These findings were similar to those of Chiduwa *et al.* (2008), who found that farmers deliberately kept small pig herds because of feed constraints. Also, Ajala *et al.* (2007) reported that smallholder farmers in Nigeria expressed their desire to increase their holdings but inadequate feed hampered the realization of this goal.

Poor housing structures and diseases are interrelated. Pigs could be exposed to diseases because of poorly planned housing structures, mainly during rainy season. Piglet mortality was probably high during the rainy season mainly due to poor housing facilities. Pigsties were filled with water and mud which then increased the chances for water-borne diseases for the animals. The causes of death were not known because no postmortem was ever conducted on the dead animals. It is important to evaluate the causes of death to animals as this will inform the producers what measures they have to take to prevent further loss due to similar disease. Conducting postmortem to dead animals is crucial as one of the management tools.

Disease control was still a major challenge in smallholding pig production systems as these enterprises do not have ready access to veterinary services. Similarly, Penrith and Thomson, 2004 reported this and indicated that rural farmers frequently had little or no ready cash to spend on animal health care. The challenge in traditional farming systems lies on how to practically apply disease control measures given the lack of resources and information.

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4.5 Conclusions

Resource-poor farmers were operating under difficult economic conditions of farming, which limited the number of animals per herd in a family. Farming requires adequate resources, including capital, and efficiently utilization of such resources for an enterprise to be sustainable. There was a desire to increase the number of animals amongst farmers in that they preferred to keep sows than boars for breeding purposes. The desire was being short-changed by limited resources such as feeds. Lack of subsidies to resource-poor farmers by government is considered as the detrimental factor to these farmers and therefore government has to consider its support to farmers in rural areas in order to intensify their farming systems.

Any form of support or intervention to improve the efficiency of pig farming by resource-poor farmers has to be informed by a broader understanding of their farming systems in order to ensure that the support services is adapted to their situation. Proper housing structure for pigs has to be made out of local materials utilizing the family labour. The housing structure has to allow the removal of waste and be always clean.

Indigenous pigs scavenge for feed immediately after crop harvest and winter. They were kept in sties during planting season or rainy season to prevent them from destroying crops. It was assumed that during scavenging period there was plenty of feed for pigs as they happen to gain weight during winter. There was sufficient feed in the fields in a form of leftovers just after harvesting of crop. It would form economic sense if farmers conserve some of the crop-leftovers for the supply to pigs in the next planting season when pigs are in sties. These

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conserved feeds could be provided to pregnant sows conceived during scavenging period, though the nutrients status would not been confirmed.

Resource-poor farmers marketed their pigs in informal markets. There was no marketing strategy and the sale of pigs was done after a customer approached the producers. Mostly pigs were sold for meat consumption, with minimal probability for breeding purposes. It would be difficult to operate maximally without access to market. New approach of institutional arrangement, such as cooperative, has to be introduced. Such arrangement will promote the spirit of working together, sharing information and knowledge as well as support. This will allow farmers to respond to the market requirements in terms of supply and market standards.

Farmers in the study areas did not keep records on pig production. It was difficult to relate to the production potential of a particular sow as there were no records linking the animal with its offspring. Therefore it was difficult to indicate if it was still economic to keep such animal or not. However, even though it was not documented the producer could give estimates in terms of the performance of their animals for a past year or two. Farming or enterprise records are important tools that inform management practices. It was difficult to develop management strategies in a situation where there are no records on production.

Assessing performance of pigs in study areas was not practiced because scales are very expensive and lack of such knowledge. In order to assess the impact of the feeds body measurements have to be monitored. Heart Girth measurements could be used to monitor such changes in cases where weighing scales are unavailable.

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The extension and advisory services seemed inefficient enough to deal specifically with indigenous pig farming. Those famers who reported receiving advice were able to consult for technical support at a cost. A two-way communication system between producers and public institutions is important in order to strengthen the extension services in the provision of technical support, advice and health matters. Training is thus important to enlighten producers in rural areas for them to be able to understand all the production factors.

Unavailability of credit to support pig producers in the study areas posed many challenges as there was no financial support. Availability of credit or rural finance institution linked to the farming systems or providing soft loans could unlock most of the opportunities that could assist with improved farming practices.

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5 CHAPTER 5 GENERAL CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Resource-poor families in Vhembe District kept pigs. The animals were maintained under a traditional rearing system. The system was characterized by poor management, inadequate nutrition, and lack of care and control of diseases. However, the animals survived and produced without the need for high value inputs, thereby making them suitable to the system. Because these pigs were adapted to harsh environments, and had lower maintenance requirements, rural people were able to raise them. Women and children were mainly involved in raising the pigs.

The animals were raised with two purposes, viz. to provide meat for household consumption and economic support for the family in times of financial hardships. Therefore, marketing usually occurs when there was a financial need in the family. Farmers also sold their pigs to reduce the number of animals in the sties. Animals were purchased mainly for slaughter for meat and to a minor extent for breeding. The marketing age preferred by both parties (pig owner and customer) was three months of age.

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5.2 Economic and social roles of indigenous pigs

The economic and social roles attached to indigenous pigs for rural livelihoods were clearly defined. Just like the reports by other researchers around the world, raising pigs in the study areas was considered as a major source of cash income. Pigs were sold mostly in cases of urgent financial needs. Pigs were considered as security mean available to be exposed in exchange of cash to most of the households. The economic benefits generated from the sales of pigs improve the livelihoods of families. Money generated from the sales of pigs covered school fees for children and cater for other needs in the family. Animals were also raised for the production of meat for household consumption. This contributes to households' food security. Pigs are also source of protein.

The socio-cultural functions of indigenous pigs included the usage of liquidified or heated fats. These fats are extracted during the process of cooking the meat and stored safely. The fats are believed to heal flue, treat throat sores, and lubricate and clean ears. The cultural belief is not limited to these though. Generally, fats liquid reported performing many functions. The Venda speaking people used pig fats to perform these functions ever since. There is a need, however, to examine these functions scientifically in order to get more understanding. The laboratory examination is important before these functions are confirmed.

The sales of pigs were reported being high during holidays, mostly in December. This is the time of the year where many people have family or social gatherings. This could be perpetuated by the fact that many people travel to home from areas of work to rest during December. The most preferred meat in times of family or social gatherings was pork.

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5.3 Production characteristics of indigenous pigs

There is great concern globally by Food and Agriculture Organization over the loss of biodiversity in domestic animals. Part of South African heritage lies in the genetic diversity of indigenous domestic breeds which have adapted to the hash African environment. The broad genetic variability of indigenous breeds enables them to have valuable traits. It is necessary that the gene pool of these unique characteristics should be conserved.

In an attempt to conserve the genetic resource of indigenous animals, those who are raising them have to be encouraged. It is important to evaluate and characterize the production systems of indigenous pigs in rural areas for one to come up with proper measures of intervention.

Raising pigs in rural areas was characterized with low input. There was little or no cost that pig owners incurred through raising these animals. The indigenous pigs demanded less feeds. No treatment or precaution of diseases undertaken in most cases. An indication made by several researchers was that the production of pigs in rural areas is low. This is expected as little is invested. Most farmers in the study areas were happy with the output putting into consideration that little has been invested to the farming systems. The findings of the research studies conducted indicated that a shift of management style from traditional one could play a major role in improving the production. The potential of indigenous pigs have been noticed.

The average number of pigs per household was 3. The number of pigs per household was kept low because of lack of feeds. Nutrition limited pig productivity as is rarely

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adequate to maintain optimum reproductive efficiency. The main sources of feed for indigenous pigs or pigs under communal production systems were household garbage and rotten fruits, and also scavenge on available grazing in winter or just after harvest. With an improved management and nutrition, pig production will improve and thus fulfill the objective of producing meat for household consumptions, and with adequate marketing opportunities, the system will be able to contribute to the family foods and income. That will exactly minimize risks for family economic emergencies.

Pigs were raised without well-planned practices that were essential for increasing efficiency in pig production. Pig owners did not attempt to obtain productivity from their pigs. This happened because they lacked knowledge that will capacitate them with good management skills. A good condition of piglets at birth is an important survival factor in indigenous pig production system. Therefore, productivity in this regard can be improved through an improved husbandry and nutrition.

An improved housing structure is important for the provision of shelter as the tropical temperature has an effect on productive performance. The lack of improved shelters makes piglets susceptible to diseases which at the end increases mortality rates of piglets. Housing structures were built out of wood, zink, bricks and stone. The housing structures were poorly built and risky to animals' well-being. The conditions of these pigs' sties have to be improved, though built out of cheap materials.

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Understanding of the family pig production systems is an important basis for one to come up with measures that can help to improve these systems. Interventions to improve the farming systems have to be linked to the needs of farmers and their patterns of life. Proper management practices could ensure an improved productivity. The higher the number of piglets weaned, the higher the gross margin income of indigenous pig production.

Most of the piglets kept by resource-poor farmers in the study areas were females than their counterpart, which then indicates the interest of pig owners towards breeding purposes. As resource-poor farmers are characterized by limited resources, heart girth measurements could be used to predict live weight of an animal by households that cannot access the weighing scales. Many researchers have reported on the use of heart girth to estimate body weights on domestic animals. This has to be implemented and probably shift the focus into assessing if farmers are properly using the idea and able to interpret the readings. The extension and advisory services of the Department of Agriculture should plan on how best to educate farmers in taking heart girth measurements.

Training on the use of the heart girth measurements is very important. Farmers have to be trained on how heart girth measurements are taken and the conversion of the readings into weight in kilogram. This will ensure that the readings are correct and will not mislead them. Monitoring the growth rate of piglets from birth to weaning age is very important and the weight measurements will inform the farmers on proper intervention for the well-being of animals. Birth weights are results of the conditions of sows during pregnancy. Piglets with

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lower weight at birth will have lower weight at weaning. Assessing weights of piglets from birth to weaning as well as the feeds fed the sows during pregnancy can inform future planning and the type of feeds to be supplemented to pregnant and lactating sows.

5.4 Constraints to indigenous pig production under traditional farming systems

Constraints to rural pig productions are similar all over the world. This study confirmed research reports on identifying the limitations to improved pig production systems. Inadequate feed, lack of knowledge, market and diseases were some of the major challenges. It is therefore recommended that adequate support, such as the institutional support providing advice to farmers and the availability of feeds at lower cost for affordability, be given to indigenous pig producers.

Government extension and advisory services should be linked to the resource-poor farmers in rural areas. It is within the scope of the South African government to encourage rural people to initiate food security projects, where the Department of Agriculture provides starter packs for the rural poor. As much as this food security program is intended to alleviate poverty and waive the dependency syndrome away, the extension and advisory systems need to be effective in assisting rural people with technical concerns. It is important to provide necessary support as pig producers are not able to secure a veterinary service that will assist in treating or informing them about the best treatment and vaccination needed to animals. This will also

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help with the diagnosis of the dead animal and address the problem with immediate effect so that other animals should not affected by the same problem.

Pig producers in rural areas need to be empowered with knowledge and skills, especially leadership skills. It is vitally important to change the mindset of these producers. Producing pigs should be considered as a farming enterprise and not as something linked to traditional or cultural behaviour. If pig producers are encouraged to form indigenous pig producers' cooperatives, they will be able to pass knowledge to one another, solicit funds, buy inputs collectively, and be able to meet the market demand.

Pigs under communal production systems adapt very well to harsh environmental conditions and able to reproduce under low planes of nutrition. Therefore, it is important to develop a working conservative method for genetic conservation of indigenous breeds in a participatory way. This will involve the government, farmers, non-governmental organizations, Higher Learning Institutions, and Research Institutions to work together and develop a gene bank for indigenous pigs. A participatory research and development can help in identifying and addressing constraints and possibilities, as well as both the felt and unfelt needs for pig producers. Government, Community Based Organizations and NGOs should pool resources to provide assistance to indigenous pig producers in order to improve pig production under traditional management system.

Resource-poor pig producers need market oriented support services, adapted to their specific circumstances in order to gradually absorb them into the main stream of agricultural production. There is a need to establish linkages between smallholder traditional producers

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with niche markets in urban centres. If that is in place, the gross margin will increase and benefits for keeping indigenous pigs will be manifested.

5.5 Further research areas

In order to stimulate growth and development on pigs under communal production systems, nutritious food has to be supplied. Pigs under communal production systems fed on gabbage and indigenous feeds. Further research on indigenous feeds that are supplied to pigs has to be conducted. This will assist establishing the nutrients values on such feeds and therefore recommend commercial feeds supplement. The fact that pigs in rural areas depended largely on scavenging for feeds, mostly during rainy season, cannot be ignored. A research to determine the viability of keeping pigs on pasture should be conducted. Such study is important as it may determine the effect of pasture consumed by pigs in rural areas on growth performances. If positive results are found, such information should inform the farming systems in rural areas. In so doing pig keeping in rural areas could improve and be transferred into profitable commercial farming, as production costs on pig farming are currently dominated by the high costs incurred on feeds.

The evaluation of pig productivity under communal production systems is essential in order to determine the viability of such enterprise. A study that shall concentrate on the economic performance of pig under communal production systems has to be carried out. The economic role of pigs to individual households and the country has been overlooked due to several reasons. Research studies have been conducted on cattle as the income contribution of small ruminants has been considered insignificant.

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6 APPENDICES A

DUSCUSSION DOCUMENT RELATING TO THE LOW INPUT PIG PRODUCTION AMONGST RESOURCE POOR PIG OWNERS

The purpose of this document is

- To gather information on personal characteristics, socio-economic and socio-cultural, feeding, methods and practices followed in raising pigs.

- To guide discussions and for capturing individual pig owner's viewpoints relating to indigenous pig farming systems in rural areas.

To achieve these, this document has been designed as a form of questionnaire. The information provided will assist in the design of intervention programme improving pig production practices or assist pig owners to benefit out of the pigs they keep. The information will assist to evaluate circumstances and problems relating to pig production in the study areas.

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GENERAL SURVEY QUESTIONNAIRE

LOW INPUT PIG KEEPING AMONGST RESOURCE LIMITED PIG OWNERS

Date : .....

Enumerator : .....

Name of respondent : .....

Region : .....

Village : .....

Respondent number : .....

A. PERSONAL CHARACTERISTICS

1. Sex of respondent (Record without asking)

1. Male
2. Female

1
2

2. Sex of household head

1. Male
2. Female

3
4

3. Marital status of household head

1. Married
2. Single
3. Divorced
4. Widowed
5. Separated

5
6
7
8
9

4. Age of household head (if unknown, judge by probing asking historical events)

1. >65
2. 55 – 64
3. 45 – 54
4. 35 – 44
5. 25- 34
6. 15 – 24

10
11
12
13
14
15
16

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7. <14 | 17

8. Don't know

5. The highest education level you have attained?

1. None | 18
2. Std 1 – Std 6 | 19
3. Std 7 – Std 10 | 20
4. Diploma | 21
5. Degree | 22

6. Ethnic group

1. Venda | 23
2. Tsonga | 24
3. Sotho | 25
4. Others (specify) | 26

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B. HOUSEHOLD CHARACTERISTICS

7. Household structure (Write number) | 27 | 28

Household members	Age Group	Male	Female
	>65		
	55 – 64		
	35 – 54		
	25 – 34		
	15 – 24		
	5 – 14		
	<5		

29	30
31	32
33	34
35	36
37	38
39	40

8. Child education profile (write number) | 41 | 42

Age	Male	Female
Attending School		
>21 years		
19 – 21 years		
14 – 18 years		
6 – 13 years		
<6 years		

43	44
45	46
47	48
49	50
51	52

9. Household members working (number) .....

10. Areas of work (if more than one job please indicate) | 53

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1. Education 54
2. Health 53
3. Correctional services 55
4. SAPS 56
5. Civil services 57
6. Metropolitan 58
7. Private 59
8. Factory 60
9. Shop 61
10. Self 62
11. None 63
12. Other (specify)

11. Pension members of the household 64

1. Father to the household head 65
2. Mother to the household head 66
3. Both father and mother to the household head 67
4. Household head 68
5. Household's spouse 69
6. Son/s 70
7. Daughter/s

C. INCOME

12. Source of income

1. Salary/Wages 71
2. Pension 72
3. Business 73
4. Stokvel 74
5. Sales of crop 75
6. Sales of Livestock 76
7. Slaughtered meat 77
8. Remittance 78
79

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9. Others (specify)
10. None

80

NB: Where more than one source is identified, please indicate the sources.

13. Income per month

1. <R200
2. R201 – R600
3. R601 – R1000
4. R1001 – R2000
5. >R2000
6. None

81
82
83
84
85
86

14. How much money do you generate from the sale of pigs per annum?

15. How much money do you generate from the following crops per annum?

1. Maize R.....
2. Millet R.....
3. Sorghum R.....
4. Groundnuts R.....
5. None

87
88
89
90
91

D. EXPENDITURE

16. Expenditure per month on household needs

1. R100 – R300
2. R301 – R600
3. R601 – R900
4. R901 – R1200
5. R1201 – R1500
6. R1501 – R1800
7. R1801 – R2100
8. R2100 – R2400
9. >R2500

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100

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17. What do you spend your money on most in your household? 101 102

1. Food
2. Clothes 103
3. School fees 104
4. Hired labour 105
5. Maintenance of pigs 106
6. None 107
7. Others (specify)

18. How many hours of labour per week do you think is required for attending your pigs? 108

E. PIG COMPOSITION, OWNERSHIP AND MANAGEMENT

19. How many pigs do you have? 109

20 What breed of pigs do you keep? 110

21. What is their composition? 111

1. Boar 112
2. Sow 113
3. Piglets .....

22. How did they come to be in your possession? 114 115

1. Worked for (feeding) 116
2. Payment in kind for the job done 117
3. Loaning 118
4. Bought 119
5. Inherited 120
6. Given
7. Others (specify) 121 122

23. Why do you keep pigs? 123

1. Source of food

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2. Selling
3. Inherited
4. Just
5. For pleasure/Hobby
7. Don't know

124
125
126
127

24. Who feeds your pigs?

1. Myself
2. Members of the family
3. Workers
4. Neighbours to get piglets

128
129
130
131

25. How many times do you feed your pigs?

1. Once
2. Twice
3. Three times
4. Several times
5. None at all

132
133
134
135
136

NB: Observe the condition of pigs where possible and note down as: good, reasonable or bad.

26. Where do you get the feed for the pigs?

1. Collect
2. Buy
3. Accumulate kitchen waste
4. Others (specify)

137
138
139
140

27. What is the source of feed?

1. Feed manufacturers/suppliers
2. Maize bran
3. Bush
4. Orchard
5. Garden
6. Other (specify)

141
142
143
144
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28. What kind of feed do you feed your pigs?

1.	Concentrates
2.	Maize bran
3.	Wild fruit
4.	Weeds
5.	Rotten fruit
6.	Vegetables
7.	Others (specify)

147
148
149
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153

29. What is the source of water for your pigs?

1.	Tap water
2.	Kitchen waste
3.	Spring
4.	Borehole
5.	River
6.	Others (specify)

154
155
156
157
158
159

30. Why do pigs loose condition mostly in summer?

1.	Suckling
2.	Lack of sufficient & nutritious food
3.	Internal parasites
4.	Don't know
5.	Others (specify)

160
161
162
163
164

31. Why do pigs gain weight in winter?

1.	Free range
2.	Pregnant
3.	Not confined
4.	No restriction

165
166
167
168

32. How do you shelter your pigs?

1.	Wood walled sty
2.	Brick walled sty
3.	Stone wall sty

169
170
171
172

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4. Others (specify)

33. Why do people release their pigs from sties in winter or after crop harvest?

1. Relief from pressure of feeding
2. No food in winter, so they can tend for themselves

173
174

34. Why do people teather their pigs?

.....

175

35. Do you keep your pigs in the sty throughout the year?

1. Yes
2. No

176
177

36. If yes, why? .....

178

37. When do you have your pigs mated?

1. Winter
2. Summer
3. Throughout the year
4. Others (specify)

179
180
181
182

38. Do you do controlled mating or uncontrolled mating?

1. Controlled mating
2. Uncontrolled mating

183
184

F. PIG DYNAMICS

185
186

39. How many piglets were born in the past year?.....
40. How many piglets died? .....
41. What was the course? .....
42. How many piglets died? .....
43. How many pigs were slaughtered? .....
44. How many were loaned? .....
45. How many were given away? ....
46. How many piglets were sold? .....

187
188
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47. How many times does each of your sow/s give litter per annum?

1. Once
2. Twice
3. Three times

193
194
195

48. How many piglets per litter do you get?

1. Not less than two
2. Not less than four
3. Not less than six
4. Not less than eight

196
197
198
199

49. Can you tell during which month most of your piglets are littered?

.....

200

G. DISPOSAL OF PIGS

50. Do you sell your pigs?

1. Yes
2. No

201
202

51. If yes, why do you sell them?

1. To make money
2. To reduce the numbers
3. Others (specify)

203
204
205

52. At what age do you sell your pigs?

1. Young age
2. Old age
3. Others (specify)

206
207
208

53. How much do you ask for?

1. Saw R.....
2. Piglet R.....
3. Boars R.....

209
210
211

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54. How do you sell your pigs

1. .....
2. .....

212
213

55. Do you keep records of your pigs?

1. Yes
2. No

214
215

H. HEALTH AND OTHER CONSIDERATIONS

56. At what age do you separate your piglets from their mother?

1. Never
2. .....

216
217

57. Do you clean your pig sty/s

1. Yes
2. No

218
219

58. If yes, how do you do it?

1. Use of water with disinfectant
2. Remove the manure
3. Never clean

220
221
222

59. Do you slaughter your pigs?

1. Yes
2. No

223
224

60. What parasites do you know bother your pigs?

.....

.....

.....

225
226
227

61. For which occasions are pigs mostly slaughtered?

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.....

.....

.....

229
230

62. What are the prevalent diseases that you know attack pigs? (Name at least two)

.....

.....

Don't know

231
232
233

63. Where do you get advice on your pigs from?

1. Extension officer
2. Animal health officer
3. Other pig owners
4. Read from books
5. None
6. Others (specify)

234
235
236
237
238
239

64. What are the cultural uses of pigs and their products?

1. Fat .....
2. Meat .....
3. Others (specify).....

240
241
242

65. What are the social uses of pigs and their products?

1. Davha
2. Gatherings
3. Others (specify)

243
244
245

66. What are the taboos related to the pigs? (two if any will suffice)

1. .....
2. .....

246
247

67. Do you eat pork?

1. Yes

248
249

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2. No

68. What are the main reasons for not eating pork or bacon?

1. Cultural	250
2. Religions	251
3. Health reasons	252
4. Others (specify)	253

69. Name two major constraints that hamper your pig keeping

.....	254
.....	255
	256

Don't know

70 How do you think Government can help you in improving your pig keeping practices?

1.	257
2.	258

71. How do you think the University can help you in improving your pig keeping practices?

1.	259
2. Don't know	260

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