CHARACTERIZATION OF SHEEP AND GOAT PRODUCTION SYSTEMS AMONGST SMALL-SCALE FARMERS IN THE SOUTHERN FREE STATE

by

MOLEFI PETRUS KUMALO

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Supervisor: Dr. L.M. Schwalbach (B.VSc, M.Sc. Agric)

Co-supervisor: Prof. C. van der Westhuizen (M.Sc. Agric., Ph. D.)

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DECLARATION

I, Molefi Petrus Kumalo, identity number [redacted] and student number 993501, hereby declare that this research project submitted to the Central University of Technology, Free State for the Degree, **MAGISTER TECHNOLOGIAE: AGRICULTURE** is my own independent work and complies with the Code of Academic Integrity, as well as other relevant policies, procedures, rules and regulations of the Central University of Technology, Free State; and has not been submitted before to any institution by me or any other person in fulfillment (or partial fulfillment) of the requirements for the attainment of any qualification. I further cede copyright of this dissertation in favour of the Central University of Technology, Free State.

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Signature of the student **Date**

MP Kumalo

DEDICATION

I would like to dedicate this study to my loving family who gave me support and encouragement during this study. This thesis is therefore dedicated to my wife Maqcinumuzi Kumalo and my children Qcinumuzi and Nobayeni; especially for their patience and understanding when I was not available to share their love. I thank them very much for allowing and giving me time to carry out this study.

Lastly I honour and salute my late parents Rakgomo Kumalo and Mamakgotho Kumalo for the greatest gift they gave me, which is unconditional love and support. “Lalani ngoxolo Batongwa a bahle”.

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CHAPTER 1 - GENERAL INTRODUCTION

1.1 INTRODUCTION

Small-scale farming in sub-Saharan Africa over the past decades has been carried out in a context of rapid structural changes in economic, social and political processes (Delgado, 1997; Dovie *et al*., 2003). Many of the poor depend on small-scale livestock farming and crop production for their survival. Their main aim is to produce food for own consumption, but part of that excess is sold or battered to obtain other products (mainly food). Some small-scale farmers in the African continent have shown extraordinary resilience in coping with changes in the economic, demographic, ecological and political spheres.

The productivity of small-scale farmers in the rural areas in most developing regions is relatively low. This low productivity is known to be associated with the behavior and characteristics of small-scale farmers, which are not properly understood by researchers and development agents (Nthakeni, 1993; Birthal *et al*., 2007). Although small-scale farming and production systems are practiced in most of the sub-Saharan region, its productivity is considered to be very low and in most cases insufficient to ensure food security and seldom assures or generates adequate financial returns. In general small-scale farming cannot compete with commercially orientated livestock production systems (Ramsay, 1992) as well as Swanepoel & De Lange, 1993; Louw *et al.,* 2006).

In South Africa, the traditional small-scale farmers have not received adequate attention from, amongst others, policy makers regarding land rights, access to credit, markets and agricultural extension support services. These constraints have been recognized by the National Agricultural Marketing Council (National Department of

Agriculture, 1998; Proctor, 2007), which has reported that poverty in the rural areas of South Africa is associated with poor agricultural policies.

1.2 BACKGROUND OF SMALL-SCALE FARMERS IN SOUTH AFRICA

According to Simphiwe *et al.* (1988) and De Beer (2009), the changing political and social environment in South Africa is drawing attention to the general issue of rural livelihoods and the actual potential role of small-scale agriculture therein. There is also now greater policy attention to household welfare and gender distribution of opportunities, in addition to employment growth per se (Louw *et al*., 2007). Yet there is also a disappointment observed in virtually all political and social factions in South Africa about what small-scale agriculture, and in particular, what livestock production does for rural areas of the country (Simphiwe *et al*., 1988; Louw *et al*., 2006).

Evidence from elsewhere in the world and most particularly in South Africa overwhelmingly demonstrates that small-scale agriculture in its diverse forms has been the principal motor of development in rural areas. If given proper support and incentives small-scale agricultural units have been in many cases far more productive over time than many large-scale commercial agricultural farming operations (Delgado, 1997; De Beer, 2009). The current dynamic policy environment and the emphasis on the development of the small-scale resource-poor farming sector presents a window of opportunity to small-scale farmers in South Africa that should be harnessed. This, therefore, calls for careful analytical research to understand, the socio-economic complexities and to inform the policy makers on the needs and challenges faced by this sector (Delgado, 1997; Grant *et al*., 2004).

For most small-scale farmers in South Africa livestock and their products provide direct cash income and animals are a "living bank" or easily convertible capital (Moorosi, 1999; Mojapelo, 2008). However, very little is known about the socio-economic characteristics of the small-scale farmers and their production systems. Therefore, it is important that more research is conducted on the socio-economic

characteristics of small-scale sheep and goat farmers, their productivity and the sustainability of its resource base (FAO/ILRI, 1995; Hausmann & Klinger, 2006). According to Hofmeyr (1996) & Louw *et al*. (2006) the multi-disciplinary nature of livestock production and the complex interactions between the biological, technical and social components involved in the production cycle and its efficiency requires an integrated farming system approach. For these reasons the business of animal production is a fully-fledged enterprise/industry that needs combined knowledge of many disciplines, including elements of applied animal science, economics, business administration, sociology, amongst many others (Kirsten & Van Zyl, 1998; Van der Westhuizen, 2008).

According of the latter authors, the efficiency of these systems can be optimized through the adoption of proven technologies that make optimal use of the available nutritional, genetic and natural resources to ensure the long-term sustainability of the systems. The adoption of correct management practices such as feeding, breeding and disease control amongst others is essential to achieve these objectives (Hofmeyr, 1996; National Department of Agriculture, 2006). Small-scale livestock farmers in South Africa need to be supported and developed as far as management and farming systems are concerned in order to achieve sustainability (Parkins & Holmes, 1989). The development of this sector requires adequate policy changes in order to uplift rural poor communities and improve the living conditions of their members (Schwalbach & Greyling, 2006). Therefore it is imperative that governmental and non-governmental development agents must know the basic characteristics and constraints of the small-scale livestock farmers in order to create the most adequate policy framework and apply the most adequate support programs to efficiently assist these farmers.

The different types of farmers currently found in South Africa, as an inheritance of the apartheid era, are subsistence farmers, commercial farmers and small-scale farmers (Mocwiri, 2006). These types can generally for the purposes of this study, be described as follows:

1.2.1 Subsistence farmers

These are mostly black and resource poor farmers and describe the farmers who have no formal land rights and farm on communal grazing areas governed by traditional land rights and communal property. Traditionally, communal farming is conventionally seen as the villain of African rural areas (Kotze *et al*., 1987; Baiphethi & Jacobs, 2009). Dovie *et al*. (2003), is of the opinion that traditional communal farming is generally considered unproductive and largely or solely responsible for poverty, over-grazing as well as the general degradation of the land. The solution to problems such as over-stocking and poverty thus usually includes some attempt to replace communal farming with some system of individual tenure (Diergaardt, 1989; Dovie *et al*., 2003). It is assumed that communal farming inevitably results in over-grazing because it is totally unregulated (free-for-all) where individuals attempt to maximize short-term gains (e.g. by over-stocking) at the inevitable expense of the resources. The ensuing environmental degradation is merely one aspect of what has been termed “the tragedy of the commons” (Moorosi, 1999; Marfo, 2002). However, many studies of traditional communal farming do not support the free-to-all assumption. This is far from suggesting that there are no controls to ensure the continued viability of land held in common ownership. In addition there is a widespread belief that communal farming is unproductive because decisions are motivated by tradition, rather than by rational or scientific knowledge (Kotze *et al*., 1987; Medina *et al*., 2007).

1.2.2 Commercial farmers

These are mostly white farmers who own land and operate their farms individually. In general they are able to bear the risk of innovation, provide jobs and produce mainly for the market. According to Mocwiri (2006), during the apartheid era the government largely supported this group of farmers to the detriment of all other groups. Mocwiri (2006) is of the opinion that much of South Africa’s (white controlled) commercial agriculture has become over-capitalized, inefficient and unsustainable as a result of market distortions.

The commercial sector consists mostly of full time, medium to large-scale farmers with established enterprises (Mocwiri, 2006; Brom, 2007). The latter author said that commercial enterprises are an effective labour market, providing a safety net and opportunity. This well established sector is responsible for stable food production and is a valuable asset to the nation economy. Farmers in this sector are generally well articulated and can obtain information and support simply by seeking it. It can be argued that this group is lesser dependant on public support services and will obtain advice from agricultural expert consultants, co-ops, other farmers and agricultural corporations (Hardin, 1986; De Beer, 2009). The legacy of past policies that entrenched the benefits of large farms remains in the form of hugely unequal land distribution, pushed millions of black South Africans into overcrowded and impoverished reserves. The gap between flourish white farmers and under resourced small producers is very big. There has yet to be a noticeable change in rural livelihoods (Marfo, 2002).

1.2.3 Small-scale farmers

Small-scale farmers may be defined as the type of farmers who come from the communal farming sector, but who produce for their own consumption and cannot produce much more than their household needs (Mocwiri, 2006; Assad, 2007; Concepción *et al*., 2007).

This study will focus more on the small-scale farmers because there is little information available on sheep and goat farming in the Southern Free State. Very little is known about the characteristics of small-scale farming production systems. There is a need for more research on small-scale farming systems in order to facilitate policy makers in introducing appropriate policies as well as support services to assist sheep and goat small-scale farmers in the Southern Free State.

1.3 THE CHANGING POLICIES ENVIRONMENT AFFECTING SMALL-SCALE FARMERS IN SOUTH AFRICA

According to Van Zyl *et al*. (1996), as well as Ehui *et al*. (2002), a major policy debate in South Africa concerns the impact on overall rural income and the implementation of development programs that will facilitate the small-scale farmer's access to new and better quality land as well as to improved support services. Issues of access to land and support services have undoubtedly fuelled and continue to fuel this debate, but issues of viability of small-scale farming under current incentives and desirable institutional structures are central to what might be done (Van Zyl, Kirsten & Binswagter, 1996; Hooton *et al*., 2006). The promulgation of the "Market of Agricultural Products Act" of 1996; the launch of the Land Care initiative by the National Department of Agriculture and the policy support for black farmer cooperatives to enhance access to markets as well as farm inputs are further progressive elements of the present dynamic agricultural policy environment (Van Zyl *et al.,* 1996; Bienabe & Vermeulen, 2007).

Farmers, both commercial and small-scale are the principal users and primary custodians of land, veld and animal resources. It is their responsibility to produce food for the nation. The South African government will encourage integrated land use, planning and community participation to ensure optimum management and utilization of the natural resources (Department of Agriculture, White Paper on Agriculture, 1995; National Department of Agriculture, 2006).

1.4 PROBLEM STATEMENT

According to Kirsten and Van Zyl (1998) & Grant *et al*. (2004), South African small-scale farming is often equated with a backyard, non-productive, non-commercially orientated, subsistence agricultural farming that is found in the former homeland areas. This is generally associated with black farmers, generating the perception that black farmers do not have the ability to become large-scale commercial farmers (Kirsten & Van Zyl, 1998; Medina *et al*., 2007). The latter authors say that most black

farmers, whether small-scale or emerging, have limited access to land and capital, and have received inadequate or inappropriate research and extension support in the past.

The National Department of Agriculture Forestry and Fisheries (2006) has committed itself to address the above mentioned constraints and it is presently reformulating its policies to correct the discrepancies of the past. As a result, the policy makers, the extension and veterinary officers know very little about the socio-economic characteristics, production systems, constraints, and small stock diseases amongst the farmers in the Southern Free State.

1.4.1 Hypothesis of this study

- Small-scale sheep and goat production systems in the Southern Free State area are not sustainable;
- Both the policy makers and the extension and veterinary officers know very little about the socio-economic characteristics, production systems, constraints and small stock diseases amongst small-scale sheep and goat farmers in the Southern Free State region.

1.4.2 Overall objective of the study

The overall objective of the study is twofold namely:

The overall objective of the study is twofold namely:

- To investigate and characterize the small-scale sheep and goat farming in the Southern Free State and to identify the major constraints threatening the sustainability of these systems; and
- To identify the common diseases which affect the small-scale farming of sheep and goats in the Southern Free State.

1.4.3 Specific objectives

- To characterize the small-scale sheep and goat production systems of the Southern Free State region (nutritional management status, flock size, flock health, and personal characteristics of the small-scale farmers);
- To identify the socio-economic factors which constrain the sustainability of small-scale farmers in the long term;
- To identify the most important farming husbandry practices used (i.e. breeding season, supplementation, etc.), to farm sheep and goats;
- To investigate the specific constraints currently faced by small-scale sheep and goat farmers, according to their ranking order of importance;
- To conduct a rapid screening on the most common animal diseases affecting sheep and goat flocks of small-scale farmers according to their ranking order;
- To ascertain the support rendered by government, non-governmental agencies and the local municipality to small-scale sheep and goat farmers in the Southern Free State region.

1.5 LAYOUT OF THE STUDY

Following this introductory chapter, a literature review is presented in Chapter 2, where, amongst others, the population, food production, socio-economic importance, as well as the role of Departments of Agriculture and Rural Development as well as Department of Land Reform and Rural Development in South Africa are discussed. Chapter 3 outlines the choice of the study area and the methodology used. Chapter 4 describes the agricultural resources of the study area. Chapter 5 presents the results obtained via the questionnaire used in the study. Chapter 6 presents a quick disease screening exercise amongst sheep and goat farmers in the Southern Free State. Chapter 7 provides the conclusions and presents recommendations at policy level, at extension level, at support services level, at infrastructural level, at research level, management and at disease level in as far as small-scale farming is concerned.

CHAPTER 2 - LITERATURE REVIEW

2.1 POPULATION, FOOD AND ANIMAL PRODUCTION IN SUB-SAHARAN AFRICA

In sub-Saharan Africa, approximately 70% of the population lives in rural areas, where crop and animal production are direct sources of food and provide an income for subsistence (FAO, 2002; Holmén *et al*., 2005). Sub-Saharan Africa is regarded as a food crisis region in the world. In this region food consumption by an ever increasing population exceeds current food production and supply (Hofmeyr, 1996; World Bank, 2001). This statement is supported by the FAO (2002), whereby it has documented that in 1994; only 69% of the economically active population in sub-Saharan Africa was engaged in agriculture, compared to 84% in 1961. Food security and the production of animal protein are major challenges in the African continent. According to the food security index, Mozambique is the 6th most food insecure country in the world, while Lesotho, Malawi, Swaziland and Tanzania rank only as medium food secure countries. Botswana, which ranks highly as an example of economic success amongst developing countries, was the 7th most food insecure country in 1988 (Van Rooyen, 1997; Balat *et al*., 2005).

Farm animals can make a direct or an indirect contribution to human nutrition. These also supply milk and meat and are the primary source of cash income that pastoralists use to buy grain food. Thus livestock production enhances the economic viability of farming systems (FAO, 2002). It has become more and more apparent that, in many areas, this is only possible with the use of hardy adapted animals. Beets (1990), Van Niekerk (1996) & Kaminski (2008) stated that Africa remains a continent in which per capita food production continues to decline, yet in terms of natural resources, Africa has enough land for nutritional self-sufficiency. It is believed that even with the assumption of low levels of inputs, the combined potential productivity in all African countries could feed nearly three times the people in need.

According to Fênyes (1998) and FAO (2002) the importance of understanding and tackling the problem of food insecurity in Southern Africa in a broad context of poverty, inadequate income, lack of access to productive resources and lack of synchronization between potential supply and effective demand should be prioritized. Van Rooyen (1989) and Kaminski (2008) suggested that, in order to solve the above mentioned limitations, small-scale farmers' needs should receive priority from an economic and political viewpoint, to enable long term efficiency in the South African agricultural economy.

2.2 THE ROLE OF LIVESTOCK IN SMALL-SCALE FARMING IN SOUTH AFRICA

Lebbie (1996) & Odeyinka & Okunade (2005) reported that African meat and milk consumption per capita was generally lower than in all other regions of the globe. Small-scale farmers rely on the natural resources for their daily livelihood and because there are few other alternatives for a potential source of income. (Beets, 1990; FAO, 2002) proposed that in order for production in agriculture to be achieved, it should be based on systems in which there is room for continuous change, leading to marginally raised productivity that can be indefinite. This was seen in Bangladesh, where it was found that the productivity within some farming systems increased by the adoption of innovations whereby livestock productivity increased between 50% and 147% (Hossain *et al*., 1998; Balat *et al*., 2005).

The incidence of diseases and parasitic infestations is one of the major constraints of small-scale sheep and goat farming. Diseases in small stock, particularly goats result in mortality, which ranges from 5 to 25% in adults and 10 to 40% in kids (Rekib & Vinah, 1997; Okoli, 2001). In addition, morbidity losses result in low productivity of the animals. Existing veterinary services for the prevention and control of diseases in goats and sheep in the rural areas, particularly among small-scale farmers, are inadequate (Rekib & Vinah, 1997; Opara *et al*., 2006). Livestock services available to smallholder livestock farmers are focused on delivering preventative more than curative veterinary services. In most African countries, livestock production

constitutes an important sub-sector of the agriculture which accounts for about 25% of the value of agricultural production in developing countries. In Kenya, small holder farmers produce over 75% of the total milk generated (Lanyasunya *et al*., 1998; Opara *et al*., 2006). In India 70% of all livestock is owned by small-scale farmers. To overcome this problem the majority of the small-scale farmers in Africa have resorted to crop-livestock integration systems (FAO, 2002).

In India, livestock contributes 8% of GDP of the country and about 26% to the agricultural economy (Kaushik & Garg, 1998; Ehui *et al*., 2002). Livestock production is vital for subsistence and economic development of Sub-Saharan countries. The contribution of the livestock sector of agriculture to the national economies of different countries varies a great deal. Coastal countries in Western and Central Africa show low inputs by livestock production. Countries with large areas of arid land show relatively high livestock production inputs e.g. Ethiopia (Kaminski, 2008). The contribution of livestock to the food production chain and fertilizer (manure) has been emphasized by several authors (Rocha & Starkey, 1990; FAO, 1997; Micheni, 1998; Nduibuisi *et al*., 1998; Ehui *et al*., 2002; FAO, 2002; Odeyinka & Okunade., 2005). It provides a supply of essential nutrients throughout the year, is a major source of government revenue and export earnings, sustains the employment figure and ensures income to millions of people in the rural areas and contributes draught power and manure for crop production (Rao, 1998; Okoli, 2001; Opara *et al*., 2006). In many parts of Africa, sheep and goat are still used for ritual purposes (Hossain *et al*,. 1998; Opara *et al*., 2005), but these animals are mainly used for slaughter during traditional occasions such as weddings and funerals and may also be seen as a way of status recognition or as a symbol of wealth (Smalley, 1996; Hossain *et al*., 1998; Ewert *et al*., 2007).

Dion (2000) and Mbele (2007) conclude that small stock production is an important component in agriculture. Sheep and goats are no longer considered to be poor “men’s animals”, according to Basotho tradition. However, these species are valued for more than their potential to generate income (Mocwiri, 2006). In general, livestock particularly sheep and goats adapt easily to the environment, but there is still room for

improvement as far as small-scale farming systems are concerned (Claassen, 1998; Harrison, 2007). Anderson (1996) & Mocwiri (2006) believe that livestock provides valuable nutrition to families, and are important sources of additional income. Since livestock production generally represents a more viable activity than crop production in South Africa and is used as a form of financial security, every small-scale farmer aspires to have more sheep and goats. This leads to overstocking and overgrazing as livestock population exceeds the carrying capacity of the land.

2.3 THE ROLE OF THE DEPARTMENTS OF AGRICULTURE AND LAND REFORM AND RURAL DEVELOPMENT IN SOUTH AFRICA

The challenges for the South African Department of Agriculture are to promote and facilitate the development of new business oriented entrepreneurs. The new entrepreneur should be fully equipped to compete in the agricultural sector, and be able to create jobs for others while creating a sustainable livelihood for him/herself. The Ministry of Land Reform and Rural Development (1998) & Aliber (2009), stated that the main aim was to redistribute land to the landless people, as well as to farm workers, tenants and historically disadvantaged people so that it can be used for homes, for subsistence production and to improve rural livelihoods. In order to be sustainable, the Land Reform Programme must give people access to land right across the spectrum from small-scale to commercial farmers. This must go hand in hand with access to water, support services and infrastructure that enable people to make productive use of the land (Ministry of Agriculture & Land Reform, 1998; Aliber, 2009; Shackleton *et al*., 1998; Altman & Jacobs, 2009)

2.4 THE IMPORTANCE OF SMALL-SCALE LIVESTOCK FARMING IN DEVELOPING COUNTRIES WITH PARTICULAR REFERENCE TO SOUTH AFRICA

On a global basis, animal products - meat, milk, eggs and fibre-constitute about 40% of the total value of agricultural output. This proportion of contribution is about 50% in the developed regions and only 25% in the developing world (USDA, 1990; Altman & Jacobs, 2009). Small ruminants are an important source of food and income for many small-scale farmers in South Africa and contribute with a significant proportion of the animal protein consumed in the region (Matayo, 2002). Small-stock production and development can greatly contribute to household food security and income of the smallholder farmers. Goats are mainly raised by small-scale farmers under low-inputs-output. Extensive production systems play an important role in meeting the nutritional needs of the communities in the rural areas. The main constraints hindering small-stock production are: diseases, parasites, poor nutrition, poor breeding policies and poor general management (Mpelumbe, 1984; Kusiluka, 1995; Opara *et al*., 2006).

Moorosi (1999) & Wiebe *et al*. (2001) noted that livestock are used as a medium of exchange and trade both for “rights in persons” and material goods such as grain food. The “rights” obtained by farming is that people have a specific material value as well as prestige. The “numbers not quality argument” is followed and there is neither implicit nor explicit acknowledgement of any subsistence or utility role. Sheep and goats are traditionally perceived by the Basotho as instruments of power, authority, diplomacy, friendship, social relationship, security and therefore a highly convertible currency (Ntsane 1996; Baiphethi & Jacobs, 2009). Furthermore, in general animals and sheep and goats in particular are perceived as static, locked up insurance policies or fixed deposits, easily converted in cash to face urgent needs.

In South Africa, some small-scale farmers (Baiphethi & Jacobs, 2009) stated that apart from the production of meat which contributes substantially to their diet, other uses of sheep and goats include the production of dung for manure in gardens, skins

for clothing and mats. Swallow (1987) & Mocwiri (2006) assess livestock to have two types of products that are classified as “flow products” and “stock products.” According to the latter authors, flow products are useful when the animal is alive, and consider that the two most important are wool and mohair for sheep and goats respectively. Of the stock products, live sales and own home consumption are singled out as the most important ones. In conducting opinion surveys, Matayo (2002) independently confirmed that the single most important reason for owning sheep and goats in Lesotho is for ritual purposes (when a daughter in-law arrives at her husband home, a sheep or a goat is slaughtered to welcome her in that family). According to Tshabalala (1992) & Matayo (2002), livestock ranked as the second largest source of cash income after remittances in Tanzania. Matayo (2002) & Mocwiri (2006) agree that in Southern Africa sheep and goats are basically for home consumption while cattle are mainly sold. Sieff (1995) & FAO (2002) reported that small stock have the higher economic and social value among the small-scale farmers compared to cattle and horses (Baiphethi & Jacobs, 2009).

2.5 GENERAL CONSTRAINTS FOR SHEEP AND GOAT PRODUCTION IN TRADITIONAL AFRICAN SMALL-SCALE FARMING SYSTEMS

There are several constraints that influence and limit traditional sheep and goat production in African societies. In the past the genetic make-up of sheep and goats has usually been blamed as the sole cause for the low livestock productivity in developing countries (Jasiorowski & Quick, 1987; Wiebe *et al*., 2001). If this was indeed the main reason, it could be quickly corrected by cross breeding with the correct breeds due to the current possibilities for artificial insemination, as semen is easy to obtain and transport. In reality, however, there are many multifaceted factors that limit small-scale farming production systems in Africa. These include nutrition, disease management and marketing amongst other constraints.

2.5.1 Genotype constraints

Reproduction is the basis of any animal production system, as it is the source of animals to breed, select, sell and replace in a flock. From an economic viewpoint, reproduction is much more important than production (animal growth itself) (ILCA, 1990; Odeyinka & Okunade, 2005). Constraints on an animal's genotype due to inadaptability to harsh environments naturally lead to constraints on reproduction, which compromises the universal reproductive goal of at least one lamb/kid weaned per ewe/doe per year (Labuschagne *et al*., 2002). Poor management and nutrition are the two basic aspects that often limit the reproductive objectives for the ewe/doe-flock (Schwalbach & Greyling, 2006). Poor grazing conditions (often coupled with progressive overgrazing), shortage and cost of grain (which are urgently in competition for human consumption), animal diseases and a low level of efficiency in small-scale farming are major challenges that decrease productivity (Jasiorowski & Quick, 1987; Wiebe *et al*., 2001). Unlike most of the goat breeds, Boer goats are partially seasonal breeders. Anestrous does not occur and Boer does will cycle virtually all year-round if favorable rearing conditions are provided.

According to Schwintzer (1981) and Mamabolo & Webb (2005), ewe lambs reach puberty at approximately 7 months of age and they continue regular cyclic activity for approximately 5 months, showing an average of 8.8 normal cycles during this period. According to the latter author, the main sources of reproductive constraints are due to animals' intrinsic characteristics which include, among others, poor body condition at time of breeding; use of infertile rams/bucks; disproportion in size of lamb/kid and pelvic opening, misuse of breeding season and inappropriate sheep/doe-ram/buck ratio. External factors include lack of adequate nutrition and management skills, inadequate reproductive hygiene, and diseases, especially venereal diseases (Brucella ovis) in the case of small-stock farmers (Schwitzer, 1981).

2.5.2 Nutritional constraints

According to Moorosi (1999) & Seo (2011) under extensive production systems seasonal climatic variations determine seasonal changes in the quality and quantity of the natural pasture veld. According to Moorosi (1999), in most arid and semi-arid areas of South Africa, cyclic seasonal dry periods are associated with nutritional shortages for the ruminants. These periods are extended by frequent droughts and alleviated by erratic rains during summer. This brings a short period of nutritional abundance in which the animals build some reserve body fat for the coming long day season. Under extensive natural range conditions, overgrazing and misuse of pastures, especially near water points and along sheep and goat routes, worsen the situation of feed shortage. Range conservation practices, or soil and veld improvement programmes, are seldom practiced by small-scale farmers in South Africa (Moorosi, 1999; Mocwiri, 2006).

The use of a limited breeding season by autumn to lamb/kid in spring and raise the lambs/kids during the raining season is usually a successful management practice, based on the principle of matching the period of natural nutritional abundance with the period of higher nutritional requirements of the breeding ewe and doe (Gareth & De Wet, 2000). Matching periods of higher nutritional demand of the flock especially during early lactation and when the sheep or goat must complete uterine involution, resume ovarian activity and re-conceive, with periods of higher nutritional value of the veld is the basis of a sound nutritional management under commercial grazing system (Mocwiri, 2006). Unfortunately, this practice is used by few commercial and small-scale farmers and almost impossible to introduce under communal grazing system, with free ranging communal rams all year round (Mocwiri, 2006). The nutrient requirements of most food animal species constitute the major production expense, and seasonal effects of temperature and rainfall are major factors affecting forage quantity (Gareth & De Wet, 2000).

2.5.3 Diseases

According to Moorosi (1999) and Opara *et al*. (2006), in general, small-scale farmers do not report diseases of their livestock. According to Moorosi (1999), in India, in order to determine the types of health problems in livestock, a register at the Indian Veterinary Research Institute was run on a weekly basis. This revealed that small stock suffered mainly from worm load, mange, mineral deficiency, anorexia, contagious (Orf), diarrhea, mastitis, etc. (Moorosi, 1999; Matayo, 2002). Tropical infections and parasitic diseases are a major constraint limiting livestock production in tropical and subtropical regions (Okoli, 2001). Efforts to eradicate tropical sheep and goat diseases such as foot and mouth (FMD), insect borne diseases, Brucella ovis, tuberculosis and other multifunctional diseases makes the financial and technical means to develop animal production to be used to control diseases. Ideally, diseases should be prevented, but preventative medicine schemes for small-scale sheep and goats have been only partially adopted and at a slow rate by a minority of the small-scale farmers in Africa (Gareth & De Wet, 2000; Matayo, 2002).

Most small-scale farmers prefer to treat sick animals rather than to adopt preventative measures (Nell, 1998; Schwalbach & Greyling, 2006). Preston & Leng (1987) and Opara *et al*. (2006) believed that even new disease control techniques for extensive sheep and goat farming operations would be ineffective unless supported by improvements in nutrition and management practices. According to Preston & Leng (1987) and Opara *et al*. (2006) management and husbandry practices by sheep and goat farmers can have a profound effect on the health of the flock. Possible causes of disease include micro-organisms, viruses, bacteria, fungi and ticks (which transmit the widest variety of pathogens of any blood-sucking arthropod) (Bruckner, 1995). Insect-borne diseases include Rift Valley Fever, Blue Tongue and tick toxic (e.g. Tick Paralysis and Heart-water). In Botshabelo, which is located in the South-Eastern area of the Free State Province of South Africa, 177 (88, 5%) of the 200 peri-urban small-scale farmers interviewed indicated that ticks and tick-borne diseases are a serious problem in that area and that tick abscesses, induced by tick bites, resulted in production losses (Moorosi, 1999; Takamatsu & Mellor, 2003).

2.5.4 Productivity and effect of stocking rate on livestock

According to De Waal (1998) & Hill *et al*. (2006) a major problem faced by small-scale ruminant farmers in Africa is the availability of grazing land that is poorly resourced. According to De Waal (1998) it is well accepted that for historical and cultural reasons, the use of communal grazing areas with very poor or no control over the stocking rate, is creating an increasing problem of overgrazing, veld degradation, soil depletion and erosion. In many peri-urban and rural areas, pressure from a growing population and expansion of habitational areas further aggravate the problem (De Waal, 1998; Hill *et al*., 2006). These aspects are seriously threatening the sustainability of many small-scale ruminant production systems in Southern Africa. Bothma (1993) & Munksgaard *et al*. (2005) explained the practical implications of stocking rate and carrying capacity of veld and noted that, on a small stock ruminant production systems, the stocking rate applied is the single operator dependent valuable that has the greatest influence on the biological output of saleable animal products, on the economic returns of the farmer, and on the long-term condition of the veld. Overstocking invariably leads to over-grazing with subsequent reduction in animal production, due to reduced herbage availability, range degradation and reduced specie composition (Bach *et al*., 2006). When the financial returns from livestock enterprise are low, the tendency is usually to increase the stocking rate, leading eventually to overstocking and subsequent decline in financial return in the long term (Bach *et al*., 2006).

Regarding the relationship between stock rating and animal productivity, Greenwood & Café (2007) found a negative correlation in that economic returns (income) per hectare of veld decreased with an increased stocking rate. Danckwerts & King (1984) & Seo (2011), as well as Bickel & Dros (2003), showed that in areas of lower rainfall, maximum income per hectare is considerably lower than for higher rainfall areas, and that at higher stocking rates, profitability per hectare declines significantly. Thus, for the success of an extensive livestock enterprise, the stocking rate, according to Danckwerts & King (1984) and Seo (2011), must fulfil the carrying capacity of the veld and the farmer's financial requirements.

Research conducted at the Matopos Research Station in Zimbabwe on the relationship between stocking rate and sheep/goat performance established that, at lower stocking rates, the performance indicators including conception rate and lamb/kid mortality rates measured outclassed the same parameters measured at higher stocking rates (ARDA, 1982; Hill *et al*., 2006; Schwalbach & Greyling, 2006).

2.5.5 Productivity in small-scale ruminants in Southern Africa

According to Marfo (2002) priority in most low income communities has been given to increase agricultural productivity and as far as small-scale farmers are concerned, the closer they are to the survival income level, the greater will be the likelihood that their needs will be felt especially those that will require fulfillment in the short term (e.g. producing enough food to survive). The latter author says these farmers are unlikely to be too concerned about the long term environmental degradation. In small-scale farming families, in particular, the relationship between food security and resource management is of critical essence. If conflict exists between strategies required for resource management and those ensuring food securities in the short run, problems will arise (Marfo, 2002). In high-income countries, environmental degradation is attributed to wealth, over-development and high input use, whereas poverty is usually the cause in environmentally fragile areas (Mello, 1989; World Bank, 2001). This may also imply the need for redistribution of productive resources, for example land for crop and livestock production purposes, to improve the means of escaping from poverty and improving agricultural productivity and sustainability.

In its quest for livestock production systems, Urquhart *et al.* (1998) & FAO (2002) acknowledged that improved livestock productivity supporting economic development and natural resource use are not incompatible goals. Integrating plant and animal resources to achieve optimal biomass output within a given ecological and socio-economic setting should be the ultimate goal for farming systems (Fitzhugh, 1993). Parker (1990) and Hoddinott (2003) emphasize that matching the biological characteristics of plants and animals for optimum biomass production and utilization is basic to the management of efficient animal-forage farming systems. Favourable

interactions between components should enhance complementary and synergistic responses, resulting in improved efficiency of production and strengthen the economic viability and sustainability of these systems (Hoddinott, 2003).

The unique ability of livestock to use non-competitive renewable resources (natural veld) in the production of quality protein that can be stored and transported remain important to human prosperity in most areas of the world and is vital in South Africa. Over and above this, crop residues are also a major source of feed stuff for ruminants and can play an important role in feed supplementation in integrated agro-pastoralist small-scale ruminant farming systems (Rocha & Starkey, 1990; Achten *et al*., 2008). Animal utilization of crop residues and low quality cereal grains is important and provides an economic stabilizer for grain production. A sheep and a goat faecal pellet is an important process for cycling nutrients to maintain or improve soil fertility, especially in high intensity cropped areas (Achten *et al*., 2008). According to the latter authors, a major portion of important plant nutrients ingested by ruminants is returned to the soil via faeces and urine. Amigun & Von Blottnitz (2009) reported that, of the plant nitrogen and minerals consumed by grazing lactating cows and finishing lambs, 75% to 95% of the nitrogen and 90% to 96% of the minerals are returned to the soil (Amigun & Von Blottnitz, 2009). Because of this high level of nutrient recycling, animal-forage-grazing systems are among the most efficient for maintaining soil fertility. Animals can be managed to have a significant role in the renovation of marginal land areas. According to the latter authors, this means that animals could be allowed to graze crop residues after harvesting or alternatively, be allowed to graze the land during the resting period as part of a supplementary feeding system, with advantages for both to crop and livestock production. Sheep and goats on maintenance levels of performance can be used as biological carriers for the transfer and distribution of hard forage seeds in the establishment of new seedlings (Parker, 1990; Amigun & Von Blottnitz, 2010). Cropping trees and livestock can be a complementary and sustainable production enterprise. Livestock grazing as a cultural tool provides a biological alternative that has economical and ecological advantages (Doescher *et al*., 1987 and Arndt *et al*., 2008). Effective grazing management using multiple species of livestock to eliminate the use of herbicides for the control of

competing vegetation would not only be cost effective but have beneficial effects on soil and water conservation. A typical example is the use of goats to control bush encroachment, since they are more efficient than fire or mechanical methods of control (Devendra, 1991 & Bailis *et al*., 2005).

Devendra (1987) and Bickel & Dros (2003) in their studies of a forage system, an integration of grasses, legumes and fodder trees as a major component of sustainable small stock production systems, which combines self-sufficiency in feed, wood and income, reported the extremely important role of trees and shrubs as feed resources, fence lines, windbreaks, source of wood and its benefit for soil enrichment. (Devendra, 1987) says that in the semi-arid and arid regions, browse, shrubs and trees become increasingly important feed sources. Devendra (1987) and Bickel & Dros (2003) showed that indigenous livestock feed supplements from leguminous trees (Stylosantes, Gliricidia, Leuceana and Acacia) gained 19% more liveweight and reached market weight 13% faster than non-supplemented animals. In addition, the availability of improved forages enabled higher stocking rates at 3.2 animal units/ha/year in the three-stratum forage system as compared to 2.1 animal units/ha/year in the normal cultivated pasture (non-three-strata forage system). The level of endoparasite infestation reduced significantly in small stock as a result of the anthelmintic properties of some of these trees. Firewood production resulting from the three-strata forage system on a 0.25ha of land yielded 1.5 metric tons from only 42 trees and few shrubs, and thus meeting 64% of the firewood needs of the small-scale farmers' requirements. Le Houeron (1980) and Bickel & Dros (2003) reported that in North Africa, for example, browse forms 60 to 70% of rangeland production and 40% of the total availability of livestock feed in the region, with a productivity level of about 1.5kg dry matter (DM)/ha per millimetre of rainfall. Of this livestock consumes 50%. Devendra (1987) & Assad (2007) also highlighted the advantages and beneficial effects of feeding forages from trees and shrubs.

2.6 THE MARKETING SYSTEMS

Mitterndorf & Krostitz (1984) and Proctor (2007) use the term marketing to denote the functions of assembling, transporting, processing, distributing and the dynamic role marketing plays in the development of the livestock industry. According to the latter authors, the manner in which the livestock producer or his agent seeks new market outlets or promote consumer sales of livestock products determines to a large extend, both the size of the market and also the number of animals that can be produced economically. According to Mitterndorf & Krostitz (1984) and World Bank (2001) the marketing system offers a link between producers and consumers and also provides strong incentives to farmers for expanding and structuring their production system and adoption of new technologies in order to meet the needs of the market. In most African countries, because of the absence of good marketing channels and infrastructure, the farming income of small-scale farmers remains limited due to poor access to the market (World Bank, 2001). The middleman often takes most of the benefits of production and small-scale resource poor farmers are often paid below market prices (Van Reenen, 1997 & World Bank, 2001).

2.6.1 Per capita use of meat

In the rural areas of Southern Africa where consumer income is generally lower than average, the per capita consumption of animal meat is lower than the recommended levels (FAO, 2002). Among the notable constraints to marketing in developing and rural areas are problems of demand, supply, transport and infrastructure, labour and capital (Mitterdorf & Krostitz, 1984; Harrison, 2006). According to the latter authors, there is limited demand for meat because of lower income levels. According to Harrison (2006), supply is limited because production units are often small and dispersed and poorly adjusted to market needs. There is comparatively little demand for processed meat products because of excess the cost of packaging, conservation and refrigeration, which most of the local consumers cannot afford (FAO, 2002). Infrastructure such as roads, railways, communication (phone, faxes, postal and banking systems) as well as government services is also poorly developed. Labour

may be plentiful and at a low cost, but capital is usually in short supply, so labour intensive rather than capital intensive methods of marketing are used (Harrison, 2006).

The large cost of transportation is due to the scattered nature of production units. Time and effort is involved in assembling a small number of animals scattered over a wide area and also from farmers who are not market oriented. The improvement of pricing methods and policies are of crucial importance for the development of the livestock industry and for acting as an incentive to small-scale farmers. The lack of access to functional and reliable information services to obtain accurate information on supplies, prices and demand acts as a serious obstacle in promoting an equitable system of price determination. The establishment of such services, including the adoption of quality standards, requires reliable production and slaughtering data, which are unavailable to small-scale, resource poor producers (Lenta, 1978; Wiebe *et al*., 2001).

Many researchers (World Bank, 2001; FAO, 2002; Harrison, 2006) have discussed the use and importance of formal marketing channels to increase the sales of livestock. These authors reviewed the marketing system and proposed some suggestions for institutional and structural reform including the setting up of a specialized Department of Livestock Marketing with full deployment of marketing and liaison officials to promote sheep and goat sales where the formal off take is low. Tapson (1990) & Slingerland (2000) reported that 72% of farmers preferred to use informal channels as opposed to formal ones. In southern Mozambique, only 10% of the animals in the flock are sold annually, from which 8% were traded through the formal system (Rocha & Starkey, 1990; Slingerland, 2000). Nell (1998) & Harrison (2006) also reported that only 26% of the small-scale farmers had access to formal markets within accessible distance from their farm. The majority (63%) sell their animals through the informal sector.

2.6.2 Market

Bad roads, distance from markets, transport logistics and the high cost of moving livestock discourage many small-scale farmers from trying to market products. Instead they tend to produce only what can be consumed and sell locally (Mwakubo & Martim, 1998; Proctor, 2007). The latter authors say that productivity of small-scale farmers can only be improved if the systems are partly commercialized. It is thus necessary to improve the economic environment in which the farmers operate (Beets, 1990; Van der Westhuizen, 2008). Barnes *et al*. (1996) and Slingerland (2000) reported that constraints concerning agricultural marketing include lack of feed-back (information) from marketing centers to the producers, no price information and lack of support from financial institutions. Attempts to improve the operational efficiency of livestock have been the focus of attention of many African livestock development projects and programs. According to Slingerland (2000), this is because there has been a tendency to assume that lack of infrastructure or institutional support has been the major constraint on livestock production. Often the provision of additional facilities failed to improve the efficiency or induce increased production and marketed off take (ILCA, 1990; FAO, 2002).

2.7 SUMMARY

From this literature review, it can be emphasized that sheep and goat production has always been a very important tool towards food security. It can be seen that livestock production in a small-scale system has been used for many reasons in agriculture (food, work, bank and fuel). There are however, obstacles in the way of improvement of livestock of small-scale farming in Africa, more especially when comparing South African small-scale farming with its commercial counterpart. It shows that South Africa in terms of small-scale farming has a long way to go and they must learn from experiences of the commercial counterparts.

CHAPTER 3 - GENERAL METHODOLOGY

3.1 INTRODUCTION

This chapter outlines the choice of the study area, sources of information used, the development of a questionnaire, the sampling and interview procedure, and as well as the analysis of collected data.

3.2 CHOICE OF STUDY AREA

The choice of Trompsburg and Phillipolis areas in the Southern Free State province in South Africa was conceived as an initial, broad-based investigation into the contribution of small-scale sheep and goat production systems to the livelihood of rural poor communities in these areas of the country. It was intended to characterize the current sheep and goat management practices and critically evaluate them to access how they conform to or deviate from the principles of good management that will lead to sustainable livestock production.

The researcher opted to use Trompsburg and Phillipolis as the study area. It is assumed that small-scale sheep and goat production in the Southern Free State province is represented fairly well by these two towns. These two towns form part of the Southern Free State in the Free State Province and as such the study area will be called “Southern Free State”. Trompsburg and Phillipolis are small villages with about 2600 and 2500 head households respectively, with extensive small-scale sheep and goat production as the main agricultural activity. The socio-economic factors affecting the small stock production should be investigated and appropriate measures be taken to ensure that the resource base and future of these communities are safeguarded.

3.3 SOURCES OF INFORMATION

The main sources of primary information were the local small-scale farmers of sheep and goats, from which responses were obtained through an individual interview with the aid of a structured questionnaire. A questionnaire (Annexure A) was designed to characterize the small-scale sheep and goat farmers and to assess the importance of sheep and goat production, the management practices and other information required to ascertain the sustainability of the production systems used. Sources of information and rapid screening of the major small stock diseases was conducted. Samples were taken (i.e. faecal, blood, skin scrapings and tick collection) from a representative number of animals. Climatic, soil and topography data were obtained from the Information Section, Free State Department of Agriculture (2005).

3.3.1 Questionnaire design

With no known previous empirical work done on this community of small-scale sheep and goat farmers, it was decided to conduct a questionnaire based survey in order to obtain primary information. The objective was to use this information, among others, to characterize the farming systems and to evaluate the sustainability of the small-scale sheep and goat farming activities in the area. The selection of variables included in the questionnaire was done with the aid of several similar other studies conducted elsewhere on small-scale resource poor farmers in Africa. (Matingi & Associates, 1998; Little, 1992; Matayo, 2002; Kaplan, 2004b; Mamabolo & Webb, 2005; Birthal *et al*., 2007) The questionnaire was first pre-tested in the Southern Free State area. Generally, the questions were easily understood and readily answered. The researcher interviewed the farmers personally at their respective locations.

3.3.2 Sampling procedure and sampling size

In order to achieve the objectives, this research was conducted in two phases namely:

3.3.2.1 Phase one

A questionnaire based survey was conducted with the aid of a structured questionnaire compiled by the researcher (Annexure A). The most important socio-economic characteristics of the farmers and their households, management practices used, diseases affecting small stock and major farming constraints were targeted. Each interview took on average about two-and-a-half hours, and was conducted at the 56 farmers' households.

3.3.2.2 Phase two

The respondents of phase one (small-scale farmers) in Phillipolis and Trompsburg their sheep and goats were randomly selected for a rapid disease screening. Relevant samples (faecal, blood, semen and ticks) were collected and sent for evaluation to the State Veterinary Laboratory in Bloemfontein.

3.3.3 Sampling method

All 56 existing small-stock farmers from Trompsburg (10) and Phillipolis (46) were visited at their homes, and were interviewed with the aid of a questionnaire to assist the researcher to cover all respondents with similar questions. About 10% of their animals per species were randomly selected for a rapid disease screening exercise.

3.3.4 Faecal samples

Faeces were collected from randomly selected sheep and goats to determine the number of eggs per gram (EPG). The EPG's were determined using the McMaster method (Walker *et al*., 2001). The animal would stand with the right side against a wall fence. Pressing with the knee against the animal's flank, the lubricated index finger, with oil was inserted into the rectum and rotated rapidly to stimulate the defecation reflex. The faecal pellets (at least 10g) were collected into the palm of the right hand and transferred into a small labeled container and were transported in

refrigeration (4-5ºC) to the Veterinary Laboratory in Bloemfontein about 120 km away. The feacal sample was placed in a container and filled with 42 ml of saturated sodium chloride (NaCl) solution. The mixture was poured into a pestle and grounded with the aid of a mortar. This mixture was poured through a tea strainer with an aperture of approximately 0.15 mm and the strained fluid collected in a plastic beaker. The fluid was then centrifuged at 2000 rev per minute (r.p.m.) for 5 minutes and a small volume taken from the surface of the (supernatant) liquid with the aid of a Pasteur pipette and carefully deposited into a McMaster counting chamber. The laboratory ensured that prescribed procedure were carefully followed during this exercise (SAS Institute Inc, 1990; Foreyt, 2001).

3.3.5 Blood samples

About 7ml of blood were drawn from each selected animal with the aid of a vacutainer needle that was screwed into the vacutainer tube holder, from the vena jugularis (jugular vein) into the blood collecting tube, containing the anti-coagulant ethylene diamine tetracetic acid (EDTA). The packed cell volume (PCV) was determined with the aid of the haematocrit centrifuge technique (Blood & Radostis, 1989; Wall & Shearer, 2001). The PCV was determined by measuring the percentage of packed red blood cells (RBC's) from the whole blood. The white blood cells (WBC) counts were made using free-flow blood or well mixed blood containing an anti-coagulant and a WBC pipette. Standard laboratory procedures were followed to carry out this exercise. The blood was diluted with 0.1N HCl (hydrochloric acid), mixed well, and then used to fill a haemacytometer. The granules in the cytoplasm stained pink and the nucleus dark blue. The oesinophils were similar to the neutrophils, except that their cytoplasm contained the red granules. The basophil leukocytes on the other hand contained large, course granules in the cytoplasm. The lymphocytes showed large, round, dark-stained nuclei and a small amount of pale blue cytoplasm. Blood eosinophil counts (cell/ml) were determined by mixing 100ml in the counting chamber (Dawskins *et al*., 1989; Wall & Shearer, 2001). The prescribed laboratory procedures were carefully followed to carry out this exercise.

3.3.6 Tick samples

Tick identification and species identification was done in order to identify the tick species present at the onset of the screening research. Ticks were collected by hand from all over the body of both sheep and goats. All ticks collected were observed and recorded. Ticks were fixed in a 70% ethanol solution in order to identify the species present (in the laboratory) and their relative abundance. All tick species were identified with the aid of the stereomicroscope and a magnifying glass according to the information supplied by Sousby (1986); Kilonzo, (1980) & Walker *et al*. (2001).

3.3.7 Data analysis

Data was statistically analysed and processed using basic descriptive statistics and frequency distribution. In most cases percentages were used to present the results in a meaningful and user-friendly manner. A frequency distribution was used to process the bulk of the information collected in the questionnaire based survey and the characterisation of sheep and goats production systems were also evaluated.

CHAPTER 4 - AGRICULTURAL RESOURCES INVENTORY OF THE STUDY AREA

4.1 INTRODUCTION

Climate and soil factors are two natural elements that significantly affect the success of any land use, and are the main limiting factors in livestock production (Bonsma, 1980; Richardson *et al*., 2000; Braun, 2010). The climatic factors of importance are rainfall, temperature and evapotranspiration. The physical environment, the climate and soil determine the type and composition of the vegetation in an area. These in turn determine the type and intensity of the sheep and goat production systems (Schwalbach & Greyling, 2006). On the other hand, in discussing the concept of livestock ecology, some authors (Bonsma, 1980; Seo, 2011) stressed that the human being (the farmer) is the most important single factor in the environment and emphasizes the need to understand the interaction between the farmer and livestock production.

4.2 CLIMATE

Climate plays a very important role in agricultural production, since different areas have different potential for a particular agricultural production. Different breeds of livestock and crops also have specific climatic and soil requirements in order to produce optimally. Therefore, optimal production can only be achieved by matching these two factors.

The analysis of precipitation, in terms of amount, variability and seasonal distribution is important in any farming enterprise selection. The Trompsburg and Phillipolis areas and their surroundings receive an annual rainfall of between 275mm and 300mm. The average early summer (September-December) rainfall is between 70mm and 100mm while most precipitation occurs in January to April. (Information section, Free

State Department of Agriculture, 2005). The average rainfall is distributed in Table 4.1.

Table 4.1: Rainfall distribution in Trompsburg and Phillipolis in the Southern Free State.

Rainfall distribution	Rainfall (mm)	Percentage (%)
Winter (May-Aug)	25	9,2 %
Early Summer (Sep-Dec)	100	36,3 %
Late Summer (Jan-Apr)	150	54,5 %
TOTAL	275	100,0 %

Source: Free State Department of Agriculture: Farm Information Section, 2005

The average daily temperature, daily winter is between 4-5ºC and this limits the production of the veld during this season. These facts should be taken into consideration by the small-scale farmers when planning their crops and small stock (sheep and goat) farming systems. With an expected higher summer rainfall (Figure 4.1), crop and pasture productivity should be high, while in winter with its lower expectancy for rain, the crop and pasture growth should decline. The significance of this in extensive animal production and dry land crop production is that the potential to harvest or use enough herbage and crops is greatest, and more certain, in the summer months. These facts should be taken into consideration by the farmers when planning their production systems.

4.3 SOILS

Soils together with rainfall are probably the most important natural resources on a farm. Their properties and limitations have a major effect on enterprise selection and the success of these enterprises. Small-scale farmers require some knowledge of their farms soil properties and potential in order to group soils into units of common production potential, thereby increasing the potential productivity of the farm or veld. The main soil forms occurring at the area as they affect the production potential and risk are as follow: Hutton, Escourt, Valsrivier, Bainsvlei and Valsrivier. Clay and loamy soil are the most common texture classes in the sloppy areas clay is

dominating, in the veld areas loamy soil is dominating, but gravel and coarse sand dominate in both Trompsburg and Phillipolis areas around the mountains; depth limiting materials are calcrete and rocks.

4.4 DAILY TEMPERATURES IN TROMPSBURG AND PHILLIPOLIS IN THE SOUTHERN FREE STATE

Temperature indicates the energy status of the environment and determines the rate of plant growth. It is also important in events such as seed germination, flowering and maturity of plants. The monthly variation of the maximum and minimum temperatures is important for plant growth as well as animal well-being, maintenance and production. In sheep and goat farming systems, air temperature is the most important bio-climatic factor in the animal's physical environment (McDowel, 1987; Seo, 2010). During the hot summer months (January and February), the sheep and goats try to reduce activities that rise body temperature. As walking, grazing, digestion, growth, production and reproduction generate heat; these functions are relatively reduced under hot climatic conditions as a way to control homeostasis (Bonsma, 1980 & Slingerland, 2000). The author asserted that British livestock breeds in the tropical regions suffer from tropical degeneration causing a decrease in fertility and stunted growth if the annual isotherm exceeds 21ºC. The temperature data on the climatic zone under which the study area falls indicates that the mean average daily maximum temperature for January is 22.8ºC with average maximum being 31.2ºC (Table 4.2)

Table 4.2: Average monthly minimum and maximum temperatures (℃) in Trompsburg and Phillipolis in the Southern Free State

Months	Trompsburg			Phillipolis		
	Maximum temp. (℃)	Minimum temp. (℃)	Average temp. (℃)	Maximum temp. (℃)	Minimum temp. (℃)	Average temp. (℃)
January	30,4	15,2	22,8	31,2	14,6	22,9
February	29,1	14,5	21,8	23,8	14,2	22,0
March	26,6	12,1	29,3	27,5	12,4	19,0
April	22,9	7,8	15,3	23,8	8,3	16,1
May	19,0	2,9	10,9	19,9	4,0	11,9
June	16,1	-1,1	7,5	17,2	0,2	8,7
July	15,9	-1,8	7,1	16,9	-0,1	8,4
August	19,3	0,9	10,1	20,4	2,1	11,3
September	22,3	4,8	13,5	23,3	5,5	14,4
October	25,5	8,9	17,2	26,3	8,8	17,5
November	27,5	11,3	19,4	28,0	11,3	19,7
December	29,8	13,3	21,55	30,4	13,6	22,0

Source: Information section, Free State Department of Agriculture (2005)

4.5 TOPOGRAPHY

The study area lies at an altitude ranging between 960m to 1700m above sea level. Characteristically, the land is undulating with steep slopes, with 65% having a slope of between 10-40%, another 10% having a slope of over 50% and only 10% with 2-6% slope surface. All over 70% of the study area has a slope above 8%. These slopes restrict cultivation and necessitate the erection of protective measures to reduce erosion and run-off, given that the soil condition permits cultivation. Only 15% of the land permits cultivation without the need for protective measures, while the rest (85%) is under natural vegetation (veld).

4.6 VEGETATION AND VELD CARRYING CAPACITY

The vegetation type (defined as a unit of vegetation whose range of evaluation is small enough to permit the whole of it to have the same farming potentialities) is distinguished into three veld types, namely, Sourish Mixed Bushveld, Sour Bushveld and small portion of Turf Thornveld (Mentis, 1984; Acocks, 1988; Seo, 2010). The broader area is mainly composed of Cymbopogon plurinodis, Themeda triandra, with Acacia caffra as the dominant tree in the Sour Mixed Bushveld and short Acacia karoo in the Turf Thornveld. Fairly tall and dense grassveld dominated by Eragrostis bicolour Cyperus usitatus, pp occur. Other grass species found include Felicia muricata, Nestlera conforta, Asparagus sp (Stiff glau cuos), Lycium oxycladum (hilly), Pentzia. Grasses found in the Turf Thornveld include Setaria spp., Eragrostis chloromelas, Panicum coloratum, Sporobolus festivus, Fingerhuthia plurinodis and Bothriochloa spp.

In the study area, the veld is typically dominated by grass veld (Eragrostis bicolour and Cyperus usitatus). The carrying capacity of the veld in this area is estimated at 5ha/SSU (Taiton, 1981; Seo, 2011).

4.7 LAND TENURE AND LAND USE SYSTEM

The main land tenure system used by the small-scale sheep and goat farmers in the study area is communal land holding. However, the permission to occupy (PTO) system also exists. In this system, permission is granted by the Municipality for an individual to have exclusive rights to use a particular piece of land, and attracts a fee before being granted. Animals from the small-scale farmers graze together since there is no exclusive right to a particular piece of land for grazing purposes. Such form of land ownership is very common in Southern Africa and usually leads to negligent management practices, such as overstocking and overgrazing which result in soil erosion and veld degradation (Free State Department of Agriculture Information Section, 2005). There are some farms which have been leased by small-scale

farmers who are now becoming commercial farmers and they pay an annual rental fee of R10/sheep/goat. This price differs according to areas.

4.8 INFRASTRUCTURE SITUATION

The infrastructural situation within the study area is divided into four main categories:

- Physical infrastructure;
- Economic infrastructure;
- Social infrastructure; and
- Institutional infrastructure

4.8.1 Physical infrastructure

This consists of physical facilities on a scale larger than that of the individual small-scale farmers, and includes roads, dams and structures such as dipping and holding facilities for animals. Generally, the role of physical infrastructure development, particularly road construction, has long been recognized. Economic growth requires accessibility to rapid and cheap delivery of inputs and outputs and broad access to markets. Good physical infrastructure has far reaching implications for the cultural and political spheres of small-holder farming activity. In the study area, the general conditions of the gravel roads are very poor, making the movement of vehicles very difficult, especially during the rainy season. The average maximum speed on the road is about 40km/h. Because of this, accessibility to transport is quite difficult for the local inhabitants. Such poor roads also lead to inadequate delivery of extension, veterinary as well as other farming support services such as adequate and efficient economic infrastructure such as electricity.

4.8.2 Economic infrastructure

Electricity, telecommunications, transport and water are critical for supporting development. This also contributes directly or indirectly to small-scale farmers' living

standards. The main sources of energy for households use are electricity, firewood, paraffin and gas. Telephone facilities serve the townships. There are some public phones, which serve the whole community, both in Trompsburg and Phillipolis. Vodacom telecommunication network coverage for cellular phones is not accessible in some of the areas. These two areas rely on potable water from taps for household consumption and for the sheep and goats there are some dams (brick built up reservoirs) to drink from. However, the yield of the boreholes is too small to meet the needs of the community and their animals.

4.8.3 Social infrastructure

Social infrastructure covers areas such as religious and educational institutions and organizations, tribal and communal laws, extension, credit and marketing services (Snowball, 1992; World Bank, 2001; Proctor, 2007). For small-scale farmers, social considerations may exert a greater influence than financial ones. In African traditional societies, small-scale farmers' decisions tend to be affected and constrained by attitudes and relationships within the local community. Like most other rural areas of South Africa, the study area is under the leadership of a municipality. Traditional laws, rules, norms and believes permeates the society, but this study did not probe into that. There are schools available in both Trompsburg and Phillipolis; these areas are each served with a primary and secondary schools. The Free State of Department of Agricultural service centres are only available some 75km away from Phillipolis (the area that serves them is Fauresmith whereas in Trompsburg there is an Extension office available).

4.8.4 Institutional infrastructure

This refers to the way in which institutions make use of their human and financial resources, in order to increase the efficiency of small-scale farmers' development programmes. Such institutions may include development agencies that help to co-ordinate small-scale farming development programmes. Both towns have co-

operatives which are located within a reasonable distance from the study area. However, small-scale farmers are not registered members of these co-operatives and as such they have no access to benefit the lower prices and technical or marketing information.

4.9 SUMMARY

The local agro-climatic conditions (mainly the rainfall, the soil and the topography) determine that most of the available land for agricultural purposes is best suitable for production. The latter is most profitable way of converting the local natural pastures (veld) into food for humans (in the form of animal products). However, the existing infrastructure in the area is poorly developed and the basic supporting services necessary to allow sheep and goat production are practically very poor.

The prevailing land tenure system determines that the communal grazing area is used by all the local small-scale farmers without the forced application of proper veld management practices or any forms of restriction. These results in overgrazing, veld deterioration and soil erosion, are limiting the sustainability of the production system.

Infrastructure is the most important issue because, without proper facilities, work on animals can't be easily performed; especially veterinarians that need to perform activities like branding, dehorning and vaccinations.

CHAPTER 5 - CHARACTERIZATION OF SHEEP AND GOAT PRODUCTION SYSTEMS IN THE SOUTHERN FREE STATE, A QUESTIONNAIRE BASED SURVEY

In this section, the results of the questionnaire based survey, namely, general socio-economic and the households' characteristics, the reasons for farming, farming experience, flock structure, total household and farming income, major constraints and areas in need of improvement are discussed both quantitatively and qualitatively.

5.1 INTRODUCTION

Small-scale animal ruminants (sheep and goat) production is extremely important for the economy of the developing countries in general, and to Southern African countries in particular. The economic importance of sheep and goats in agriculture can be measured in terms of the supply of animal protein, especially where the need has been extensively acknowledged (Devendra, 1987; Hoddinott, 2003). Meat from small ruminants accounts for 30% of the total quantity of animal protein consumed in Africa (FAO, 2002). Livestock plays a very important role in maintaining a cash flow to resource poor farmers, and essentially to provide food for household use (Sarwatt & Lekule, 1996; Balat *et al*., 2005).

The multi-disciplinary nature of livestock production and the complex interaction between the biological, technical and social components involved in the production cycle and its efficiency requires an integrated farming systems approach. The efficiency of these systems can be optimized through the adoption of the proven technologies that can make optimal use of the available nutritional, genetic and natural resources and ensure the long term sustainability of the systems. The adoption of correct management practices such as feeding, breeding and disease control amongst others are essential to achieve these objectives (Schwalbach & Greyling, 2006). Although small-scale sheep and goat production is practiced in most

of the sub-Saharan region, its productivity is considered to be very low and in most cases insufficient to ensure food security. In the past, the traditional African livestock production systems have not received adequate attention from, amongst others, policy makers regarding land rights, agricultural extension support services, and access to markets. These constraints have been recognised by the National Department of Agriculture (1998; 2006), which has reported that poor agricultural policies, which persistently marginalise small-scale black farmers as their access to resources such as land, credit and technical knowledge, are limited.

The National Department of Agriculture (1998; 2006) has committed itself to address the above mentioned constraints and it is presently reformulating its policies to correct the discrepancies of the past. It is envisaged providing full support to these farmers and helping in uplifting their productivity and the well-being of the rural agricultural communities. Very little is known about the characteristics of these small-scale farmers and, to fulfil the present government objectives research into this field is needed. This urgent need for more research on small-scale farming systems was identified by the National Department of Agriculture (1998; 2006). The aim of this study was thus to characterize the small-scale farming systems in the Southern Free State, find out the constraints limiting small-scale farming productivity and areas to be improved, and to propose some recommendations to improve these farming systems.

5.2 MATERIALS AND METHODS

This study was conducted at Trompsburg (30º 2′ South, 25º 47′ East) and Phillipolis and (30º 16′ South and 25º 15′ East respectively) which are located in the southern part of the Free State province of South Africa. It was intended to characterize the current sheep and goat management practices based on a questionnaire survey and also to consider socio-economic factors that might impact negatively on small stock production systems. These two towns (Trompsburg and Phillipolis) were chosen to conduct the research as it was assumed that small-scale sheep and goat production in the Southern Free State region province area is represented fairly well by these two towns. Trompsburg and Phillipolis are small townships with about 2600 and 2500

households respectively, with small-scale sheep and goat production as the agricultural activity in their communal land.

5.3 RESULTS AND DISCUSSIONS

5.3.1 Characteristics of farmer households

The average family size amongst the respondents is six people but varies between 2 to 17 per household. Larger families tend to put a lot more strain on the head of the household to provide for all their needs. In order to cope with the most basic need (feeding and clothing), other important aspects such as the schooling of the children often suffer first. In most rural areas of South Africa the situation is generally the same and it is usually difficult for a single breadwinner to support so many dependants adequately (Williams, 1994; Moorosi, 1999; Motlomelo *et al*., 2002; Marfo, 2002; Mocwiri, 2006).

5.3.2 Age distribution of the household heads amongst respondents

The age distribution of the household heads who, for the purposes of this study, are representing the sheep and goat small-scale farmers in the Southern Free State who were questioned/interviewed are depicted in Table 5.1.

Table 5.1: Age distribution of the household heads

Age groups (Years)	Number of respondents	Percentage (%)
20-29 years	5	8,9%
30-39 years	10	17,8%
40-49 years	15	26,7%
50-59	20	35,7%
> 60	6	10,7%
Total	56	100%

As it can be seen from Table 5.1, almost half of the respondents are headed by individuals over 50 years of age. The group between 20 to 50 years of age are said to be economically active and they play the most essential role in the community (Marfo, 2002; Mocwiri, 2006).

As a matter of fact old age not only has an impairing effect on the physical ability of farmers, but these farmers are also less keen to change and adopt new technologies and are more likely to maintain traditional farming techniques (Anon, 1981; Tshenkeng,1999; Greyling & Schwalbach, 2002). Matayo (2002) considered that age plays an important part in agriculture, since it has a strong effect on the way a person thinks and behaves. Motlomelo *et al*. (2002) stated that studying sociology effects of an individual's age is one of the most important personal characteristics.

According to Gebrelul *et al*. (1994) as well as Greyling & Schwalbach (2002), there must be adoption and diffusion of new technologies in livestock farming operations. Matayo (2002) & Greyling *et al*. (2002) reported that young farmers tended to be better adopters of new technologies than older farmers, and therefore more productive. Nell (1998) & Matayo (2002) stated that farmers over 40 years of age adopt fewer practices due to reduced physical ability and a more cautious outlook associated with age. Although chronological age may have an impairing effect on physical capabilities, several research-studies in recent years have indicated there is little or no deterioration in intelligence at least up to 60 years of age (Matayo, 2002; Motlomelo *et al*., 2002). Since farm management has been considered to be primarily a mental process, the latter authors say that there is no serious impairment of managerial ability with increased age.

5.3.3 Gender distribution of the household head respondents

The gender of the household heads amongst respondents in the Southern Free State is shown in Table 5.2.

Table 5.2: Gender distribution of the household heads amongst the respondents

Gender	Number	Percentage
Female	34	65%
Males	22	35%

Table 5.2 depicts the gender of the head of the farming household, amongst the respondents, indicating the vast majority (65%) are females. This demonstrates the great role played by woman as compared to men in small-scale agriculture in the study area. These findings are not in agreement with those reported by Matayo (2002) & Motlomelo *et al*. (2002) where 78% of the household heads in their studies were males, and Marfo (2002) who has a sample with 87% of households in Rustenburg headed by males. However, these findings are in line with some of other rural areas of South Africa, where agricultural households are headed mostly by females (Matingi & Associates, 1998; Motlomelo *et al*., 2002).

The high percentage of female heading households in this study area may be due to the fact that most males have migrated to look for jobs in other areas, as jobs are very scarce in this area. The poor limited opportunities and other income generating economic activities in most rural areas of South Africa, and the marginal value of the land limiting their opportunity to engage in high productive farming activities, forces most men to migrate to urban areas and commercial farmsteads in search of jobs, leaving the responsibility of the household and the farming activities to their women (Marfo, 2002).

5.3.4 Marital status of the household head amongst the respondents

The marital status of the household heads amongst respondents in the Southern Free State is presented in Table 5.3.

Table 5.3: Marital status of the household heads amongst the respondents

Marital status	Number of respondents	Percentage
Married	34	60%
Divorce	6	10,7%
Widows	6	10,7%
Widowers	5	8,9%
Single	5	8,9%
Total	56	100%

As shown in Table 5.3, most (60%) of all household heads are married compared to fewer respondents that are widows, divorced and single. This high marriage impacts positively on the family's social stability, which is a vital consideration in long term sustainable strategies. These results suggest a strong social cohesion and can be seen as a strong base to exploit multiple livelihood strategies, with a better distribution of the workload among the family members according to gender. These findings are similar to those of Mocwiri (2006) who reported that most of household heads in Ganyesa in North West province were married (80, 4%). On contrary, these results also raise some concern with regard to a large percentage of households who are headed by single; divorced or widowed (60%) persons, as these individuals may have some additional difficulties in providing for the basic needs of their families.

5.3.5 Highest level of education amongst the respondents

Education plays a very important role in Agriculture. Tshenkeng (1985) & Dovie (2004) stated that education is regarded as a basic human need, which in turn is seen as a means of meeting other basic needs and accelerating overall development through training farmers at all levels. Small-scale farmers who are literate are able to obtain farming information from written materials such as books and newsletters. Such small-scale farmers tend to be more receptive to new ideas, especially if these new ideas are related to information, which they can obtain from written sources (i.e.

magazines, farmers weekly, etc,.). Figure 5.1 gives an indication of the level of education of the small scale farmers in the southern Free State.

Figure 5.1 depicts the distribution of the education levels amongst respondents

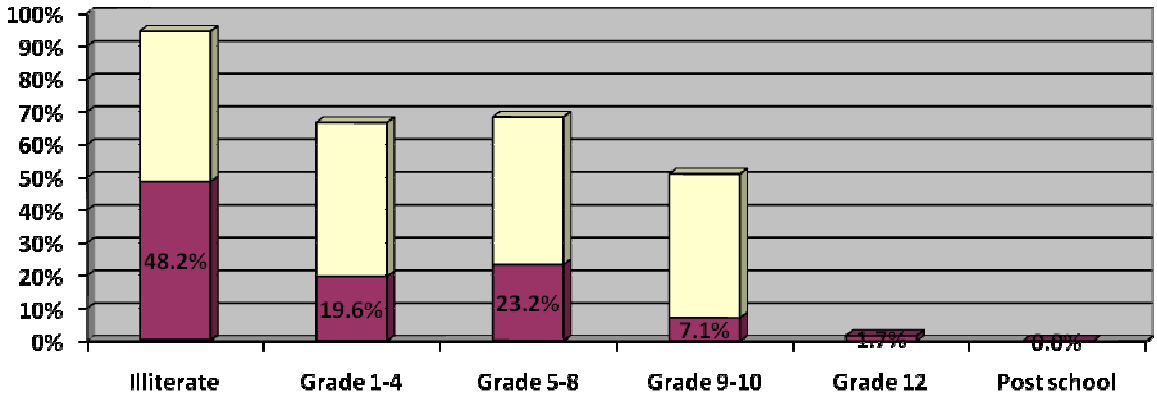

Figure 5.1: The level of education of the sheep and goat household respondents in the study area

According to Kumar *et al*. (2000), persons with less than four years of formal schooling are considered to be illiterate, and this constitutes 67,8% in the study area. Most respondents of the households (48, 2%) are illiterate. These results are in line with those reported by Kumar *et al*. (2000) who provided information whereby it can be deduced that the majority of the small-scale farmers in Southern Africa are illiterate. The majority of respondents in this study are Xhosa speaking (45%), while 35% uses South Sotho as their first language. Regarding their ability to also communicate in other languages, 75% can speak Afrikaans (as this area is linguistically dominated by Afrikaans) while only 5% can speak English. In another study by Williams (1994) and Matayo (2002) it was found that small-scale farmers had difficulty in understanding the guidelines of financial planning. Motlomelo *et al*. (2002) agree that education and poverty are negatively correlated, that is, people with less education are much more likely to be poor. Williams (1994), Mukhala (1999), Matayo (2002) & Motlomelo *et al*. (2002) reported that there is strong evidence showing that in general educated farming households are more successful than those less educated and that those better-educated outperform those with lower levels of

education. This is in line with other findings in most parts of the former homelands of South Africa where the standard of education is reported to be quite low (Matayo, 2002; Mocwiri, 2006). The latter authors found the level of education amongst farmers in South Africa to be positively correlated with new technology adoption. With more knowledge farmers are more likely to adopt new ideas.

5.3.6 Farming experience of the household heads

Farming is one of the businesses that need experience. It is therefore important that small scale farmers be monitored and mentored by more experienced commercial farmers in most of the time.

Figure 5.2 depicts the farming experience of the household heads

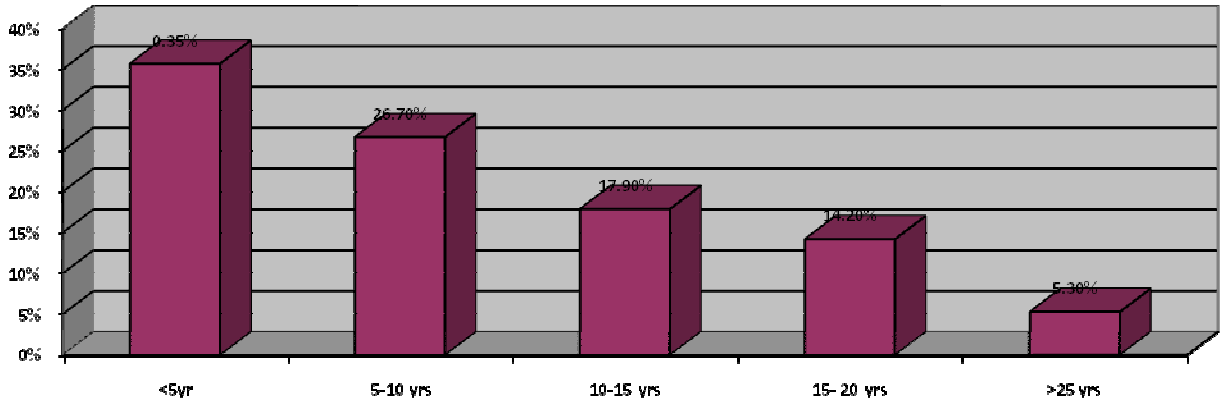

Figure 5.2: Farming experience of the household heads

Generally speaking, it can be considered that the sheep and goat small-scale farmers in the Southern Free are reasonably well experienced in this activity, as 64,3% have more than 5 years' experience and 37,4% have more than 10 years experience. A large portion of the respondents (35,7%) has less than 5 year has less than 5 years experience and can thus be considered relatively inexperienced in this activity. However, these results indicate opportunity for improvement as experience increases in time.

The adoption of new farming techniques as well as farming efficiency correlates negatively (r = -0.2) with farming experience, meaning that those small-scale farmers with more experience are less willing to change (Nell, 1998; Moorosi, 1999; Mocwiri, 2006). This implicates that in general it is more difficult to introduce new technologies to experienced farmers. Less experienced farmers are more open to technological innovations with higher returns and therefore, tend to be relatively more efficient and productive. Attempts to introduce new technologies in the Southern Free State small-scale farmers need to take this factor into consideration.

5.3.7 Sources of grazing and grazing management

The natural veld is the most important and valuable resource utilized by small-scale sheep and goat farmers in the study area. It will always be the most economical source of animal feed and in most regions of the country is the only or main source of animal feed. Ever increasing demands will be placed on the veld in the face of rising living standards and the ever-increasing population. Veld degradation has unfortunately already assumed enormous proportions in South Africa (Skinner, 1977; Richardson, 2000; Seo, 2010). We are thus in a situation where on the one hand we must strive towards an increase in animal production, and on the other hand ensure that the resource base (veld) is not only protected but in most cases also improved before it can be optimally utilized (Skinner, 1977 and Seo, 2010). Under these circumstances the sustainability of livestock production systems using ruminants are threatened.

About 59% of respondents in the study area indicated that the veld status has deteriorated significantly over the past years. This could be a serious threat to the sustainability of small-scale sheep and goat production systems in the Southern Free State region. In addition, 41% of the small-scale farmers indicated that there are signs of soil erosion on their farms. According to Seo (2011), the basal cover of the grassy vegetation plays an important role in the dissipation of much of the energy of the falling raindrops, which would otherwise pound and pulverize the soil surface. Hence the basal cover and the canopy cover of the veld have an important influence

on the infiltration of water into the soil, by protecting the soil surface from direct impact of raindrops, which would reduce the infiltration of water.

Bembridge (1984) as well as Van der Westhuizen (2008) state that any grazing management programme is likely to fail in the long term unless farmers have a positive educated perception of the veld condition and trend. Richardson (2000) & Seo (2010) indicated that veld condition is the most appropriate measure of grazing management success. Mocwiri (2006) found a different perception between farmers and extension workers on the veld condition. In various parts of South Africa, when most farmers thought that their veld condition was good; extension workers classed it as poor. The veld condition plays a very important role in livestock production. If the veld condition is poor, the performance of livestock and hence farming income will be unsatisfactory, and the activity non-sustainable. The respondents in this study in the Southern Free State were not asked to define their perception of “veld conditions”.

5.3.8 Sheep and goat flock size of respondents

Tables 5.4 and 5.5 respectively show the sheep and goat flock size of respondents in this study.

From the date gathered in the study the average flock size was calculated to be 12.1 sheep and 11.6 goats per respondent.

Table 5.4: The average sheep flock size amongst the respondents

Sheep flock size classes	Number of respondents (%)
<5 sheep	20 (35.7%)
5-10 sheep	18 (32.1%)
11-20 sheep	12 (21.4%)
21-50 sheep	1 (1.8%)
>50 sheep	5 (8.9%)
Total	56 (100%)

The average flock size found to be: 12.1

Table 5.5: The average goat flock size amongst the respondents

Goat flock size classes	Number of respondents (%)
<5 goats	18 (32.1%)
5-10 goats	12 (21.4%)
11-20 goats	10 (17.9%)
21-50 goats	11 (19.6%)
>50 goats	5 (8.9%)
Average flock size	11.6
Total	56 (100%)

The average flock size was found to be: 11.6.

The majority of the small-scale farmers in this area own less than 5-10 sheep (32,1%) and less than 5-10 goats (21,4%) respectively. Very few (8.9%) respondents' farmers in the Southern Free State have more than 50 small-stock (sheep and/or goats). Only one farmer owns 60 sheep and no one owns more than 60 goats. These results are not in agreement to those that were reported by most authors in similar small-scale farming systems in Southern Africa.

Murray (1992) as well as Motlomelo *et al*. (2002) reported that the severe drought causes a great decrease in livestock numbers and has a great influence on the flock size of small-scale farmers. As the flock sizes and arable lands have been decreased, these small-scale farmers are migrating to urban areas where they could find work in

order to support their families. Nthakeni (1993) and Greyling & Schwalbach (2002) postulated that the smaller the flock/herd, the lesser the chances of selling animal products and making a living out of livestock farming. It was also recommended that subsistence farmers acquire a certain minimum number of livestock to satisfy household and social needs, before indulging in commercial animal production (Tapson, 1990; Swanepoel & De Lange, 1993; Mocwiri, 2006).

5.3.9 Main sheep and goat breeds of respondents

Table 5.5 and 5.6 present the most important breed types farmed by respondents. It is virtually impossible to talk about a breed, as most of these respondents farm with cross breeds or commercial animals not classified as pure breeds. Therefore, based on types of animals, the author opted to refer to breeds types when the appearance was very similar to a described breed.

Table 5.6: The type of goat breeds of respondents

Breed type	**No. of respondents (%)**
Boer goat	20 (35,7%)
Angora	15 (26,7%)
Indigenous	10 (17,8%)
Undefined type (mixed crossbreeds)	11 (19,6%)

Table 5.7: Sheep breeds farmed with by respondents

Breed type	**No. of respondents (%)**
Merino	35 (62,5%)
Dorper	18 (35,7%)
Undefined type (mixed)	3 (5,3%)

The most predominantly farmed breeds of goats are the Boer goat (35,7%) followed by the Angora goat (26,7%) which represent the majority of goats used (62,4%). The Merino (62,5%) and Dorper (35,7%) types represent the vast majority (94,7%) of the

sheep breed types used in the area. The choices for these breeds are probably due to the good mothering ability and the adaptability of these breed types to the local climate conditions. Sheep and goats provide ready sources of meat for own consumption or to be sold for urgent cash needs since it are much easier to consume or sell smaller ruminants (sheep and goats) than cattle. The additional advantage of farming merino sheep, a dual purpose breed, is the possibility to also produce and sell wool.

5.3.10 Sheep and goat flock composition amongst the respondents

Reproductive performance of the females in a flock is a major factor affecting flock productivity amongst small-scale farmers (Mattner *et al*., 1971; Kilgour, 1993; Matayo, 2002; Schwalbach & Greyling, 2006). The number of animals born determines the potential number of animals weaned and available for selection, breeding, and for selling as meat (Motlomelo *et al*., 2002). Reproduction is ten times more important than production in economical terms and has a determinant effect on the profitability of farming systems (Bellows & Short, 1994; Baiphethi & Jacobs, 2009). Regarding male to female ratios it is recommended that a farmer uses 2 to 3 percent of rams to the ewes (Perkins *et al*., 1992; Gareth & De Wet, 2000 and Matayo, 2002).
Tables 5.8 and 5.9, depict the composition of all the sheep and goat flocks kept by respondents.

Table 5.8: Sheep composition of the respondents

Class of animals	Total Number (%)
Mature ewes >2 years	450 (66,2%)
Young ewes 1-2 years	80 (11,8%)
Mature rams over 2 years	15 (2,2%)
Rams 1-2 years	5 (0,7%)
Young lambs <6 months	50 (7,4%)
Weaned lambs 6 month-1 year	70 (10,3%)
Wethers	10 (1,5%)
Total	680 (100%)

Table 5.9: Goat composition flocks of the respondents

Class of animals	Total Number (%)
Mature does >2 years	400 (61,5%)
Young females 1-2 years	150 (23,1%)
Mature bucks over 2 years	10 (1,5%)
Young males 1-2 years	20 (3,1%)
Young kids <6 months	20 (3,1%)
Weaned kids 6 month-1 year	20 (3,1%)
Wethers (castrated > 6 months)	30 (4,6%)
Total	650 (100%)

From the results depicted in Tables 5.8 and 5.9 it is clear that breeding females make up the largest part of the total flock, accounting for 66,2% and 61,5% of the sheep and goats flocks respectively. These flock compositions are typical of small-scale pastoralist systems, in which the flock is directed towards reproductive animals (Seobi, 1980; Sieff, 1999; Braun, 2010). This clearly shows the intention to increase flock size. The relatively high proportion of young females in both cases (sheep 25% and goats 20%) supports this view of increasing the flock size; it can limit production if most sheep or goats in the flock are males (Schwalbach & Greyling, 2006). Table 5.9 shows the male: female ratio of flocks of respondents.

Table 5.10: The male female ratio of sheep and goat flocks for respondents

Total number of mature rams and bucks	Total number of breeding females	Male to Female ratio
Mature rams (15)	530	1: 35 (2.83%)
Mature bucks (10)	400	1: 40 (2.5%)

The fertility rate of both sheep and goat amongst the small-scale farmers in the Southern Free State is not known but it is estimated to be very low based on the relative low percentage of lambs/kids in the flock.

Most small-scale farmers in Southern Africa do not keep records, which can be used to estimate the lambing/kidding percentages. Similarly, new born lambs/kids are not weight and their birth documented by respondents in this study. These results are in agreement with many authors (Rocha & Starkey, 1990; Sieff, 1999; Moorosi, 1999; Matayo, 2002; Mocwiri, 2006) are in agreement that Boer goats and sheep are highly productive under good management. When comparing the sheep and goats compilation in this study, especially the small number of young animals, production seems low and that could be due to poor management.

5.3.11 Origin of the males used for breeding amongst the respondents

Table 5.11 depicts the origin of the males (rams/bucks) used for small stock breeding.

Table: 5.11: Types of ram/buck used for breeding by respondents

Origin/type of buck/ram	Respondents in (%)
Stud ram/buck	0 (0%)
Bought in ram/buck	10 (17, 9%)
Own bred ram/buck	30 (53, 6%)
Borrowed from neighbours	5 (8, 9%)
Do not have a ram/buck	11(19, 6%)

It is clear from the results showed in Table 5.11 that most small-scale farmers (53,6%) mate their ewes with their own bred rams. The fact that most farmers own rams (80.4%) and use communal grazing practices, allows rams/bucks to run with the females of other flocks' all-year-round. These rams/bucks are referred to as "communal rams/bucks". This may be reason why some farmers (19,6%) do not bother to own a ram/buck. This practice, although economically justifiable, as rams are considered to be non-productive animals, may put a lot of strain on the communal rams, as in most cases the ram/buck to female ratio is not considered. This problem is aggravated by the fact that most of these communal rams/bucks are not tested for fertility and venereal diseases or vaccinated against common diseases. This may lead to serious fertility problems, which may affect a considerable part of the flock

without being detected, limiting total flock productivity and farmers' income. The problem of inbreeding may also occur.

5.3.12 Other animal species of respondents

In the study area 80% of respondents keep sheep, 65% farm with goats and 82% keep backyard chickens. The small-stock numbers fluctuate over a period of a year as sheep and goat are used for home consumption or sold for urgently needed cash. Donkeys are used mainly for transportation and horses for herding the flock. These findings support those reported by Schmidt (1992) & Mocwiri (2006) that most small-scale farmers keep their animals as an investment or capital that can be easily be converted into cash when the need arises. Schwalbach & Greyling (2006) also confirmed that livestock provide direct cash income and are a living form of bank for many farmers.

5.3.13 Main purpose for sheep and goat farming

Livestock production and particularly sheep and goat farming play an important part in the economy and social life of the respondents in the Southern Free State. Altman & Jacobs (2009), stated that the reasons for keeping livestock reflect individual needs, either directly or indirectly, since needs represent the basic motive governing human behaviour. Motlomelo *et al*. (2002), stated that small-scale farmers rely on the natural resources for their daily livelihood and because there are few other alternatives for a potential source of income, small-scale farming has to be sustainable.

Figure 5.3 shows the main purpose for sheep and goat farming amongst the respondents.

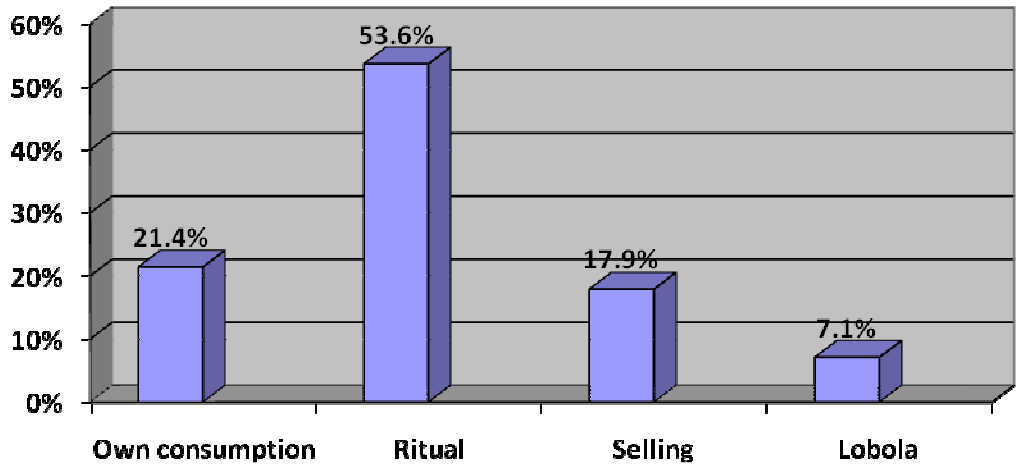

Figure 5.3: Main purpose for sheep and goat farming

As shown in Figure 5.3, the respondents use 21.4% of their animals for their own consumption while 53.6% is for ritual purpose. Selling accounted for only 17.9% and lobola for 7.4%. These results are similar to those reported by many authors in other parts of South Africa, where most black African farmers' farm mainly for cultural reasons (Mocwiri, 2006).

These results clearly indicate that the small-scale farmers in the Southern Free State are still very traditionally bound and need to be trained with the latest technology that will assist them to make more money and improve their livelihoods instead of being culturally and traditionally bound.

5.3.14 Income sources of respondents

Figure 5.4 depicts income sources of respondents in the Southern Free State.

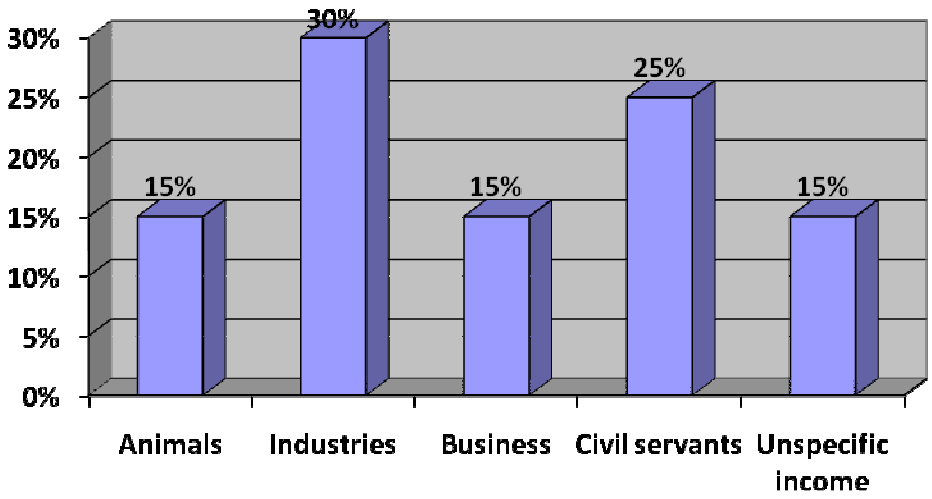

Figure 5.4: Sources of income of respondents.

The above figure (Figure 5.4) implies that the majority of the respondents are employed, and that they do not depend entirely on their animals for living. In line with the primary objective of small-scale farmers in Africa. It appears that the respondents mainly have animals for prestige; self-consumption and also a form of (saving 'bank on hooves) (Southey, 1981; Moorosi, 1999; Matayo, 2002; Mocwiri, 2006).

5.3.15 Total monthly household income of the respondents

Figure 5.5 shows the total monthly household income of the respondents.

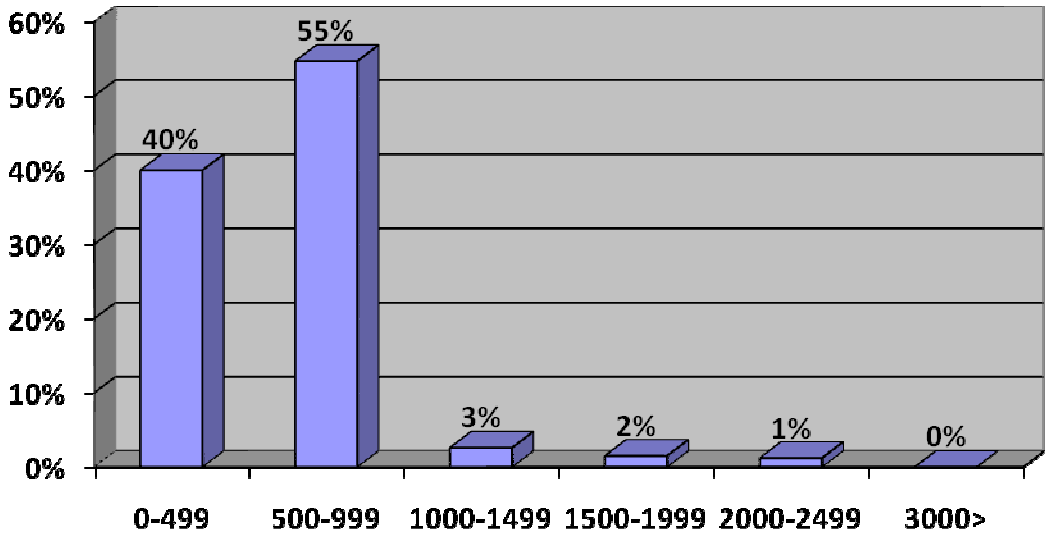

Figure 5.5: Monthly income (R) per household

In general, the level of total household income reflects the status of the household's welfare condition. Figure 5.5 revealed that the most (55%) of the respondents have a total monthly income of between R500 and R999. These results are in agreement with most of the existing literature (Moorosi, 1999; Matayo, 2002; Mocwiri, 2006).

5.4 MANAGEMENT OF LAMBS/KIDS FROM BIRTH TO WEANING

As mentioned before none of the respondents in the Southern Free State keeps record at weight or at any other subsequent time (including weaning). Birth weight remains an important growth trait, as it is correlated to subsequent growth and weight gain at all ages (Mbele, 2007). The percentage of the lamb/kid and the mean weight at weaning are probably the most important factors determining profitability in livestock. Weaning rate is generally used to reflect the reproductive efficiency of the breeding season, mothering ability and lambing/kidding survival. It is defined as the number of lambs/kids weaned, expressed as percentages of the total number of

ewes/does in the flock, which were exposed to the ram/buck. Weaning percentage is a measure of survivability of kids from the birth to weaning. Prolificacy (number of kids per doe that kidded per year) is a measure of multiple births and does that kidded more than once in a year. Kidding percentage is a measure of the kids born per doe in the flock and is a measure of the flock composition (Matayo, 2002). An important decision is the time of weaning. Early weaning practices are usually applied when lambs are to be finished intensively. Milk production of the lactating ewe/doe drops fairly rapidly from 42 days after lambing/kidding. This reduction is more marked in slow development breeds. Besides this, little is to be gained from the weaning of lambs later than 90 days of age (McCrindle *et al*., 1996; Schwalbach & Greyling, 2006). Rumen development in the young lamb/kid is fairly rapid so that some 60 to 70% of adult capacity is reached by 60 days of age. Good feeding during the pre-weaning stage (creep feeding), especially of good-quality roughage, stimulates rumen development and the ability to utilise roughages and other types of feed. Practices such as creep feeding make the lamb/kid less dependent on the ewe's/doe's milk.

The time of weaning therefore depends on the lamb's/kid's stage of development and the availability of high quality of feed after weaning.

5.5 WEANING AND MORTALITY RATES

According to Mbele (2007) the following factors are important in deciding on the stage at which the lamb/kid should be weaned (creep feeding):

- Feed saving
- Better utilization of feed by growing animals
- Poor seasons
- Longer recovery period for the ewe/doe
- Prevention of overgrazing where grazing is limited

Lambs/kids can be weaned 60 days of age or when they reach a body mass of 20kg to 25kg provided good feed is available in the post-weaning period. Feed utilisation

efficiency of lambs/kids is considerably better than that of mature animals, which implies that it is better to supply feed directly to the lamb rather than via the ewe/doe. Table 5.12 indicates weaning status of lambs and kids amongst the respondents.

Table: 5.12: Weaning status of lambs and kids

Type of weaning system	Frequency
Yes, they wean (artificially)	11 (19,7%)
No, they don't wean (natural weaning)	45 (80,3%)

Table 5.12 clearly shows that the majority (80,3%) of the respondents of the study in the Southern Free State do not wean their lambs/kids artificially. Weaning occurs naturally when the milk production reduces close to the next parturition. The lack of fences in the communal grazing does not facilitate the separation of the lambs/kids from their mothers. The local small-scale farmers reported that natural weaning occurs during summer, but the age at weaning is not known. This practice is in agreement with those reported by Moorosi (1999) & Mocwiri (2006) who also found no weaning rates to be available and no weaning practiced amongst the respondents in Thaba Nchu and Botshabelo. It is obvious that the weaning rates are very low and much below the potential of breeds farmed commercially.

Weaning percentage is a good measure of productivity and a good indicator of farming efficiency and the major factor determining profit in livestock (Schwalbach & Greyling, 2006). According to Speedy (1985); Schwalbach & Greyling (2006) weaning of lambs/kids should be at 8 to 12 weeks of age to allow the ewe/doe to recover from the stress of lactation. The ewe/doe can then achieve an acceptable body condition to breed again approximately four months later. Surveys showed that the lambs/kids mortality in South Africa is about 15%, i.e. approximately 2 million lambs/kids per year (Greyling & Schwalbach, 2002). It is however, quite realistic to bring the death rate below 10%, with 5 % or less being the target figure. The loss in terms of money is alarming:

- Loss in wool production of pregnant lambs/kids;

- Supplementation feed of pregnant ewes/does;
- Increased ram cost per surviving lambs/kids;
- Loss of breeding material.

Records of mortality rates are not known by respondents in the study. According to Payne & Wilson (1999) & Matayo (2002) mortality of kids may be reduced by control of internal and external parasites, feeding of the ewes/does, vaccination and improved housing. Under traditional management sheep have higher outputs and a better rate of return than goats. Goats are considerably more prolific, but sheep are bigger, heavier and experienced lower mortalities, in addition to fetching a higher price in the market (Upton, 1985; Altman & Jacobs, 2009). Sheep require more attention than goats because of their tendency to wander and to damage crops under the free roaming system. Small-scale sheep production is more specialized than a goat rearing, demanding greater management input while offering higher returns (Donkin, 1993; Schwalbach & Greyling, 2002).

5.6 FEED SUPPLEMENTATION OF SHEEP AND GOATS

Most respondents (90%) indicated that they do not supply supplement feeding for their animals especially during winter time when natural grazing is so scarce. The rainfall is low and unreliable and sheep and goats tend to lose considerable weight during winter. The remaining 10% of the respondents provide salt licks and fodder, but only during the winter season. According to Mutsvanga *et al*. (1990) & Mocwiri (2006), improving the nutrition of grazing is essential especially during the pregnancy period. Managerial decisions on supplementary feeding are edged with more uncertainties than that of any other husbandry practice. However, the importance of feeding salt and mineral licks to livestock is important. Small-scale farmers should be taught to improve their knowledge and understanding of the relationship between adequate nutrition and small stock productivity. Of particular importance are the benefits to sheep or goat fertility, lamb/kid growth as well as benefits to the immune system and resistance to diseases.

5.7 INSURANCE AGAINST THEFT AMONGST SHEEP AND GOAT SMALL-SCALE FARMERS

None of the 56 respondents interviewed have insurance against theft of their sheep and goats. This clearly shows that these farmers are not protected should their animals get stolen resulting in no compensation for lost animals. It is also obvious that even if insurance could be made available to these farmers, they can't afford to pay for it because they struggle to have food on the table. The absence of banks and insurance companies in the area may also contribute negatively towards these farmers to have the insurance. The stock theft seems to be a very big problem according to interviews held with respondents whereby most respondents (80,3%) agree that stock theft is rife in this area (see Table 5.15).

5.8 ANIMAL IDENTIFICATION AND RECORD KEEPING BY RESPONDENTS

As an aid to prevent stock theft to monitor flock productivity and to determine the animal's production and reproductive performances, there is a need for individual identification of animals and to record the reproductive and productive performance of the animals. A satisfactory identification system should provide:

- Positive identification
- The necessary information about the animal and easy recognition.

Keeping of records is an integral part of good management program. This is the only way of becoming aware of what is going on in the flock. The records enable the manager to measure business success or failure. No one keeps basic records of lambing/kidding date, sex and financial records, and only 6,9% keep sales records. Table 5.13 depicts identification methods used by small-scale sheep and goat farmers in the Southern Free State.

Table: 5.13: Identification of animals and record keeping of sheep and goat

Method	Number (%)
Ear tags	0
Tattoos	4 (7, 1%)
Colour	21 (37, 5%)
Names	5 (8, 9%)
No identification	26 (46,4%)
Total	56 (100%)

Only 7,1% of the respondents use tattoos and can prove ownership of animals in case of theft. Some respondents (37,5%) use the colour of their animals as a means of identification, while 8,9% of the farmers use names to identify their animals. The vast majority of the respondents (46,4%) do not use any identification method.

Keeping records is an integral part of any sustainable agricultural system. The relatively low percentage of respondents keep some records and it is an indication that their management skills are poor and this reflects on the overall low productivity and profitability of their farming activities. It is only through proper record keeping that one is able to evaluate the progress that is made on the farm. To accurately determine efficiency levels such as lambing/kidding and weaning percentage as well as mortality rates, it is absolutely essential to maintain basic records. Complete and accurate flock records are valuable aids to the management of any flock/herd (Matayo, 2002).

In a sustainable sheep and goat production system, identification of individual stock is essential. Furthermore to determine their productivity, including their reproductive and growth performances, the evaluation of the adaptability or vulnerability of these animals to the prevailing environment is necessary, and also measures their growth performance and subsequently that of their progeny.

5.9 PROVISIONING OF SHELTER FOR ANIMALS

All respondents shelter their animals at night. Most (89,2%) use roofless kraals as shelter to protect their sheep and goats at night, while six respondents (10,8%) make use of both an open yard and a roofed kraal to shelter their small stock at night. These results are in line with those of Marcus *et al*. (1996) and Motlomelo *et al*. (2002) who stated that keeping livestock in kraals at night for security reason is a common practice amongst small-scale farmers in most rural areas of South Africa.

5.10 ACCESSIBILITY AND USE OF EXTENSION AND VETERINARY OFFICERS

The establishment of a new democratic government in 1994 gave impetus to a major policy shift in agriculture from food self sufficiency to food security. Jordaan & Jooste (2003) concluded that the government extension services should focus on small-scale and emerging farmers while the private sector should focus on the commercial farming sector. The extension services should play a very important role in disseminating technical information amongst emerging and small-scale farmers in South Africa. The latter constitute a priority client of the Department of Agriculture Forestry & Fisheries (DAFF). Access to extension and veterinary services should provide the small-scale farmers with technical information in order to help them to control diseases and mortalities. These services should have a great impact on the management practices used by small-scale farmers.

Respondents were asked what sources of information they use (results indicated in Table 5.14)

Table: 5.14: Access to sources used by respondents

Types of information sources	Frequency
Neighbours and farmers	20 (35,7%)
Extension officers	12 (21,4%)
Veterinarians	10 (17,8%)
Cooperative Manager	7 (12, 5 %)
Radio & TV	5 (8, 9%)
Extension publications	1 (1, 7 %)
News letters	1 (1, 7%)
Own records	0 (0%)
Never use veterinary services and extension	0 (0%)
Total	56 (100%)

From the information in Table 5.14 it is evident that few small-scale farmers make use of the services of Agricultural officers as it can be calculated 39,2% of the respondents have access to and use the services of veterinary and extension. Most small-scale farmers frequently (48,2%) obtain information from the co-farmers and the cooperative managers compared to veterinary services and extension. The main reason for these respondents not using government veterinarians is that in most cases do not have drugs to treat their animals with low prices, as a result they are forced to use the private veterinarians (are expensive).

5.11 MARKETING STRATEGY AND OPPORTUNITIES

The main aim of any farmer is to generate a stable, sustainable income and profit from a farming business. For this to be achieved the farmer has to have access to markets and a marketing strategy that will enable the selling during a predetermined period, the type as well as the number of livestock that will earn a satisfactory income to sustain the household (ICRA, 2001). Marketing plays a very imperative role in any business. It is therefore, crucial that before a farmer begins any enterprise the possible market is identified and a marketing strategy is formulated. The availability of market opportunities remains one of the most vital external elements influencing the

sustainability of rural livelihoods and in leading to self-reliant rural land users (Proctor, 2007). Lack of access to markets is a very serious challenge for small-scale farmers in South Africa (Marfo, 2002). This is a common limitation to the respondents, because most of them (74,5%) indicated to have poor access to markets. These findings are more or less in agreement with those reported by Mampholo & Botha (2004), who stated that 57% of respondents in Ganyesa mentioned that they had difficulties in reaching markets.

In general there are no readily available markets for small stock produce in the Southern Free State. If small-scale farmers at the auction are to sell their sheep and goats at reasonable and acceptable prices they must wait for the auction that is taking place once a month or three months. Bidders are perceived, by the local small-scale farmers, as paying better prices for all types of livestock auctions than speculators who buy directly from them. There are however, some small-scale farmers who prefer or have no other alternative but to sell their sheep and goats to speculators when there is a dire need for cash in the family. In order for these small-scale farmers to sell together they must organize themselves to satisfy the demands (Van Reenen, 1997; Aliber, 2009). The lack of information regarding auctions and the long distances to markets may block small-scale farmers' aspirations to sell their produce through this way. Some respondents (17%) indicated that they sell their sheep and goats privately as live animals in communities to meet unexpected cash needs (informal markets).

5.12 MAJOR CONSTRAINTS FACED BY THE RESPONDENTS

Table 5.15 shows (in ranking order) the major constraints of the respondents. (representing the small-scale livestock farmers in the Southern Free State).

Table 5.15: A ranking order of major constraints facing respondents

Constraints and intimidations	**Number of respondents in percentage agreeing to constraints**
Some areas lack handling facilities, e.g. kraals, crush pens, fattening pens	54 (96,4 %)
Too many animals graze in one or two camps hence stock theft	50 (89, 2%)
Not enough grazing	40 (71, 4 %)
Poor conditions of the roads	40 (71,4%)
Lack money to buy fodder for animals during winter	35 (62,5%)
High rent payment for sheep or goat	35(62,5%)
Low fertility of rams/bucks	30 (53, 5%)
Their animals have slow growth rate	25 (44,6%)
Veterinary staff no longer treat the animals but they refer them to private veterinarians who are expensive	25 (44,6%)
Unavailability of medicines for treatment from veterinary services	5 (8,9%)
Lack training in small stock	5 (8, 9%)
During winter there are veld fires which destroy the grass	5 (8.9%)
Competition in the market is high	5 (8, 9%)

Most respondents (89,2%) mentioned that there is a shortage of grazing, too many animals graze in one or two camps and rotational grazing is not practiced hence soil erosion occurs. Almost all (96,4%) were of the opinion that there is a shortage of

handling facilities, and most 5l,5% that the shortage of medicines by state veterinarians who in turn refer them to private veterinarians who are very expensive and farmers cannot afford to pay for their services. Most respondents agree that competition of selling sheep and goats is high, some (53,5%) say there is price fluctuations, while many (71,4%) is of the opinion that the instability of market prices are rife in this district. The municipality does not have supportive programs (98,2%), while a lack of infrastructure (98,2%) is a very big problem because small-scale farmers cannot dehorn, castrate and shear the sheep and goats. High stock theft (80,3%) is common according to these farmers and something must be done about it. This is being aggravated by a lack of fences.

Moreover, respondents feel that rent is too high and some farmers can't afford it. They suggested that people should pay according to their number of livestock they have (rent should be proportional to the livestock owned). Diseases can't be controlled well due to poor management practices. Sheep scab is very rife in this region and proper coordination in controlling and prevention of diseases should be communicated well. Many camps fences are broken and that spread disease further. Then it implies that farmers who dip their livestock would have wasted time and money because those sheep and goats are going to be infected by those that were not dipped due to commonage grazing. That is another reason why they need to have farms that they own individually.

5.13 SATISFACTION OF FAMILY WELFARE AND SMALL-STOCK FARMING PROGRESS

In ascertaining the household's level of satisfaction with the general welfare of their family, only 40% indicated that they were satisfied, 55% were not satisfied and only 5% were unsure. Regarding satisfaction of farming activity, 65% of respondents indicated that they were not satisfied. The reasons advanced for dissatisfaction of both farming activity and welfare of family were that they have too much debt, inability to expand their sheep and goats enterprise (40%) due to lack of money (20%) and 10% have housing. Thirty percent of respondents indicated that they have no sense

of security for their family, as they cannot earn enough money from their farming activity. Such high dissatisfaction with regard to family welfare and farming progress indicates that small-scale farmers in the Southern Free State are most probably in need of innovative technologies or practices that will enable them to have higher returns.

5.14 AREAS IN NEED OF IMPROVEMENT

Most respondents (94,4%) said they would like to buy the farms which they are renting or leasing as promised. The government should speed up the process of selling these farms to the farmers for the land redistribution programme. It is difficult for the government to maintain these farms. All the respondents who were interviewed indicated that they need some assistance from the government. More specifically, 80% of them indicated that they need training, 75% need assistance for marketing of their sheep and goats in their area, 60% need technical advice, 50% need improvement of the infrastructure, 40% need financial assistance and 30% need assistance to genetically improve their animals.

5.15 CONCLUSION

This study has served to put into perspective the nature and complexities of small-scale farming in the Southern Free State. This production system can be characterized by its low productivity and generally insufficient economic and social satisfaction amongst farmers. The interlocking components of communal land, overstocking, overgrazing and progressive deterioration of its main resource base, lack of supportive structure, institutions and extension services creates a sense of impending crisis and an urgent imperative for change. Based on this discussion, there is a need for policy intervention to urgently support the resource-poor small-scale sheep and goat farmers in the Southern Free State area. Small-scale farmers in general can adapt new technology, but the necessary supporting systems are not always in place, despite government's policy to priority to provide support to these vulnerable groups as stated in the agricultural sector policy document.

CHAPTER 6 - A QUICK DISEASE SCREENING EXCERCISE AMONGST SHEEP AND GOATS OF THE RESPONDENTS

6.1 INTRODUCTION

The limiting effect of animal diseases on the productivity of livestock cannot be underestimated, particularly in small-scale farming (Motlomelo *et al*., 2002). The latter authors stated that in sub-Saharan Africa alone, the great economic losses due to animal diseases average 4 billion rand annually, representing approximately one-fourth of the total livestock production in this region. However, the consensus is that due to a series of reasons, little is known amongst small-scale farmers about the prevalence of diseases and their real impact on the productivity of livestock as well as on the economy (Motlomelo *et al*., 2002).

Some researchers like Matayo (2002) & Mocwiri (2006) have reported on disease problems amongst small-scale farmers in Southern Africa. Most authors consider that the main reasons for improper disease control measures amongst small-scale farmers are the lack of funds by most governments and the inability to support and maintain efficient operational extension services (Moorosi, 1999; Marfo, 2002; Mocwiri, 2006). Most African extension services have been geared towards controlling specific infectious diseases of livestock (i.e. Foot and Mouth, pest des pestit ruminants, etc.,) and have ignored general farm management practices such as general husbandry and health control, focused on disease prevention (Schwalbalch & Greyling, 2006). In South Africa, the greatest costs for disease control in sheep and goats are spent on internal and external parasites (Gareth & De Wet, 2000), which are major causes of financial losses and reduced health and welfare in small stock production systems. Both adult and immature internal parasites may reduce animal productivity; they cause sterility and abortions, puncture blood vessels in the stomach and intestinal wall and feed on the blood of the host (Gareth & De Wet, 2000). In addition, external parasites pose important limitations to efficient livestock production in Southern Africa (Schwalbach & Greyling, 2002). These external parasites may

have direct effects on animals (as blood sucking parasites), and indirect, perhaps more detrimental effects, caused when ticks act as vectors and/or transmitters of highly pathogenic micro-organisms such as viruses, rickettsia and protozoa. These micro-organisms can cause important vector-borne diseases, endemic to most of Southern Africa and result in high mortality rates in livestock (Matayo, 2002). Very little is known about the prevalence of diseases of small stock amongst respondents in the Southern Free State.

The general aim of this quick disease screening exercise was thus to determine the most common diseases that affect the sheep and goats of respondents in the Southern Free State. This could serve as a first step towards developing a basic animal health program to control the most important small stock diseases amongst small scale farmers in South Africa, with particular relevance to the Southern Free State.

6.2 MATERIALS AND METHODS

This part of the study was carried out simultaneously with the questionnaire as discussed in the previous chapters. The questionnaire included questions on the animal health status and the most common diseases amongst the sheep and goats of the respondents (Annexure A). In addition, during the farm visits a number of sheep and goat animals were randomly selected for disease screening from the flock of the 56 small-scale farmers interviewed.

The study was carried out for a period starting in autumn and early spring, thus mainly during winter time. During the farm visits at each of the 56 farmers, the first 5 sheep and 5 goats that could be caught in the kraal irrespective of age and sex were used for a quick internal and external parasites assessment. From these a faecal sample and all engorged visualized ticks were collected by hand for laboratory analysis. In addition skin scraping samples were collected from all sheep that showed any signs that could be associated with sheep scab, such as itching, wool biting and scratching (in total 8 sheep were selected). Blood and semen samples were taken

from all the mature breeding rams (15) and bucks (10), and the respondents answered a series of questions related to disease occurrence and control. The selection of animals for sampling and the sampling procedures, preparation and analysis are described in the following paragraphs.

6.2.1 Faecal samples

Faecal samples were collected from the first 5 sheep and 5 goats that could be caught in the kraal irrespective of age to determine the mean number of eggs per gram (EPG). Faecal pellets (about 10g) were collected by inserting a lubricated index finger into the rectum of the animal, the pellets were extracted into the palm of the hand and transferred into a small labelled container and transported in refrigeration (4-5ºC) to the State Veterinary Laboratory in Bloemfontein, where standard laboratory procedures were followed to carry out this analysis. The modified McMaster method (Walker *et al*., 2001) was used to determine the number of internal parasite eggs per gram of the faeces.

Exactly 5g of faeces were placed in a container by the lab technician, and later filled with 42 ml of saturated sodium chloride (NaCl) solution. The mixture was then poured into a pestle and grounded with the aid of a mortar. This mixture was poured through a tea strainer with an aperture of approximately 0,15 mm and the strained fluid collected in a plastic beaker. The strained suspension was then centrifuged at 2000 rev per minute (r.p.m) for 5 minutes and a volume of 1,5 ml was taken from the surface of the liquid (supernatant) with the aid of a Pasteur pipette and carefully deposited into a McMaster counting chamber. The EPG was then visually determined under the microscope using the procedures described by Walker *et al*. (2001).

6.2.2 Tick collection samples

From the same 5 sheep and 5 goats on each farm that were used to determine the EPG (par.6.2.1), all visible engorged ticks were pulled of their skins by hand and placed in a 20ml container filled with a 70% ethanol solution and then sent to be

identified at the State Veterinary Laboratory in Bloemfontein. All tick species were identified with the aid of the stereomicroscope and a magnifying glass (Walker *et al*., 2001; Wall & Shearer, 2001; De Castro, 1987).

6.2.3 Skin scrapings

From all sheep present in each flock visited, those that showed suspicious signs of sheep scab (i.e. itching, scratching, wool biting signs and skin lesions) were caught and sampled for sheep scab. In total, eight sheep showed one or more of the above mentioned signs. A skin scraping sample was taken from the edge of the lesion after removal of the excess wool. The scrapings were placed in a properly identified mite-proof glass or plastic container and then sent to the State Veterinary Laboratory in Bloemfontein for analysis. The skin scraping sample was examined by a lab technician under a low power microscope to confirm and identify the possible presence of mites (Walker *et al*., 2001; Wall & Shearer, 2001).

6.2.4 Screening of mature rams and mature bucks for venereal diseases

From the mature breeding rams and bucks (Table 5.9), about 7 ml of blood was drawn from each animal with the aid of a vacationer needle that was screwed into a vacationer tube holder, from the vena jugular (jugular vein) into a blood collecting tube, containing the anti-coagulant ethylene diamine tetracetic acid (EDTA). The blood sample was then placed into a cooler bag 4-5°C and then sent to the State Veterinary Laboratory in Bloemfontein for analysis of Brucella ovis for sheep and Brucella melitensis for goats.

6.3 DATA ANALYSIS

Data was statistically analysed and processed using basic descriptive statistics and frequency distribution. In most cases percentages were used to present the results in a meaningful and user-friendly manner. A frequency distribution was used to process the bulk of the data collected with the questionnaire.

6.4 MOST COMMON SMALL STOCK DISEASES NOTICED BY RESPONDENTS

Table 6.1 depicts the most common small stock diseases, as noticed or perceived by small-scale sheep and goat respondents.

Table 6.1: Most common diseases frequently noticed or perceived by respondents

Diseases/Signs/Problems	Number of respondents	Respondents (%)
Sheep scab	40	89,2 %
Bluetongue	39	75,0 %
Internal parasites	35	69,6 %
External parasites	34	60,7 %
Abortions	30	53,6 %
Abscesses	29	51,7 %
Lambing/kidding problems	28	50,0 %

According to the results depicted in Table 6.1, which reflect the most common sheep and goat diseases that are frequently noticed by respondents, it is clear that sheep scab was judged to be problematic disease by the farmers (89, 2%). In South Africa sheep scab is one of the few animal diseases controlled by the state. Sheep scab is a disease caused by an external parasite called Psorotes ovis, which feeds on body tissues such as blood, skin, hair and limit production in small stock, particularly in woolen sheep (Mullen & O'Connor, 2002). Farmers affected by this disease cannot buy or sell sheep, and animals are quarantined (no movement without permit). According to Schwalbach & Greyling (2006); Matayo (2002), external parasites are major problems in most domestic species in Southern Africa and pose important limitations to efficient livestock production in Southern Africa. Environmental factors

such as high ambient temperature and humidity, vegetation and the abundance of wildlife (reservoirs for the parasites) create ideal conditions for these insects to survive and reproduce. In the study area, some respondents (30%) reported to control this disease by using an “Ivermectin” drug. However, the problem is that farmers who treat their livestock mix them with other stock that is not treated, so this has little effect because the treated animals may later become infected by carrier animals not treated, due to the communal grazing system.

In second place in order of importance, most frequent disease mentioned by the respondents (75%) considered bluetongue disease as the second most. According to Gareth and De Wet (2000), this viral disease causes considerable mortality in livestock, particularly sheep. Blood sucking insects called midges (culicoides) transmit the bluetongue virus to small stock, particularly sheep resulting in this disease. The most important action to control this disease is to vaccinate sheep yearly before the first rains of spring. Vaccination should be carried out in three fractions A, B and C, each 3 weeks apart to ensure proper immunity. This vaccine should be administered before the mating season. The vaccine can be administered as soon as the ewes have lambed. Lambs will receive passive immunity from the colostrum of ewes and should not be immunized with bluetongue vaccine before the age of 6 months. Rams should be vaccinated 2 months before mating season, or otherwise, after the mating season. Vaccination of early pregnant ewes may lead to abortion (Gareth & De Wet, 2000).

In third most common diseases (69,6%) identified by respondents was internal parasites. They survive by feeding of their host and do this directly by attaching to the wall of the digestive system and feeding on the host’s blood and/or nutrients (Kaplan, 2004a). Endoparasites decrease the efficiency of small stock production by absorbing the host's nutrients and/or blood, damaging the gastrointestinal tract, while also decreasing feed intake and digestibility (Gareth & De Wet, 2000). These authors reported that internal parasites infection in small ruminants decrease the daily intake by more than 20% and weight gains by 15 to 80%, depending on the level of infection. A large number of respondents (69,6%) indicated having this problem in

their small stock, particularly in sheep. These parasites are difficult to manage because on many farms in South Africa, they have developed resistance to many and sometimes all available anthelmintic drugs (Parkins & Holmes, 1989; Matayo, 2002; Mocwiri, 2006). Many producers can no longer rely on drugs alone to control internal parasites (Linklater & Smith, 1993; Gareth & De Wet, 2000). Rather an integrated approach that relies on sustainable methods to control internal parasites is needed. Sheep and goats can pick up parasite larvae on the grass and sheep are in generally more affected than goats because sheep prefer to graze short pastures near the soil where the infection larvae accumulate, while goats browse most of the time. These results are in agreement with various authors (Devendra, 1991; Gareth & De Wet, 2000). Most small-scale farmers (70%) do not dose their small stock against internal parasites while those that do so (30%) use Ivermectin.

Most small-scale farmers (60,7%) also indicated external parasites as a problem to sheep and goats. Ticks and sheep mites are largely responsible for downgrading the quality of skins (in sheep) and hides (in cattle) and damage to the teats and testes of animals, cause ill health and loss of animal production (Matayo, 2002). Sheep scab (already discussed earlier) is one of the diseases which the state must control The most effective way of controlling this disease is dipping the stock with an effective drug, particularly in winter when the parasite is more active. Apart from sheep scab, there are no tick borne diseases for sheep and goats in the study area. Apart from abscesses, moderate tick infections are more nuisance than a serious health threat. Nevertheless respondents have pointed ticks as the fourth most common problem, this seems to support the findings of Motlomelo *et al*. (2002) that small-scale livestock farmers react on what they can see.

In order of commonality, the next disease problem experienced by respondents in the study is abortion (53.6%). Abortions amongst sheep and goats might be caused by different reasons. Upton (1985) as well as Matayo (2002) reported that abortion may be due to different diseases like Brucella ovis which is caused by Brucella ovis in sheep and Brucella melitensis in goats. Infected ewes/goats remain carriers of the disease and contaminate the grazing. After lambing/kidding an infected ewe usually

introduces the disease in the flock. Lambs/kids may also be born alive, but die shortly afterwards. The milk of the infected ewe/doe contains the organisms and will show signs of mastitis. Vaccination for this disease is the option of choice where there is a high incidence of the disease, but ultimately the aim should be to eradicate it by also testing and slaughtering all the carriers of the disease. Another disease, according to Rattner *et al*. (1994); Schwalbach & Greyling (2006) which may cause abortion is Rift Valley Fever (RVF), which is transmitted by mosquitoes during the summer season where there is heavy rainfall and persistent flooding. Unfortunately, the abortion rate from the sheep and goats of these small-scale respondents in the Southern Free State is not known because they do not keep records. From the questionnaire it is clear that 53.6% of the respondents in the Southern Free State have abortion problems in their flock. These results are in agreement with those of many authors who consider that abortions in small stock are a major problem (Traore & Wilson, 1988; Osuagwuh, 1991; Matayo, 2002; Mocwiri, 2006; Schwalbach & Greyling 2006). According to Lebbie (1996) & Matayo (2002) a rapid modification of the ration can lead to an outbreak of enterotoxaemia, caused by a sudden increase in the Clostridium perfrigens population in the intestine where the fast growing bacteria produce toxins which diffuse into the blood. This disease as well as other metabolic disturbances linked to nutritional disorders may also precipitate incidences of abortions. From these results, there is a need to study the occurrence of abortion and its causes amongst small-scale farmers.

Abscesses are mostly caused by bacterial infections that affect the skin, internal and external lymph nodes and internal organs (Ayres, 1977; Schwalbach & Greyling, 2006). As it can be seen from Table 5.11, in the Southern Free State 51,7% of the respondent farmers seem to have abscess problems in both their sheep and goats. Gareth & De Wet (2000) mention that this is a worldwide chronic disease in sheep and goats; however, some animals within the flock appear to be resistant to this disease. Schreuder *et al*. (1994) and Walker *et al*. (2001) consider Corynebacterium pseudotuberculosis as one of the microorganisms which infects both sheep and goats and these bacteria are found in the soil of contaminated pens, feed and water troughs, and in shelters and other congregation points (Williamson, 2001). Animals

acquire the infection orally when ingesting contaminated feed or grass. Direct contact with the abscess of flock-mates particularly in places where the skin is selected or cut will also spread the infectious bacteria from animal to animal.

About 50% of the sheep and goat farmers in the study area indicated to experience lambing and kidding problems. Small stock, particularly sheep, has been reported to be a major constraint on improving productivity in traditional goat husbandry system (Linklater & Smith, 1993; Walker *et al*., 2001). The lamb/kid crop is one of the most important elements in successful sheep and goat production. A good crop of lamb/kid at weaning is essential for the enterprise to be profitable; a poor lamb/kid crop will result in economic losses and poor production figures. It makes no sense to have ewes/does mated successfully and to look after them during their pregnancies only to have large numbers of lambs dying shortly after birth. It must be appreciated that lambing/kidding time is “harvest time” for the sheep/goat farmer, and that good care and management will influence not only the volume of lambs/kids for sale but also:

The number of surplus sheep/goats for sale, and
The selection in breeding programs and for culling to increase flock productivity.

6.4.1 DATA RESULTS

6.4.1.1 Faecal egg per gram results

Table 6.2 and 6.3 shows the average number of eggs per gram of the faecal samples for round worms, tape worms and flukes for goats and sheep respectively.

Table 6.2: Eggs per gram worm burden for goats

Sample number	Round worm	Tape worms	Flukes
1	600	100	0
2	0	0	0
3	0	0	0
4	200	0	0
5	0	0	0
6	800	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	100	0	0
12	200	0	0
13	0	0	0
14	200	0	0
15	0	0	0
16	0	0	0
17	0	0	0
Total	2100	100	0
Avg	123,53	5.88	0
STD	234,52	24.25	0

Table 6.3: Eggs per gram worm burden for sheep

Sample number	Round worm	Tape worms	Flukes
1	100	0	0
2	200	0	0
3	0	0	0
4	600	0	0
5	200	100	0
6	0	0	0
7	500	0	0
8	0	0	0
9	0	0	0
10	1000	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	100	0	0
15	0	0	0
16	0	0	0
17	0	0	0
19	0	0	0
20	400	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	200	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	200	0	0
30	0	0	0
31	200	0	0
32	0	0	0
33	300	0	0
34	100	0	0
35	0	0	0
36	0	0	0
37	0	0	0
38	200	0	0
39	0	0	0
Total	4300	100	0
Avg	110,25	2.56	0
STD	228,65	16.01	0

The results in tables 6.2 and 6.3 show that the faecal samples from goats had an average of 230 roundworm, 2.56 tape worm and 0 fluke eggs/gram and 233.33 round worm, 0 tapeworm and 0 fluke eggs/gram in sheep respectively. This demonstrated the presence of round worms even though not showing a very heavy burden. Gareth & De Wet (2000) consider that more than 10 000 eggs/gram a very heavy worm burden in the faeces of the sheep or goat. The low number of eggs per gram found in the animals is probably due to the fact that this assessment was done during late winter season when the roundworm burden is generally low. These results are in agreement with those of Matayo (2002), who reported that low number of eggs per gram is common in goats in Tanzania in the dry season. The gastro-intestinal endoparasites reduce the productivity of both sheep and goats. To prevent these losses, a good understanding of the parasitology, nutrition and the interaction with one another on animal performance is essential (Kaplan. 2004a). Unfortunately, because of the variety of environment conditions in which sheep and goats are maintained (especially by small-scale farmers), very little information is available with regard to change in the performance of sheep and goats (especially where animals are in poor nutritional status) due to endoparasite infestations. Internal parasites (worms) survive and reproduce by feeding off their host and do this directly by attaching to the wall of the digestive system and feeding on the host's blood (Matayo, 2002). These parasites are difficult to manage because on some farms they have developed resistance to anthelmintic (Gareth & De Wet, 2000). Producers can no longer rely on drugs alone to control internal parasites (Kaplan, 2004b), rather an integrated approach that relies on sustainable methods to manage internal parasites. From the responses in the questionnaire, only 10% of the small-scale farmers deworm their animals for internal parasites by using the Ivermectin drug. This represents only one third of the number of farmers who control external parasites. Most effective internal parasites control programs rely on a combination of management strategies and anthelmintic treatments. Managerial procedures such as pasture rotation are effective to decrease the livestock exposure to infective 3rd-stage parasite larvae (Walker *et al*., 2001). Anthelmintic treatments are designed to kill the adult parasites and 4th-stage larvae in the GI tract. It is most efficient to use

anthelmintic treatments at times when the nematode life cycle can be broken before pasture rotation, before parturition, or in the spring and autumn (Matayo, 2002).

Some of the small-scale participating farmers (15%) do use the aloe plant as a remedy for deworming their small stock, but most respondents (75%) do not deworm their sheep and goats at all. This is in agreement with Matayo (2002) who reported that external parasites are better controlled than internal parasites by small-scale farmers.

6.4.1.2 Tick identification results

The aim was thus to identify the kind of ticks present in sheep and goats of the respondents who are located in the Southern Free State. The results showed that the ticks found during tick collection were Rhicipelaphalus evertsi evertsi (5 ticks) and Boophilus decoloratos (15 ticks). A very low number of ticks were collected during the trial, most probably due to the fact that tick collection was done in winter when ticks are less abundant. These results are in agreement with those of Spickett *et al*. (1989) & Walker *et al*. (2001) who also found much higher tick numbers during the summer season when compared to the winter season. Tick burdens on the animals depend on the weather and environmental conditions. Ticks are largely responsible for downgrading the quality of skins and hides and damage to the teats and testes of animals, ill health and loss of animal production (Mersie & Bekele, 1994; Schwalbach & Greyling, 2006). In addition, heavy tick infestation may result in anaemia and skin wounds (often contaminated with opportunistic bacteria resulting in abscesses). To a certain extent, indigenous livestock to Southern Africa are relatively well adapted and more resistant to tick and tick-borne diseases (TBD) when compared to exotic breeds. Several studies have demonstrated their higher resistance or tolerance to both tick and TBD, compared to the exotic European breeds (Matayo, 2002).

The European settlers in Africa soon realized ticks as a major limitation for livestock production in Southern Africa and thus introduced several conventional western insecticides, most of them synthetic chemicals for tick control. The history and

development of veterinary services in Southern Africa is closely associated with this need to control external parasites and vector borne diseases in this region (Ameen, 2001).

About 25% of the respondents do use Ivermectin drugs to control these external parasites. Although these drugs have some effects against some ticks (i.e. Boophilus), they are not the preferred control method. This also relates to Nell (1998) as well as Schwalbach & Greyling (2006) that small-scale farmers rely on what they see when it comes to adoption of medication technology.

6.4.1.3 Skin scrapings sample results

Out of the eight skin scraping samples taken, only one was found to be positive for sheep scab with the mite Psoroptes ovis positively identified. This mite causes sheep scab mainly in sheep but goats are carriers of this disease and do not get affected. Even though only one sample was found positive, this proves that the mite is present. This is a controlled and highly contagious infectious disease which is controlled by the state in South Africa. The mite lives it's entire life cycle on the sheep. The female mite lays eggs in the fleece or on the skin. These hatch in 2 to 3 days, and under favourable conditions females can produce 180 000 offspring in just 2 months, hence the explosive spread and apparently sudden appearance of sheep scab (Gareth & De Wet, 2000). Sheep scab affects the wool of the sheep and farmers cannot sell their wool. The Veterinary services have to quarantine the area and treat all animals in the area. The treatment should be done twice within eight days interval. All sheep treated in the first round should be present in the second treatment; otherwise the whole treatment should be repeated (Gareth & De Wet, 2000).

For sheep scab prevention the farmers should ensure the following:
keep boundary fences sheep proof at all times;
buy animals only from known sources and free from infection signs;
never allow new sheep or goats to be introduced immediately to other sheep on the farm;

Always quarantine introduced sheep and goats and annually treats them for sheep scab against mites at the beginning of the winter season.

6.4.1.4 Results for disease screening of rams/bucks for venereal diseases

The results of the blood test for venereal diseases (15 rams and 10 bucks) were all found negative for Brucella ovis in sheep and Brucella melitensis in goats. Even though these results are negative, it does not mean that the risk of Brucella ovis and Brucella melitensis does not exist. None of the respondents in the study area vaccinate their sheep and goats against Brucell ovis and Brucella melitensis. Rams/bucks with Brucella ovis or Brucella melitensis are infertile and they lessen the production in the flock. Rams need attention throughout the year, but because they are few in number, they are neglected. Gareth & De Wet (2000) reported that the rams/bucks will need the following attention:
a fertility test should be done two months before mating (it allows sufficient time for a re-test and replacement if they are found infertile; the genital organs should be palpated and checked two weeks before mating; internal parasites infestation must be monitored by means of a faecal sample; before mating season screening of the rams must be carried out against B.ovis; rams/bucks with B.ovis must be culled; the last bluetongue inoculation must be administered two months before mating.

Semen sample evaluations from all the 15 breeding rams and 10 breeding bucks for Brucela.ovis (B.o) and B.melitensis were also all found negative by the State Veterinary Laboratory in Bloemfontein, though it does not mean that the entire flock will remain negative in the future; hence the test should be done on an annual basis. Organisms that infect the genital tract of rams fall into three groups of HPA groups (Haemophilus, Pasteurella and Actinobacillus). The infected rams with B. ovis infect ewes and get infected by ewes that are contaminated. Ewes can contract a transient infection which is known to cause abortions in ewes (Gareth & De Wet, 2000). There is a vaccine available in South Africa called “Rev.1” from a live attenuated strain of

Brucella melitensis (Bm), which can be used to prevent both Brucell ovis and Brucella melitensis infection in sheep and goats.

According to Linklater & Smith (1993); Walker *et al*. (2001), infected rams with this bacteria or pus in the semen should not be used for breeding purposes and should be sold. Lumps or lesion on the testes are usually permanent and if the seminiferous tubules are blocked by inflammation, the affected testes will be infertile. All preventative measures will be useless unless the infected rams are removed from the flock. Good hygiene is a basis of all preventative and control measures (Linklater & Smith, 1993; Schwalbach & Greyling, 2000).

6.5 OTHER DISEASES

Pulpy kidney is one of the most important diseases of small stock that should also be taken into consideration by farmers because it is a very common disease in South Africa. This bacterial disease is precipitated by a sudden change of diet. It is caused by a bacterium called Clostridium perfrigens type D, which occurs naturally in the gut of sheep and goats. When their digestion is disturbed, the bacteria multiplies rapidly and produce large quantities of poisoning toxin that can be absorbed into the blood stream and cause acute deaths. The disease can be easily prevented by yearly vaccination. This is a disease commonly present in multiclostridial vaccines available in the market. In addition, sudden diet changes should be prevented (Gareth & De Wet, 2000). When pulpy kidney is suspected, the following actions should be done:
animals should be prevented from over-consumption of feed; move sheep/goats to a less lush camp; inoculate all sheep immediately; be aware that even after vaccination, deaths will continue for up to 10 days; dosing sheep/goats with a level of teaspoon of sulphur can be of help; a long acting tetracycline injection will protect sheep/goat for a few days until the vaccination takes effect.
There are a few vaccines available in South Africa to prevent this disease. A oil based vaccine should be used to inoculate lambs of about 3 months of age for the first time; these should receive a second dose 4 to 6 weeks later with alum-based vaccine and thereafter every 6 to 12 months with this alum-based vaccine. The oil

based vaccine is used for young lambs, but they can develop an allergic reaction to it if it is repeated. Most commercial pulpy kidney vaccines comprise a variety of combinations, often with an anthelmintic and can be used to vaccinate pregnant ewes annually 6 weeks before lambing. The lambs are vaccinated according to the manufacturer's instructions (Devendra, 1991; Linklater & Smith, 1993; Gareth & De Wet, 2000; Schwalbach & Greyling, 2006).

In conclusion it is clear that respondents in the study located in the Southern Free State have disease problems especially sheep scab, bluetongue as well as internal and external parasites. The low efficiency in animal production systems is characterised by poor management practices. There is high probability of diseases if proper prevention and control measures are not put into place especially in a communal grazing system. There is a need for a basic herd health disease control package to be implemented by Veterinary Services in the area.

CHAPTER 7

GENERAL CONCLUSIONS AND RECOMMENDATIONS

7.1 GENERAL CONCLUSIONS

From the results of this study it may be concluded that, based on the respondents in the study, a significant proportion of the small-scale sheep and goat farmers from Phillipolis and Trompsburg in the Southern Free State adopt basic management husbandry practices with considerable influence from traditional management practices typical of small-scale, subsistence agriculture in South Africa. These small-scale farmers make use of communal grazing, have limited access to resources as well as technology and tend to over-exploit their natural resources, particularly the veld. Income from stock farming activities is low and most of the respondents (75%) are only farming on a part-time basis. Other income sources (non agricultural) are the most important economic support base of these communities.

A considerable percentage of the respondents in the Philipolis and Trompsburg areas in the Southern Free State farm with less than 5 sheep (35,7%) and/or 5 goats (32,1%) per household. Only 8,9% of the farmers have more than 50 sheep and goats together. One can conclude that these small-scale farmers are still far from commercial farming. The land tenure holding is still communal and belongs to the local municipality. The communal usage of the grazing areas makes veld management very difficult. The communal veld is overstocked, which results in overgrazing and veld deterioration. It is estimated that 70% of the fences in the area are in poor condition, which further complicates veld management by making it difficult to control animals. As a result, the veld in the grazing camps is in a poor condition.

One of the major limitations to livestock production is the lack of water. Most of the grazing camps have no water because most windmills are broken and some

boreholes are not in good condition. Many camps are not equipped with windmills and the reservoirs in some of the grazing camps are also in poor condition. This situation has led to uneven utilisation of the rangeland (some grazing camps are under-utilised and others are over-utilised). This leads to overgrazing and bush encroachment as recognised by respondents in the study area.

The veld deterioration expresses its effect in terms of low animal productivity (poor body condition, low conception rates, low lambing/kidding rates, low weaning rates and high mortality rates). The productivity of the small stock animals is low and therefore the income of the farmers from their farming activities is much lower than the potential. These conditions threaten the long term sustainability of small-scale sheep and goat farming in the Southern Free State region. Policy intervention to support the desirable development of these small-scale farmers into sustainable commercial producers is urgently required.

Training and more regular visits from extension and veterinary officers are needed in order to provide the farmers with knowledge and skills regarding modern livestock management practices to improve the productivity and sustainability of small scale sheep and goat farming systems in the Phillipolis and Trompsburg areas.

7.2 GENERAL RECOMMENDATIONS

7.2.1 At Policy Level

The small-scale sheep and goat farmers in the Southern Free State need to operate within the overall framework of Agri-business in order to reduce rural poverty and to promote livestock production to improve their living conditions. These small-scale farmers should be encouraged to use their natural resources (mainly the veld) more sustainably. The government should speed up the process of land redistribution by selling some or all municipal lands to selected small-scale farmers who demonstrate

capacity to farm sustainability and adopt recommended practices (i.e. correct stocking rate).

By privatising state land, access to farmland should be given to livestock farmers who prove to be more knowledgeable and skilful in farming, are willing to buy land and engage in farming on a full time basis with a more commercial orientation. In disposing of such land, the municipality or the state must ensure that people, who can afford it, do not grab more land than they need or can use. Continuous training and support should be provided at subsidized costs to small-scale farmers in the area.

7.2.2 At Institutional Support Services Level

Small stock numbers must be limited to the grazing capacity of the veld as dictated by the prevailing environmental factors, such as climate, soil and vegetation. Guidelines for alternative feeds and supplementary production strategies that do not rely on natural and cultivated pastures must be developed. The municipality must promote the implementation of better veld management practices through the introduction of fenced camps, improved water supply, correct stocking rates and rotational grazing.

The continuous effective monitoring of camps by the municipality, Department of Agriculture and Rural Development as well as Department of Land Reform and Rural Development should ensure that small-scale farmers use the land sustainably at the correct stocking rates. Nutritional restrictions negatively affect the survival, growth and productivity of livestock limiting the genetic expression of the productive potential of animals.

There is a great need for the education and training of small-scale sheep and goat farmers in Phillipolis and Trompsburg areas. Short courses for small-scale farmers, demonstrations, farmers' days and field working days to train them on basic husbandry aspects, including veld management and disease control must be organized. The small-scale farmers in the Southern Free State should be encouraged and be taught good farming management practices, to enable them to achieve high

weaning rates. Since the percentage of weaned lambs/kids reflects the productivity from a breeding flock, it is important that female sheep and goats should produce a high percentage of lambs/kids which depends largely upon the proper feeding of the breeding flocks. Commercial farming offers higher levels of income and therefore, economic welfare for both themselves and future generations. In so doing it is hoped that as rational economic factors those in a position to do so will embrace a more commercial orientation towards livestock production.

Optimal resource utilisation has a general requirement that economic benefits should outweigh economic costs. The provision of appropriate yet comprehensive sets of extension and veterinary services are required.

A basic well planned vaccination programme to control the most common endemic diseases should be developed and implemented by the government free of charge under the supervision of the district veterinary office. Through veterinary officials, extension officers and economists, small-scale farmers need to be capacitated with the necessary skills and knowledge development in group dynamics and procedures, marketing and price determination, financial record keeping, technical matters and problem solving skills, as well as in veld management and sheep and goat production and management practices.

The establishment of Small Medium Enterprise (SME) will help generate employment and income by providing inputs to farmers' land based livelihoods or process agricultural output to effective program and local economic development. The establishment of a small feedlot and auction will lead to better access to markets, valuable employment creation and generation of income.

7.2.3 At Infrastructure Development Level

The Departments of Agriculture and Rural Development, Department of Land Reform and Rural Development and the municipalities in the Free State province should assist small-scale farmers with the basic infrastructure (dipping tanks, handling

facilities, crush pens and fencing) to enable small-scale farmers to practice correct livestock and veld management practices. Veld quality and management can be improved by sub-dividing the area into camps with water distribution storage points and to facilitate rotational grazing and resting of veld. This can be done along with bush control, vegetation restoration through reseeding and technical assistance on veld utilisation.

The conservation and improvement of the grazing resources (veld) is seen as having important welfare implications for rural livestock production and those that keep livestock for traditional cultural reasons. Conservation is imperative if the economic viability of livestock production is to be achieved. Only in this way it will be possible to avoid prejudicing levels of economic welfare derived from these forms of production both now and in the future.

Provision of drinking water for livestock at strategic points is essential for veld management and utilisation. In the study area in the Southern Free State water is the scarcest resource in most camps due to broken windmills and untested boreholes. Perhaps laying pipes over long distances can be a solution. Livestock production can be improved through implementation of the directly applicable management practices e.g. disease control and treatment programmes, appropriate breeding seasons, provision of adequate nutrition, observance of correct grazing capacity and stocking rates.

7.2.4 At Marketing of Livestock

The current system of sheep and goat marketing through speculators offers low and unstable prices to farmers. It is therefore imperative that small-scale farmers in this area are assisted by the local government to organize themselves into a body or association which could then engage auctioneers in the Southern Free State and elsewhere to hold regular auction sales in the area.

The structures of farmer's organizations should be encouraged, stimulated and restructured to assist extension officers and Veterinary officials to channel the necessary information, financial - and technological support to small-scale farmers.

7.3 Proposed Basic Flock Health Program to be carried and Supervised by the Veterinary Extension at a reduced/or Subsidized price

Flock health management and disease control should be dealt with throughout the year and according to a predetermined programme. Just before breeding a number of activities and procedures have to be dealt with (i.e. dosing, vaccinations and dipping which should not be administered at the same time within a certain period). Table 7.1 stipulates clearly those different classes of sheep and goats and how they should be treated accordingly throughout the year (Gareth & De Wet, 2000).

Table 7.1: Proposed Basic Flock Health Program to be carried and supervised by the Veterinary Extension at a reduced/or subsidized price

Class	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*December*	*January*	*February*	*March*
Rams & Bucks 2yrs	Mating 1 April - 30 May		Ivomec. 1st June Remove rams/bucks. Vit A	BCS.		Resting BCS	Shearing sheep	1st wk BT A, 4th wk BT B. Dose	3RD WK BT, C Dose	BCS	Dose & dip. Breeding soundness evaluation & B.ovis test Multivax P Plus	Hoof trimming. BCS. Supplement if needed 2wks before mating.
Ewes & Does > 2yrs	Mating 1Ram/Buck: 40 ewes/ does	Mating		Scan, PD.& BCS 1ST wk Ivomec & Vit A		Lambing & kidding. Shearing.	Lambing & kidding. Shearing.	1st wk BT A, 4th wk BT B. Dose	3RD WK BT, C	Weigh ewes & Does	Dose & dip. Multivax P Plus. Weaning.	Hoof trimming. BCS. Selection for breeding. Flush feeding (250g maize/day-2wks). Culling/selling old ewes
Young ewes & does 1-2 yrs	Mating 1Ram/Buck: 40ewes/does	Mating		Scan & PD 2ND WK Ivomec & Vit A	Sell not pregnant ewes/does	Lambing & kidding	Lambing & kidding. Hoof trimming. BCS. Shearing	1st wk BT A, 4th wk BT B Dose.	3rd wk BT C, Selection and selling of the unwanted for breeding.	Weigh young ewes & does	Dose and dip. Multivax P Plus. Weaning.	BCS Hoof trimming. Selection for breeding. Flush feeding (250g maize/day-2wks). Culling/selling old ewes.
	18	19	20	21	22	23	24	13	14	15	16	17

Class	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*December*	*January*	*February*	*March*
Ewe lambs & Doe kids replacements 0-1 yr	Sell unwanted. Multivax Booster 6	Dose winter remedy for cold active roundworms 7	 8	Sell unwanted for breeding Ivomec. Vit A. Selection for breeding. 9	 10	 11	Shearing and dipping. Hoof trimming. BCS 12	Ear tag(ID) 1	Ear tag(ID) Weigh lambs/kids at birth 2	Dose wide spectrum for round and tapeworm 1st wk BT A, 4th wk B 3	3rd wk BT C. Weaning 4	Multivax P Plus Dose for round and tapeworm. Ivomec 5
Ram lambs/ buck kids	Selection for breeding and sell the unwanted. Multivax Booster 6	Sell all males 7	Check conditions 8	Check conditions Dosing for round and tape worms 9	Check body condition 10	Re-selection and selling 11	 12	Ear tag (ID) 1	Ear tag(ID) Weigh lamb/kid at birth 2	Dip and dose wide spectrum (Round). 1st wk BT A, 4nd wk B. Castrate 3	3rd wk BT C 4	Multivax P Plus, Ivomec 5
Supplements		Protein lick	Protein lick	Protein lick	Protein lick	Protein lick	Protein lick					

NB: 1-24 Average age of the lambs/kids in months (Gareth & De Wet, 2000)

April

1st of April is the start of the mating season. The Animal Health Technician (AHT) brings the tested rams/bucks to ewes/does.
The Extension Officer (EO) reminds the farmers about the visit of the AHT.
The farmers must sell all males because the AHT brings tested rams/bucks.
The AHT gives some lectures to the farmers on how to vaccinate (inject) Multivax P Plus Booster.
The farmers must check that rams/bucks work.

May

The farmers must dose their sheep and goats with a broad spectrum anthelmintic for round worms.
The farmers must sell all the remaining males.
AHT visits the farmers to inform them about:

- The ordering of Ivomec from head office to be used the following month for sheep scab control;
- 31 May is the end of the breeding season and the AHT removes the rams/bucks from the ewes/does and;
- The farmers must provide protein lick to all sheep and goats (100-150g/ewe/day).

June

The EO reminds the farmers that the AHT will visit them to assist them with the selection for breeding purposes on the 4th week of the month and also to assist to check the body condition of the animals.
The farmers must inject the Vitamin A to all animals.
The EO officer must arrange with the farmers the date for the pregnancy diagnosis (PD) and scanning for the following month to be done by AHT.

The farmers must provide a protein lick to all sheep and goats (100-150g/ewe/day).

July

The AHT assists the farmers with the PD to mated ewes/does and also check the body condition score (BCS) in the 1st week and adjusts the supplementation if necessary.
The farmers must dose for round worms and mites with an endectocide (i.e. Ivomec) and also provide a protein lick to all sheep and goats.

August

The AHT does the BCS of rams/bucks.
The farmers must sell all the unwanted sheep and goats for breeding purposes (i.e. non pregnant ewes/does).
The AHT assists the farmers to check the flock for BCS and adjusts the supplementation if necessary (150g/sheep/day).
The farmer must provide the protein lick to all sheep and goats.

September

The AHT does the BCS to rams/bucks
The farmers must check lambing/kidding process (regular visits to kraals even at night to assist those with difficult births).
The EO must inform farmers to arrange animals for shearing, BCS and dipping of the animals the following month.
The farmers must provide a protein lick (150g/ewe/day).

October

The farmers must shear all sheep, dip and hoof trim young ewes/young does and ewe lambs/doe kids.
The AHT assists the farmers to do the BCS of the flock.
The farmers must look at the lambing/kidding of the young ewes/does.
The EO informs farmers about the vaccination for Bluetongue (BT) and dosing that will be done the following month and all farmers must bring their animals as requested by AHT.
The AHT lectures the farmers about the vaccination for BT.
The AHT orders the BT vaccine to be used the following month from head office.

November

The AHT brings the BT vaccine to farmers and farmers must vaccinate for BT, 1st week A and 4th week B. The AHT monitors the process.
The farmers must do ear tag (ID) of the lambs/kids and check the numbers of the ewes/does.
The AHT arranges a date with the farmers to complete the BT (C) vaccination in the 3rd week of December.
The Extension officer reminds the farmers about December activities.
The AHT trains the farmers to weigh the animals so that they can do it themselves the following month.

December

The AHT monitors for BT C administration by farmers.
The farmers must cull and sell the unwanted rams/bucks for breeding.
The farmers must ear tag lambs/kids for identification (ID).
The farmers must weigh all lambs/kids born.

January

The AHT must assist the farmers with the BCS of the breeding rams/bucks and all ewes/does.
The ewes/does and young ewes/does must be weighed.
The farmers must dip and dose the young ewes/does and young rams/kids with a broad spectrum remedy for round and tape worm. They must also vaccinate the lambs against BT for A in the 1st week and B in the 4th week.
The farmers must castrate all young rams/bucks using a rubber castrator.
The AHT informs farmers about the following month activities.

February

The AHT must test rams/bucks for B.ovis and breeding soundness evaluation.
The farmers must dip and dose the breeding rams/bucks and breeding ewes/does with a broad spectrum round and tape worm remedy.
The farmers must apply the BT C in the 3rd week of the ewe lambs and doe kids.
The EO reminds the farmers about hoof trimming of the rams/bucks, ewe/does and young lambs/kids and the supplementation before mating and Multivax P plus injection for the following month to be done by the AHT.

March

1st week the farmers must hoof trim the rams/bucks before mating.
The AHT must do the BCS to rams/bucks and breeding ewes/does.
The farmers must inject the Multivax P Plus to ewe lambs/does kids and ram lamb/buck kids.
4th week all young lambs and kids receive a Multivax P Plus booster.
The farmers must inject Multivax P Plus to all animals except the unwanted for breeding purposes.

The farmers must dose or inject Ivomec for broad spectrum for round and tape worms.

The AHT informs the farmers about mating in April and May months and he/she brings tested rams/bucks for them, so there is no need for any ram/buck which is not tested.

ABSTRACT

A CHARACTERIZATION OF SHEEP AND GOATS PRODUCTION SYSTEMS AMONGST SMALL-SCALE FARMERS IN THE SOUTHERN FREE STATE PROVINCES

Molefi Petrus Kumalo
Supervisor: Dr. Luis Schwalbach
Co-Supervisor Prof. Carlu van der Westhuizen
Faculty of Health Sciences and Environment Sciences
Degree: Magister Technologies: Agriculture

This study was conducted (in two phases) using 56 small-scale farmers in Phillipolis, Trompsburg and the areas surrounding those towns in the Southern part of the Free State Province. The first part of this study characterized the sheep and goat production systems amongst the 56 small scale farmers in Phillipolis and Trompsburg via a questionnaire based survey that was conducted with the respondents. The survey was sought to collect information on socio-economic characteristics of farmers, land tenure holdings, sheep and goat production systems, and access to farming support services and infrastructure. Males dominated (65%) over females (35%) as heads of households. Family size varies between 2 to 17 persons.

Over 48% of the respondents are illiterate. Only one person has grade 12 and none obtained a tertiary qualification. Educational levels of respondents in these areas were found to be low, which is in line with many studies conducted elsewhere amongst similar groups of small-scale farmers. Land holding is communal and overstocking and overgrazing is a reality. The area was estimated to be overstocked by about 70%. Flock composition indicated a high number of matured nanny goats and ewes and replacement females, indicating the small-scale farmers' interest in increasing stock numbers. Regarding the main reasons for farming, traditional

reasons like the use of animals for rituals accounted for 53,6% and while own consumption was the reason for raising small stock 21,4% of the cases. Cash income from sheep and goat activities was generally very low, with most farmers earning most of their income from other sources. Over 70% operate at negative margins. Availability and access to farming support services such as extension and veterinary services is very low, and this expresses itself in the low managerial aptitude and low animal productivity in the area. Similarly, institutional and infrastructural facilities are mostly absent or unavailable to be utilised.

The most common diseases as identified by the respondents were sheep scab, bluetongue as well as internal and external parasites. These are important infectious and parasitic diseases from a health view point since they limit ovine and caprine production. Most small-scale farmers are still traditionally bound because they farm in a communal area and make little use of veterinary services or medicines. However, 58% of the farmers do undertake vaccination and control measures.

The second phase of the study consisted of a disease screening whereby 650 goats and 680 sheep were part of this survey. Ten percent of these animals were randomly selected (both sheep and goats) and were screened for the most important local diseases and samples were taken (faecal samples, blood samples and tick collection for identification). The results were subjected to a statical analysis. The survey showed that sheep scab is the most common disease in the area. The study also highlights constraints like availability markets, availability of veterinary services but without drugs to treat sick animals, private veterinarians have drugs but their drugs are very expensive. Participatory approaches are needed in addressing the problems and the needs of the small-scale sheep and goat farmers. This study reveals that mixed farming should be promoted since it is unlikely that they can make a living purely from sheep and goats farming only.

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ANNEXURE A: QUESTIONNAIRE

A characterization of sheep and goat and production systems amongst small scale farmers in the Southern Free State Province

QUESTIONNAIRE TO FARMERS

FARMER NAME:……..

FARM NAME:…….

NAME OF THE SETTLEMENT:……

TELEPHONE NUMBER:…….....

FAX NO:……

CONTACT PERSON:……..

1. Farmer's characteristics

1.1 Number of people in household □

1.2 Gender of people in the household. No. of males □ No. of females □

1.3 Age of the farmer……

1.4 Age and number of the children in the household? Choose below.

1-10		**10-20**		**20-30**		**30-40**		**40-50**		**50+**	

1.5 The household is headed by

Father □ **. Mother** □ **. Other** □

If other specify ……..

1.6 Marital status of the head of the household

Single □ Married □ Divorced □ Widow □ Widower □

1.7 What is the highest level of education of the farmer?

None	
Std 1- Std 2	
Std 3- Std 6	
Std 7- Std 9	
Std 10	
Tertiary	

1.8 The farmer can speak, read and write the following languages?

	Speak	**Read**	**Write**
English			
Tswana			
Afrikaans			
S.Sotho			
Other (specify)			

1.9 Arithmetic ability of the farmer.

	Adding	**Subtracting**	**Multiplying**	**Dividing**
None				
Little				
Average				
Good				

2. Knowledge – Farming Experience

2.1 How long have you been farming? □……years

2.2 Are you a full time (FT) or partial time farmer (PT)? FT □ PT □

2.3 How long have you been farming on your current farm? □

2.4 What other work do you do to help generate your income? Mark with an x below

2.4.1 None……..

2.4.2 Farm worker (employed for other farmers)…….

Industry worker…….
Mining worker……..
Business
Civil servant…….
Other specify……..

2.5 What is your total income (R's) per month? Mark with x

0-499	500-999	1000-1999	2000-2999	3000-3999	4000-4999	5000+

2.6 Which breeds of goats you farm with?

Indigenous □ Boar goats □ Saanen □ Angora □

Other specify_____

2.6.1 Which breeds of sheep you farm with?

Merino □ Damara □ Dorper □ Persian □

Other specify_____

2.6.2. Sheep flock

Young lambs < 6mths	
Weaned lambs 6mths-1yr	
Young ewes (1-2yrs)	
Rams over 2yrs	
Rams (1-2yrs)	
Old ewes > 2years	
Total	

2.6.3 Goats flock

Young kids < 6 months	
Weaned kids >6 months-1year	
Young female 1-2 years	
Young male 1-2 years	
Old doe >2years	
Old buck > 2years	
Total	

2.7 Do you have more sheep than last year?

Yes □ No □

2.8 Do you have more goats than last year?

Yes □ No □

2.9 Do you farm with these also?

Type of animals	Number of farmers in percentage (%)
Cattle	
Pigs	
Chickens	
Donkeys	
Horses	
Other specify	

3. Main reason/s for farming?

Own consumption □ Rituals □ Selling □

Lobola □ Other specify_____

4. Disease control

4.1 **Do your animals get sick?**

Yes □ No □

4.1.1 If yes, do you treat them?

Yes □ No □

4.1.2 With the help of whom?

No one □ Veterinarian □ Animal health technician □ Neighbors □

Commercial farmers □ Traditional healers □ Co-op salesman □

Other _____

4.2 Are you able to detect different kinds of diseases/symptoms that affect your sheep or goats?

Yes □ No □ Sometimes □ Do not know

4.3 What are common diseases in your sheep and goats? Choose from table below.

	Sheep	Goats	Rank
Sheepscab/Brandsiekte			
Abscesses			
Pneumonia			
Contagious Pustular Dermatitis Contagious Ectima (Orf)			
Lambing/Kidding sickness(downersheep/downergoat)			
Heart water			
Internal parasites			
External parasites			
Pulpy kidney			
Blue tongue			
Plant poisoning			
Foot rot			
Rectum prolapse			
Diarrhoea			
Brucela ovis			
Other specify			

4.4 Do you experience abortion in your sheep flock?

Yes □ No □

4.4.1 Do you experience abortion in your goats flock?

Yes □ No □

4.4. 2 If yes, at which period of pregnancy? Choose below.

	Goats	Sheep
1-2 months		
2-3 months		
3-5 months		
Other specify		
Other specify		

4.5 Do you undertake any external, internal disease control or vaccination programs?

Yes □ No □

4.5.1 If yes, indicate the type of remedy and number of times/year.

External Parasites e.g. ticks, fleas and mites

	Goats	**Sheep**
Conventional remedy type		
Traditional type		
No. of times/yrs		
When?		

Internal Parasites e.g. worms

	Goats	Sheep
Conventional remedy type		
Traditional type		
No. of times/yrs		
When?		

Vaccinations of sheep

Diseases vaccinated against	Name of vaccine used	No of times vaccinated/yr	When?
Blue tongue			
Pulpy kidney			
Tetanus			
Other specify			

Vaccinations of goats

Diseases vaccinated against	Name of vaccine used	No of times vaccinated/yr	When?
Blue tongue			
Pulpy kidney			
Other specify			

4.6 How many sheep died last year? _____

4.6.1 Reasons for death? Choose from the table below and mark with an x.

Sickness	
Hunger or starvation	
Killed by cars (accidents), thugs, etc	
Attacked by predators	
Stolen	
Other (specify)	

4.6.2 How many goats died last year? _____

4.6.3 Reasons for death? Choose from the table below and mark with an x. Sickness	
Hunger or starvation	
Killed by cars (accidents), thugs, etc	
Attacked by predators	
Stolen	
Other (specify)	

4.6.4 What do you do with dead animals?

Eat them □ Sell them □ Make biltong □ Bury □ Leave them on the veld □ Take them for postmortems at the vet.lab □

Other specify_____

4.7 Where do you buy your sheep and goats?

Inside your local area □ Outside your local area □

4.8 Do you ask for health and vaccination status when buying sheep and goats?

Yes □ No □

5. Breeding management

5.1 Do you make use of the breeding season?

Use breeding season □ Males run with female all year round □

5.2 If you use a breeding season, when do you breed?

Winter □ Summer □ Spring □ Autumn □

For how long_____ days

5.3 Do you recognize when your sheep/goats are in heat?

Yes □ No □

5.4 Do you know your lambing/kidding percentage?

Yes □ No □

5.4.1 If yes, how much? _____

5.5 Do your sheep/goats have lambing/kidding problems?

Yes □ No □

5.5.1 If yes, choose from below.

Large lambs/kids □ Small ewes/she-goats □ Wrong presentation □

Sick females □ Other (specify) _____

5.6 At what interval do your females lamb/kid?

Once a year □ Twice a year □ Every 18 months □

Every 2 years □ More than 2 years □

5.7 Do you weigh the new born lambs/kids?

Yes □ No □

5.8 Do you wean or separation is natural?

I wean □ Natural separation □

5.9 When do you wean?

Soon after birth □ 2-4 months old □

5-7 months □ > 7 months □

5.10 If you wean, how?

Separate □ Nose ring □ Other specify_____

5.11 Do you have any form of insurance against theft, loss of income etc?

Yes □ No □

5.12 What type of rams do you use for breeding?

Stud registered bred ram	
Own bred ram	
Borrow from neighbors	
Any ram available	
Artificial insemination	
Other (specify)	

5.13 How do you identify your animals?

Ear tags □ Tattoos □ Other (specify) _____

Give names □ Color □

5.14 Are your animals sheltered at night and winter?

Yes □ No □

5.14.1 If yes, what type of shelter do you provide?

Roofless kraal □ Roofed kraal □ Open yard with trees □

On the veld □ Other specify_____

6. Sources of information

6.1 What form of source/s of information do you make use for your day to day decisions on the farm?

Animal health technicians	
Extension officers	
Co-farmers (neighbors)	
Radio and television	
Co-operative Manager	
Extension Publications	
News Letters, Periodicals	
Veterinarian	
Own Records	
Other	

7. Marketing / Sales

7.1 How much did you get from the sales of sheep/goats last year?

Sheep		Goat	
Item	**Total**	**Item**	**Total**
Weaners		Weaners	
Ewes		Does	
Rams		Rams	
Meat		Meat	
Other (specify)		Other (specify)	

7.2 Through which marketing system/s do you market your livestock?

	Sheep	**Goats**
Auction /Public sale		
Private sale		
Middlemen		
Cooperatives		
Butchery		
Open market in town		
Local livestock traders		
Other (specify)		

7.3 Indicate the products that you usually offer for sale?

Live animals □ Meaṭ □ Dung □ Wool □ Skins □

Other (specify)_____

7.4 For what reason/s do you sell the products indicated above?

Routine sale for cash □ Pay school/hospital fees □

For funeral expenses □ In bad agricultural years (Drought) □

Other (specify) _____

8. Feeding management

8.1 Which type of land do you use for grazing?

Communal grazing □ Farm owned by a group of farmers □

Your own farm □ Other specify_____

8.2 Which type of land system do you prefer?

Communal grazing □ Farm owned by a group of farmers □

Your own farm □

8.3 **Where do the animals graze?**

Both pastures and veld □ Only on veld □ Only on Pastures □

8.4 What is the size of your grazing land? _____Ha

8.5 In your view what is the present status of the veld as compared to when you started grazing your animals?

Worse □ Better □ Same □ Other (specify) _____

8.6 How many sheep/goats can you graze on the veld?

5 sheep/goats/ha □ 2 sheep/goats/ha □ 1sheep/ 1goat/ha □

2 sheep/2goats/ha □ 4 sheep/goats/ha □

8.7 What measures do you undertake to ensure adequate feed supply during winter and period of feed shortage?

Store fodder □ Buy Fodder □ Borrow from neighbors □

Sell some animals □ I do nothing □ Graze on land □

8.8 Do your animals graze on the same veld throughout the year or you move them?

Graze same veld □ Move once □ Move twice □

More than twice □

8.9 Based on what, do you move them?

Veld status □ Time to move them □ Season □

No more feed □ Other specify_____

8.10 Do you supplement your animals with feed?

Yes □ No □

8.10.1 If yes, when? Winter □ Summer □ All year □

With what? Salt □ Rumevite □ Maize □ Hay □

Bone meal □ Other specify_____

8.11 Are there any sings of soil erosions on your (grazing) land?

Yes □ No □

8.11.1 If yes, how severe is the erosion?

Very bad □ bad □ Moderate □

8.12 What do you think are/is the cause/s of the erosion?

Too many animals □ Stormy rains □ Wind □ Fire □

Bad cropping practices □

9. Record keeping

9.1 Do you keep records on your animals?

Yes □ No □

9.2 What kind of records do you keep?

Production records i.e. births, wt of lambs/kids.	
Financial records i.e. input purchase, income from sales	
Health records i.e. diseases, treatment	
Sales records	
Other (Specify)	

10. Major constraints in small stock farming that contribute to flock ill-health? Mark with an x and rank them accordingly.

	Rank
Veld	
High mortality rate	
Health care	
Veld fire	
Low fertility	
Training	
Money	
Slow growth rate	
Unavailability of drugs for treatment from veterinary services	
Private veterinarians are too expensive	
Handling facilities and dip tanks are not available	
Diseases	
Other specify	

11. Areas of improvement

Do you think you need technical help or any other assistance to do better than you are currently doing or you are convinced that you are on track to become a successful commercial livestock farmer?

Type of help needed	Yes	No
Training		
Technical advice		
Financial i.e., credits		
Marketing of products		
Genetics of animals		
Other (specify)		