Determining the feasibility of a steers-and-oxen-beef production system in South Africa

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Signed by: Johannes Jurgens Minnaar

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Colossians 3:23-24

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ABSTRACT

Barely a day goes by without reference being made to the disadvantageous circumstances that the South African farmer has to overcome. Marginal soils, climate challenges, uncertain political conditions, cost pressure from low commodity prices and high input costs are just a few of the daily obstacles that the South African beef producer has to overcome every day to survive. Luckily for the South African consumer, the South African farmer is resilient and innovative. Tough economic conditions usually kindle an awareness of cash flow and becoming more efficient in handling household or farm expenses.

Most beef producers in South Africa are price takers. They farm in marginal conditions and have no way of mitigating the effect of the highly volatile weaner prices and the constant rise of input costs. Most input costs are derived from international dollar-based commodity prices but meat prices are determined locally by supply and demand. The prices are also artificially manipulated to a large extent by members higher up in the value chain and other market makers.

This causes a lot of medium as well as small and large-sized agricultural enterprises to go bankrupt because environmental conditions prevent capacity increases. The drought of the past few years forced more farmers to reduce their cow herds rather than increase them, and poor cash flow prevents expansion or supplementation to improve efficiency. Thus, a viable solution must be formulated to maintain food and job security in South Africa.

The study made use of cash-flow models and financial analysis indicators, including net present value, internal rate of return, return on investment, annualised return on investment and simple payback period. These were used to compare the feasibility, profitability and cash flow of the different production systems with one another in different scenarios, which simulated the main production areas of South Africa.

The study concluded that commercial farmers can be more profitable by using ox production systems in more marginal areas than, cow-calf production systems. Farmers can also use the ox production system to mitigate the effects of droughts and other black swan events within the beef production sector or industry.

Keywords: beef production, feasibility study, beef production systems, net present value, internal rate of return, return on investment, annualised return on investment, simple payback period

OPSOMMING

Elke dag is dit meer en meer sigbaar hoe marginal die kondisies is wat die Suid Afrikaanse vleis produsent daagliks moet oorkom. Marginale gronde, klimaat, onstabiele politieke beleide, en geweldige koste knyptange: met lae kommoditeits pryse en hoe inset kostes. Die is maar slegs ‘n paar van die uitdagings wat die Suid Afrikaanse produsent elke dag moet oorkom. Gelukkig vir die Suid Afrikaanse verbruiker is die Suid Afrikaanse boere wêreld-wyd bekend vir hulle deursettings vermoe as te wel hulle innovasie en vermoëns om eerste aannemers van tegnologie te wees. Dit is algemeen bekend dat moeilike omstandighede en ongunstige ekonomiese tye gewoonlik die katalisators is van innoverende en spaarsamige denke.

Meeste vleis produsente in Suid Afrika is prys nemers, hulle boer in uiters marginale omstandighede en het geen manier om hulle-self te verskans teen wisselvallige speenkalf pryse, die konstante verhoging in inset kostes en droogtes nie. Meeste inset kostes word ongelukkig gebasseer op internasionale dollar pryse, maar die vleisprys word gemanipuleer deur plaaslike vraag en aanbod, asook groot komersiële voerkrale, dus verloor die boer albei kante toe. Dit veroorsaak baie kleiner komersiële boere om bankkrot te gaan en selfs groter boere sukkel om volhoubaar uit te brei en voor inflasie te bly. Dus het die die behoefte ontstaan vir ‘n lang termyn volhoubare oplossing om die boer op die plaas te hou, die platteland bevolk te hou en voedsel en werk sekuriteit te verseker binne Suid Afrika.

Die Studie het gebruik gemaak van kontant-vloei modelle en finansiële analieses soos netto huidige waarde, interne opbrengskoers,obrengs op belleging, jaarlikse opbrengs op belleging en eenvoudige terugbetalings periodes om die lewensvatbaarheid, winsgewendheid en kontant vloei van die verskillende produksie stelsels met mekaar onder verkillende produksie omstandighede te vergelyk. Die studie het tot die konklusie gekom dat kommersiële boer meer winsgewend onder marginale omstandighede kan boer deur gebruik te maak van ‘n os produksie stelsel as ‘n koei-kalf produksie stelsel. Boere kan ook die os stelsel gebruik om hulle-slef teen droogtes en ander snaakse prys wisselvalighede in die mark te verskans.

Sleutelwoorde: bees-vleis produksie, lewensvatbaarheid studie, v leisproduksie stelsels, finansiële instrumente, Obrengs op beleging, Netto Huidige Waardes, Interne Opbrengskoers, Terugbetalings Periodes.

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CHAPTER 1

INTRODUCTION

1.1 Background to the study

Barely a day goes by without reference being made to the disadvantageous circumstances that the South African farmer has to overcome. Marginal soils, climate challenges, uncertain political conditions, cost pressure from low commodity prices and high input costs are just a few of the daily obstacles that the South African beef producer has to overcome every day to survive. Luckily for the South African consumer, the South African farmer is resilient and innovative. According to Lamb and Maddock (2009, cited in Foster, Fourie & Neser, (2014:31), tough economic conditions usually kindle an awareness of cash flow and becoming more efficient in managing household or farm expenses.

Farmers are constantly looking for ways to increase the production and/or profitability of their extensive livestock enterprises, often focusing on production measures and means to increase production, as production is the profit equation component directly affecting income from the enterprise. But production has a major limiting factor in available area and roughage as well as the direct link between available fodder and rainfall. Farmers thus need to focus on cost management. Another major factor in the profit equation is efficiency because it is generally accepted that an efficient farm is a profitable farm.

According to Ramsey *et al.* (2005) and Lishman *et al.* (1984, cited in Foster *et al.,* 014:31), the most important factor in the long-term sustainability of the cow-calf enterprise is profitability. Reproduction rates in sheep and cattle reflect the level of management to which animals are exposed. There are direct correlations between animal efficacy and management involvement. Unfortunately, intensive farming models come at a price. Higher production rates at the cost of higher input costs do not necessarily mean larger bottom line profit. Therefore break-even analyses are crucial for determining, the long-term sustainability of a more intensive, high-production operation model. The major component of this management is believed to be the condition score of the animals, and this is directly linked to the feed and supplementation that the animals receive.

According to Herd *et al.* (2003), Van der Westhuizen *et al.* (2004) and Lamb and Maddock (2009, cited in Foster *et al.,* 2014:32), the provision of feed to animals is the single largest cost input in most animal production systems. The more intensive and technologically advanced production systems, such as those producing pig and poultry, have recognized this phenomenon a long time ago. More than half of the total costs related to beef cattle production are feed-related costs not including interest and payments on capital to buy agricultural land. According to Herd *et al.* (2003, cited in Foster *et al.,* 2014:32), the cost of providing feed to extensive grazing cattle is more complex to quantify, but it remains the major input cost. However, information on how to improve the production of an extensive weaning-calf production system under South African ranching conditions is readily available. It is generally achieved by primarily increasing the reproduction rate through an increased calving percentage and by increasing the average weaning weight of the calves. Feeding conditions not only influence the calving rate but also have a direct effect on the profitability of the weaning-calf production system (Foster *et al.*, 2014:33).

Information on lick supplementation for cattle ranching in South Africa is also widely available. There is, however, limited information available on the costs of providing these lick supplementations and their effect on the long-term production, profitability and sustainability of the entire farming enterprise. An archaic but possibly more holistic approach to overcome these challenges without drastically increasing the input costs or over-utilising the natural resources of a typical extensive South African farm may be the use of a steer and ox production system. Therefore the research looked into the profitability and cash flow of these two production systems in various created scenarios as well as the operational benefits and disadvantages of each system.

1.2 Problem statement and core research question

1.2.1 Problem statement

The problem that the study aimed to address is that most beef producers in South Africa are price takers. They farm in marginal conditions, and they have no way of mitigating the effect of highly volatile weaner prices and the constant rise of input costs. Most input costs are derived from international dollar-based commodity prices. Local meat prices are determined by supply and demand. Prices are also artificially manipulated to a large extent by members higher up in the value chain and other market makers. The result is that South Africa is losing small- and medium-scale producers at an alarming rate.

To keep farmers sustainable over the long run and maintain food security, a viable solution must be formulated to give them more bargaining power higher up in the value chain and reduce volatile prices.

1.2.2 Core research question

What beef production system is the most viable and long-term sustainable option for different production areas throughout South Africa?

1.3 Research objectives

- Conduct a detailed literature review to gain a better understanding of the South African beef production industry, the different production systems and the appropriate tools to do a comprehensive feasibility study
- Create different realistic scenarios to simulate most of the commercial beef production areas in South Africa
- Compare the feasibility, profitability and cash flow of the different production systems with one another in the different scenarios
- Compare the operational strengths and weaknesses of each production system with one another
- Formulate a long-term sustainable system for each scenario

1.4 Importance and benefits of the study

The South African commercial beef producer farms in some of the toughest and most marginal environmental, climatic and socio-political conditions worldwide. However, South Africa is still a net exporter of red meat thanks to the ingenuity of our commercial farmers (Maré, 2020; Farmer's Weekly, 2021). Unfortunately, medium-size and family-operated farming enterprises are under severe pressure. Although the numbers of these enterprises reduce every year, they are an integral and important contributor to food and job security nationally, especially in the rural communities of South Africa. The main reason for the decrease in the numbers of small to medium commercial farmers might be the economics of scale. However, highly volatile and cyclic weaner prices also have a major effect on their sustainability.

The price is artificially manipulated by large feedlots, abattoirs and wholesale meat distributors and influenced dramatically by the import of large quantities of low-quality meat, especially chicken from other net-exporting countries, such as Brazil and the United States of America (Berkhout, 2019). This leads to medium-size farmers becoming price takers to a large extent because they do not have the capacity to hold onto weaner calves, round them off and take them to market. This is due to a cash flow that is under pressure as well as their limited fodder and roughage on the farm. The archaic steer and ox production system may be a solution to this problem if modified correctly to fit into a 21st-century production environment. Not only does a steer and ox production system help farmers to add value and enter the value chain but it also gives them the option to hold on to their steers and add weight while waiting for better prices.

Steers and oxen also have the ability to utilise marginal areas of a farm better than cows with calves. It is also easier to sell steers and oxen of different age groups if there is a drought, which mitigates the environmental risks facing the farmer. With new technology and better feed supplementation, the turnover period of oxen can also probably be radically reduced from greater than 24 months to less than 18 months, which will address the cash-flow problems associated with the production system in the middle and late 20th century as the commercial feedlot becomes more common (Meat Promotion Wales, 2014:5). If it can be determined that a steer and ox production system can be a viable option to mitigate these risks, a lot of medium-sized enterprises can be saved.

On paper, there are multiple advantages to such a system. The first and foremost is the value that the farmer adds to his product. The second is the integration of the value chain in the enterprise’s business model, which automatically mitigates the effect of the volatile weaner market on the business. The third advantage is the liquidity of oxen. Oxen can be sold at any stage, whereas the feedlots prefer weaner calves between 220-240kg and penalises the producer if they exceed this weight. This makes it very easy to sell off excess oxen when a drought is approaching or, alternatively, to keep more oxen if resources allow it. The last advantage is the lower mortality of oxen and their ability to better utilise marginal areas of a farm. This can increase the kilogrammes of red meat that a farm can produce and therefore increase profitability. These benefits have to be weighed up against the short-term cash-flow implications of an ox production system and other feasibility implications to establish whether or not it is a viable diversification option (Scheepers, 2020; Le Roux, 2020).

1.5 Delimitations

Several studies have been done on the technical and scientific differences between and benefits of different production systems within the South African beef production sector. However, the current study focussed on the economic and financial differences between the systems. Although communal and emerging sectors account for up to 40% of the total livestock production in South Africa, the study focussed on the commercial markets.

The South African beef-grading system is relatively simple. Premiums for quality meat are not openly available for the commercial farmer, and these niche markets have to be developed by farmers themselves who want to exploit them. Thus, this study did not include premium beef, such as Certified Angus Beef ® or free-ranging brands, which would have been a feasibility study on its own if time had allowed the study to move in that direction.

1.6 Assumptions

Because the study was scenario-based there were a lot of assumptions that had to be made. Three main scenarios were created that represented the largest parts of South Africa. These three scenarios were high-potential, medium-potential and low-potential or marginal areas. The empirical values of the assumptions are displayed in Table 2.1 below. The assumptions were derived from data presented in the Census of Commercial Agriculture 2017 report (StatsSA, 2017).

The first assumption was that the average South African farm size is smaller in high-potential regions of the country than it is in more marginal regions. Thus, the farm size increases from the high-potential to the marginal scenario. The second assumption involved the carrying capacity of the area and was that high-potential beef-producing areas require fewer hectares per large stock unit than marginal areas do. Thus, the number of hectares required for each large stock unit increases from high-potential to low-potential areas. The third assumption involved developing a factor. Shifting from high potential areas to more marginal areas, the individual farm's typical marginal areas is assumed to increase as well. These marginal areas include ridges and bushy areas as well as larger camps with less developed infrastructure. Overall marginal areas could be better utilised by oxen than by cows with calves. Thus, in the study, a factor was developed to take this into account.

For the above-mentioned reasons, ox production systems may be a viable option in the marginal west of South Africa but not in the high-potential east of the country. For the study's sake, a standard wean rate was used throughout all three scenarios. However, the variable costs differed from scenario to scenario. Although maintenance and animal supplementation/feeding costs for all three scenarios were standardised, the oxen were assigned a reduced cost because their nutritional requirements were lower than those of lactating cows. Veterinary costs would increase from marginal areas to high potential areas because parasite loads would also increase with rainfall. Thus, more precautionary vaccinations and dosages were necessary. Wean weight would increase from marginal areas to high potential areas because grazing quality would increase and thus wean weight would also increase. The meat price, weaner price and slaughter weight were all standardised. Table 1.1 below summarises the assumptions made in the study.

Table 1.1: Summary of the assumptions of the study

	High Potential	Medium Potential	Low Potential
Farm Size (Hectares)	• 500	• 1000	• 2000
Carrying Capacity (Ha/LSU)	• 4	• 8	• 15
Cow-Ox Factor	• 1:1.1	• 1:1.2	• 1:1.5
Wean Rate	• 85%	• 85%	• 85%
Maintenance	• R50.00 p/ha/year	• R50.00 p/ha/year	• R50.00 p/ha/year
Feed & Lick Supplementation (Cow & Calves) (BFAP,	• R850.00p/LSU/year	• R850.00p/LSU/year	• R850.00p/LSU/year

2021:72);(NAMC, 2021); (KZNDARD: 2019b)			
Feed & Lick Supplementation (Ox) (BFAP, 2021:72); (NAMC, 2021); (KZNDARD: 2019b)	• R500.00p/LSU/year	• R500.00p/LSU/year	• R500.00p/LSU/year
Veterinary Costs	• R250.00p/LSU/year	• R150.00p/LSU/year	• R100.00p/LSU/year
Meat Price (Weaner calve) (AMT, 2021:2)	• R41.14/kg	• R41.14/kg	• R41.14/kg
	• R52.63/kg	• R52.63 p/kg	• R52.63 p/kg
Wean Weight	• 280kg	• 250kg	• 220kg
Slaughter Weight	• 300kg	• 300kg	• 300kg

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

This chapter will include a detailed explanation of the theoretical literature relevant to the study. The chapter will closely examine the South African beef industry; the different production systems used on South African farms; the beef value chain in South Africa;

and the dynamics of the different market segments. The financial tools that were used to analyse the different production systems will also be explained and discussed.

2.2 The South African beef industry

Meissner, Scholtz and Palmer (2013, cited in Saki, 2020:8) maintain that cattle is the largest livestock component of the agricultural sector in South Africa, which consisted of 13.8 million cattle according to their study. Livestock products contribute 27% of the consumer food basket on a weight basis. South Africa being a developing country typically consumes more low-cost plant-based commodities than livestock products. Nevertheless, animal production contributes approximately 48% to the agricultural production gross value of R317.6 billion, and cattle, in particular, contribute R50.8 Billion (StatsSa, 2021).

Given the natural resource base of the country, livestock production is one of the most important farming practices in South Africa. In total, South Africa has a surface area of 122.5 million hectares, of which 103 million hectares are available for farming, with only 11% suitable for crop production from cultivated land (RMRD SA, 2020). According to data from the Department of Agriculture in South Africa, livestock production is the only economically feasible agricultural activity in a large part of the country, while approximately 80% of the South African agricultural land is only suitable for extensive grazing (DAFF, 2016:65). In the past, beef cattle production in the country was used to fulfil multiple functions, and the provision of beef was only a secondary or even tertiary function (Van Marle, 1974:297). However, the application of cattle for production has changed to such an extent over time that the primary role of beef cattle currently in South Africa is to produce beef.

Since the liberalisation and deregulation of the South African agricultural markets during the early 90s, the South African red meat industry has been contending in a global market with countries that have ever-changing and innovative consumer-driven red meat industries. These industries are constantly growing their productivity at every level of the production cycle and the value chain. Better genetics has enhanced herd performance and productivity, while better pre- and post-slaughter activities have upgraded the quality of the end product (Spies, 2011:195). Internationally rising production costs, volatile feed grain prices, intermittent drought, livestock disease and increasingly stringent food safety legislation are pressuring global beef farming supply and profitability (BFAP, 2015:54).

This may cause international beef prices to remain buoyant. In addition, South Africa's beef industry is constantly affected by external factors, such as the fluid and unpredictable national political milieu; the recent labour unrest in agriculture, mining and transport sectors; decreases in local and foreign investment; stock theft; the uncertainty of the country's land reform programme; the pressure of significantly higher minimum wages; and, most recently, the coronavirus. Nonetheless, the South African beef industry is ideally positioned to take advantage of Africa's increasing middle-class expenditure and projected population growth from one billion to two billion people by 2050, including their associated demand for red meat (De Jong & Phillips, 2013:30). Livestock is produced throughout South Africa, with species, breeds and numbers varying according to the environment, type of grazing and production system (Meissner *et al.*, 2013:282).

Competition for the beef industry will come mainly from the predicted 47% growth in average annual chicken consumption by 2022 (BFAP, 2015:60). However, the Bureau for Food and Agricultural Policy estimates that South Africa's current annual average beef consumption of about 700 000 tons is likely to increase by 25% by 2020. The total number of cattle, including dairy cattle and beef cattle in South Africa, has remained stable and moved from 13 million cattle in 1995 to 13.7 million in 2015 (DAFF, 2016:66). South African beef cattle producers are unique due to the dualistic nature of the country's agricultural situation. There is a clear distinction between the highly sophisticated commercial (formal) sector of the industry that relies on new technology and the smallholder (largely informal) sector that relies mostly on indigenous knowledge. The informal sector can also further be divided into two sub-sectors, namely the small-scale subsistence producers and the communal producers (Spies, 2011:196). These three major groups of beef cattle farmers that co-exist in South Africa can be further defined as follows:

- Commercial beef producers whose production is relatively high, comparable to that of developed countries and generally based on synthetic breeds and/or crossbreeding, using Indicus/Sanga types and their crosses as dams
- Emerging beef cattle farmers who own or lease land and whose cattle generally consist of an indigenous crossbred or exotic type of animal.

- Communal beef cattle farmers who use communal grazing land and whose cattle are mostly of indigenous types.

Approximately 60% of cattle in South Africa are owned by commercial farmers and 40% by emerging and communal farmers (Meissner *et al.*, 2013:282).

2.3 Production

Total cattle numbers have been above seven million since 1970, and they had increased at variable rates to 13.6 million by 2014 (DAFF, 2015). A decrease in population was seen in some years, as shown in Figure 2.1 below. In Figure 2.2 below, the cattle population is distributed throughout the country. The Eastern Cape contains the largest share of the total population with 24%, followed by KwaZulu Natal with 20%, the Free State with 16%, North West with 12%, Mpumalanga with 10%, Limpopo with 8%, the Western Cape and Northern Cape with 4% each and Gauteng with 2% (DAFF, 2014).

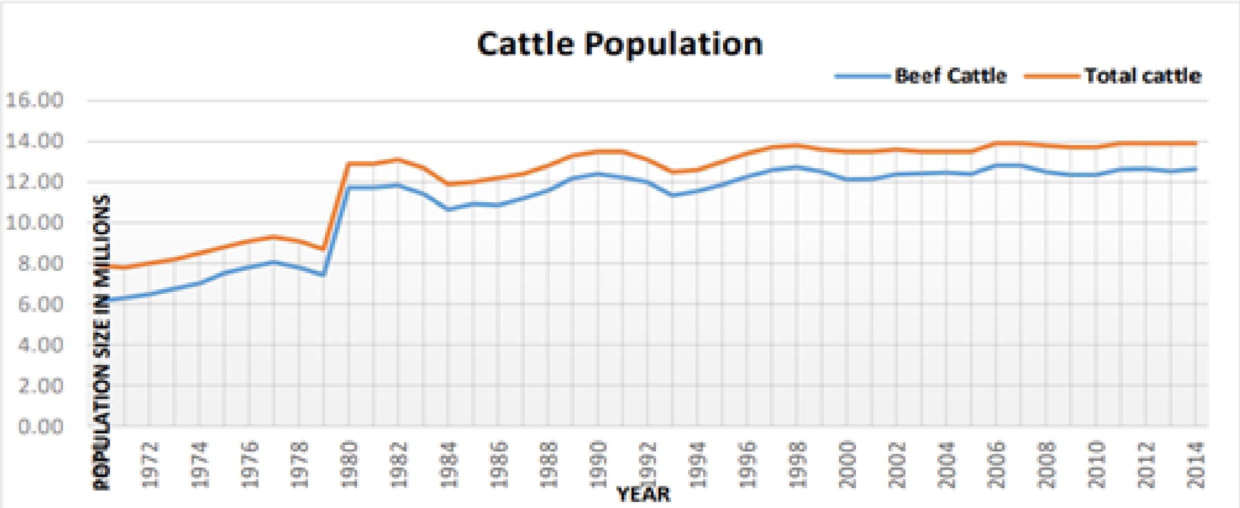

Figure 2.1: Simplified graph indicating the growth of the total cattle population compared to the beef cattle population in South Africa from 1970 to 2014

Source: DAFF (2015)

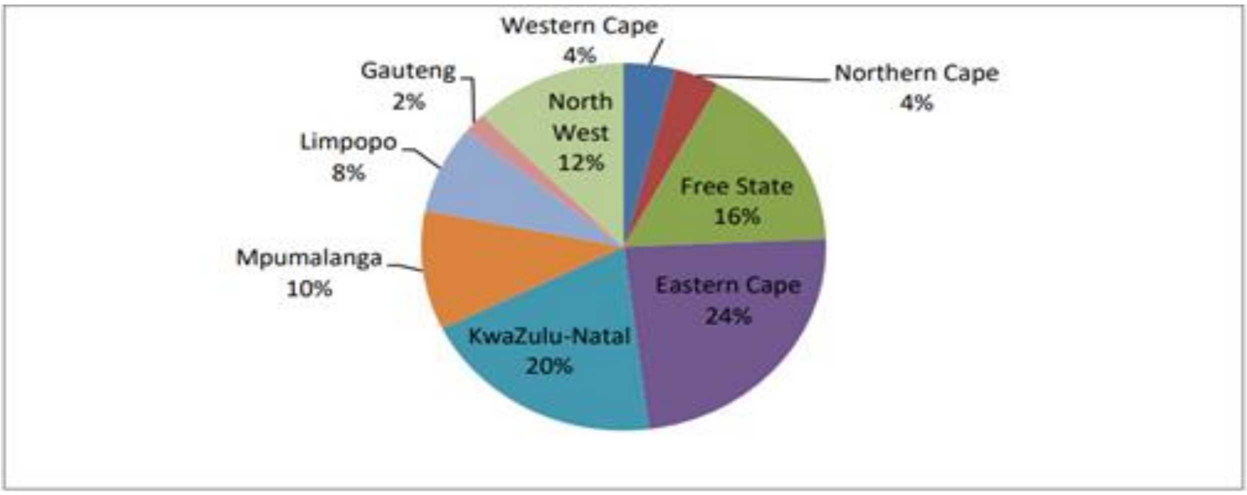

Figure 2.2: Distribution of cattle throughout the different provinces of South Africa

Source: DAFF (2014)

2.4 Value chain

The South African beef value chain comprises sequences and interdependencies of the following segments: primary producers; agents; feedlots; abattoirs; meat processing; skins and hides dealers; logistics; and the retail sector. Figures 2.3 and 2.4 figures below provide an overview of the South African beef value chain and how the different segments fit into one another as well as the parallel but dualistic nature of the formal and informal sectors of the beef value chain.

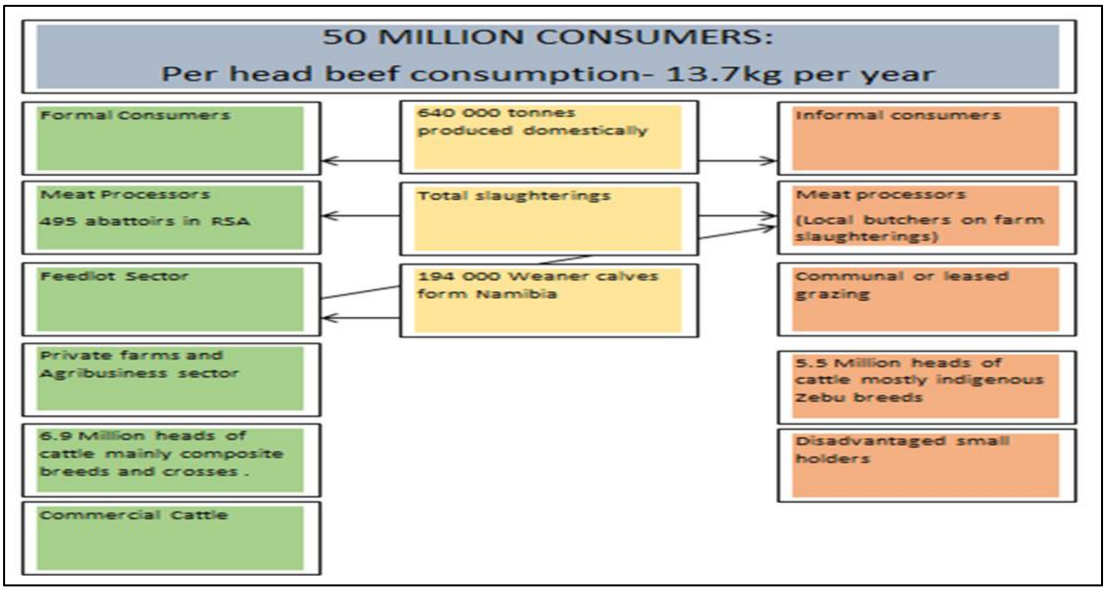

Figure 2.3: Dualistic nature of the beef value chain in South Africa

Source: IDC (2018:5)

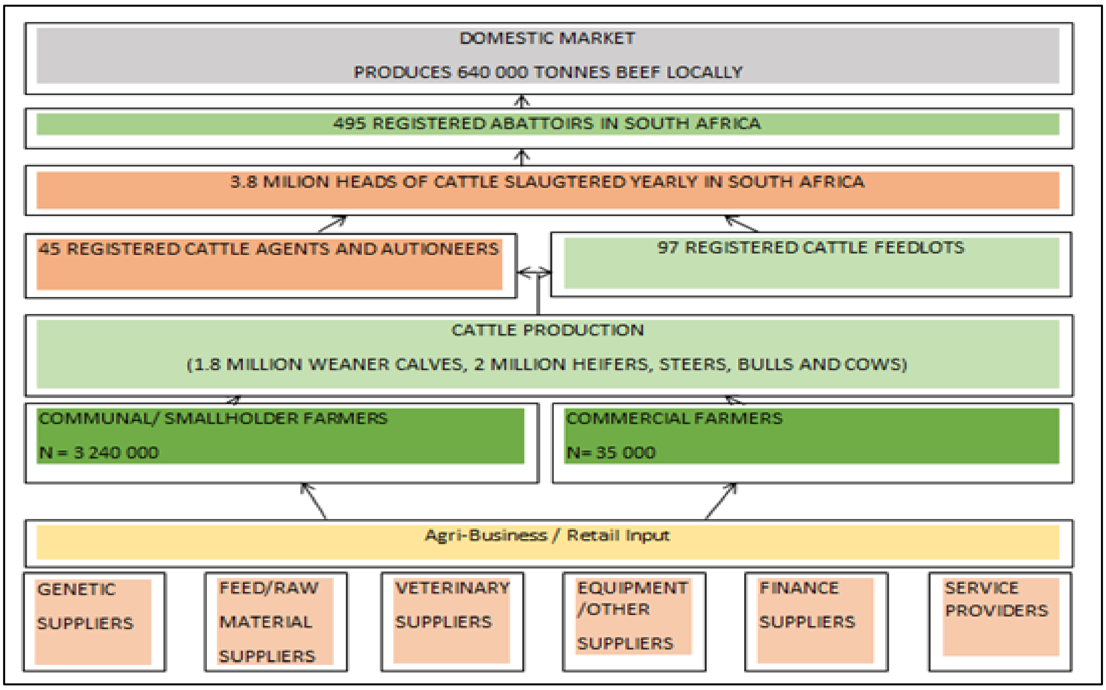

Figure 2.4: Value chain players in the beef value chain

Source: IDC (2018:5)

2.5 Beef production systems

In South Africa, the commercial livestock sector comprises approximately 35,000 farmers of which 2,500 are stud or commercial replacement heifer and grade bull producers. The informal sector includes 240,000 emerging farmers, of which 87,000 have the ability or potential to join the commercial sector. In addition to this, there are approximately 3 million subsistence farmers. Beef production systems are classified according to the age at which animals emanating from a production unit are sold. The production unit could be a farm or one of the enterprises in a larger undertaking. A full description of a system includes the age, mass and carcass class at which animals are marketed, as well as the breeding, management and feeding practices followed (KZNDARD, 2019a:1; MeatCo Namibia, 2020; Rutherford, Lively & Arnott, 2021:2). The most common beef production systems in South Africa include weaner production, steer production ("tollie", or yearling ox and ox) and cow/calf speculative systems (Maree & Casey 1993:90). As a general rule of thumb, in weaner systems, the cowherd consists of approximately 60% of the total animal units and in a steer system, including yearling ox and ox (older than yearling ox) systems, the cowherd comprises approximately 40% to 50% of the animal units, respectively (Grobelaar, 2016:1).

2.5.1 Weaner calf production system

A weaner production system or otherwise known as a cow/calf production system is, as the name indicates, the production of weaner calves. In theory, the cow to calf ratio would be 1:1 resulting in the cow herd consisting of half of the total animal units and the calves the other half. However, replacement heifers and dry cows have to be taken into consideration thus resulting in the 60% ratio mentioned above. In a weaner production system, calves are taken to market at 7 months of age and approximately 250kg. They are directly weaned from their mothers to the commercial feedlots. An efficient cow weans a calf of half her body weight at 7 months of age and receives different supplement feeding, as the nutritional value of the field changes throughout the year (KZNDARD, 2019b:1; MeatCo Namibia, 2020; Rutherford et al, 2021:2).

2.5.2 Ox production system

In ox production systems the calves are weaned from their mothers to separate camps/paddocks. Here the calves, whether male or female, (although preferably male), are grown out on natural veld with the aid of some supplementary feed if required. The oxen are then taken directly to the abattoir from the farm when they have a carcass weight of approximately 300kg and a live weight of approximately 500kg. Some ox farmers take their oxen to above and beyond a 1000kg live weight (KZNDARD, 2019a:1; MeatCo Namibia, 2020; Rutherford *et al*, 2021:2).

2.5.3 Speculative production system

As the name implies, speculative production systems buy cows or calves from other producers and try to sell them at a later stage to either commercial feedlots or directly to the abattoir depending on the carcass weight. The advantage of a speculative system is a quick and high turnover. The disadvantage is the low margins within the system (KZNDARD, 2019a:1; MeatCo Namibia, 2020; Rutherford *et al*, 2021:2).

2.6 Financial analysis tools

2.6.1 Cash-flow statements

Cash-flow statements are perhaps the most widely used tool in financial planning. As a non-optimising method, they evaluate plans in physical and financial terms. According to Rehman & Dorward (1984, cited in Hoffmann, 2010:32), there are numerous reasons for the popularity of budgets and cash-flow statements. Most of them stem from their simplicity of use and the fact that they aid in the empirical approach to decision-making, rather than imposing an analytical framework on the decision-maker. Cash-flow statements are often used as comparable quantitative techniques, and they play an important role in benchmarking. In recent years, the advancement of computer technology has introduced a dimension to budgeting methods that allowes cash-flow statements to be used as dynamic planning and decision-making tools in business and especially in agriculture. According to Pannell (1996, cited in Hoffmann, 2010:32) budgets and cash-flow statements can now also be classified as simulation models that are based on accounting principles and methods, rather than purely on mathematics. Dorward *et al.* (1997, cited in Hoffmann, 02010:32) suggest that alongside other holistic methods, budgets and cash-flow statements can be useful tools in assessing needs, aiding planning and undertaking participatory research and decision-making.

Agricultural economics accepted and developed budgeting as a tool from the inception of the discipline. According to Malcolm (1990, cited in Hoffmann, 2010:32), standard accounting methods were employed to generate comparable information for analyses and to serve as benchmark information during the inception years. Malcolm (1990) also states that throughout the development of other sophisticated quantitative methods in farm management, common budgeting approaches have been present and continually used.

Cash-flow models are normally developed using spreadsheet programmes (Hoffmann, 2010:33). Within spreadsheet programmes, complex and sophisticated calculations and relationships can be expressed in a relatively simple way. In essence, farm cash-flow models are simple simulation models. The sophistication of cash-flow models lies in their ability to allow for detail, adaptability and user-friendliness.

According to Dillon and Hardaker (1984:70, cited in Hofmann, 2010:34), agricultural budgets are drawn up to show anticipated consequences in terms of selected criteria, proposed farm plans, parameters and policy options. The most useful ability of budgets is their ability to incorporate physical as well as financial parameters and produce profitability criteria, such as net farm income or cash flow. Budgeting quantifies and subtracts overhead and fixed costs to return a net income value. Net income is commonly used for a financial comparison of different units within the farming enterprise. With some adaptation, budgeting models may also be extended over time to calculate returns on capital invested and to calculate profitability indicators, such as the internal rate of return (IRR) or net present value (NPV).

2.6.2 Net present value

According to Truong *et al.* (2007, cited in De Wet, 2018:48), the NPV method is the meat of most capital budgeting textbooks and lies at the core of what financial academics think they have to offer chief financial officers; corporate and investment bankers; and practitioners of all stripes. Moreover, as stated above, the importance of the NPV method can never be underestimated in the world of finance and is regarded amongst the top three capital budgeting techniques.

The definition of NPV is the difference between the present value of cash inflows and the present cash outflows (Kenton, 2020). If the NPV of the investment is positive, the earnings generated by the investment or project will surpass the predicted costs, and it can be regarded as a profitable investment option. Investment options with a negative NPV will indicate the probability of a net loss and that the project will not be financially viable.

Throughout the literature, it was seen that the benefits involved in the study needed to be accurately measured and applied to the capital budgeting techniques. According to Gordon and Loeb (2006, cited in De Wet, 2018:49), precisely how the benefits will be measured will be a key ingredient to utilise the NPV method fully. The NPV can be calculated using the following formula (Kenton, 2020):

$$NPV = -Co + \sum_{i=1}^{T} \frac{Ci}{(1+r)^i}$$

where

- Co = Initial investment
- C = Cash flow
- r = Discount rate (prime interest rate)
- T = Time (duration of project)

2.6.3 Internal rate of return

The ability to evaluate the future profitability of investments and projects plays an important role in the long-term planning and sustainability of any organisation. IRR is a popular analysis to measure return on potential investments, allowing the comparison and ranking of different projects based on their projected yield. IRR measures the rate of return on a project or investment while excluding external factors. It can be used to estimate the profitability of investments. Generally, a high IRR is preferable to a low one, as it signals that a potential project or investment is likely to add value to an organisation. If IRR is used to rank prospective projects or in the case of the study, different production systems, the investment with the highest IRR is probably the one that should be undertaken.

Assuming that the cost of investment for each project is equal, according to Ross, Westerfield and Jaffe (1999, cited in De Wet, 2018:49), the IRR only depends on the cash flows generated by an investment. The IRR is an intrinsic value that is not dependent on other external factors, which is why the word “internal” has been added to the rate of return. Ingersoll, Ross and Ross (1992, cited in De Wet, 2018:49), state that by using this technique, the merits of the investment are only determined based on the discounted cash flows generated by it. The rule of thumb is to advance with the project if the discount rate is less than the IRR and reject it if the discount rate is greater than the IRR. The same rule can be applied to the NPV method, and both the NPV and IRR methods consider the time value of money. IRR and NPV rely on the same formula (De Wet, 2018:48).

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The specifications of the technical financial procedures used during this study will be discussed in this chapter. The scenario generation will be explained in detail, as well as the financial models used to compare the different scenarios with one another. Thus, the following topics are addressed in the section below on the technical research plan:

- Scenario creation
- Different financial models and analysis techniques

3.2 Technical research plan

The study procedures and financial techniques are summarised in Figure 3.1 below.

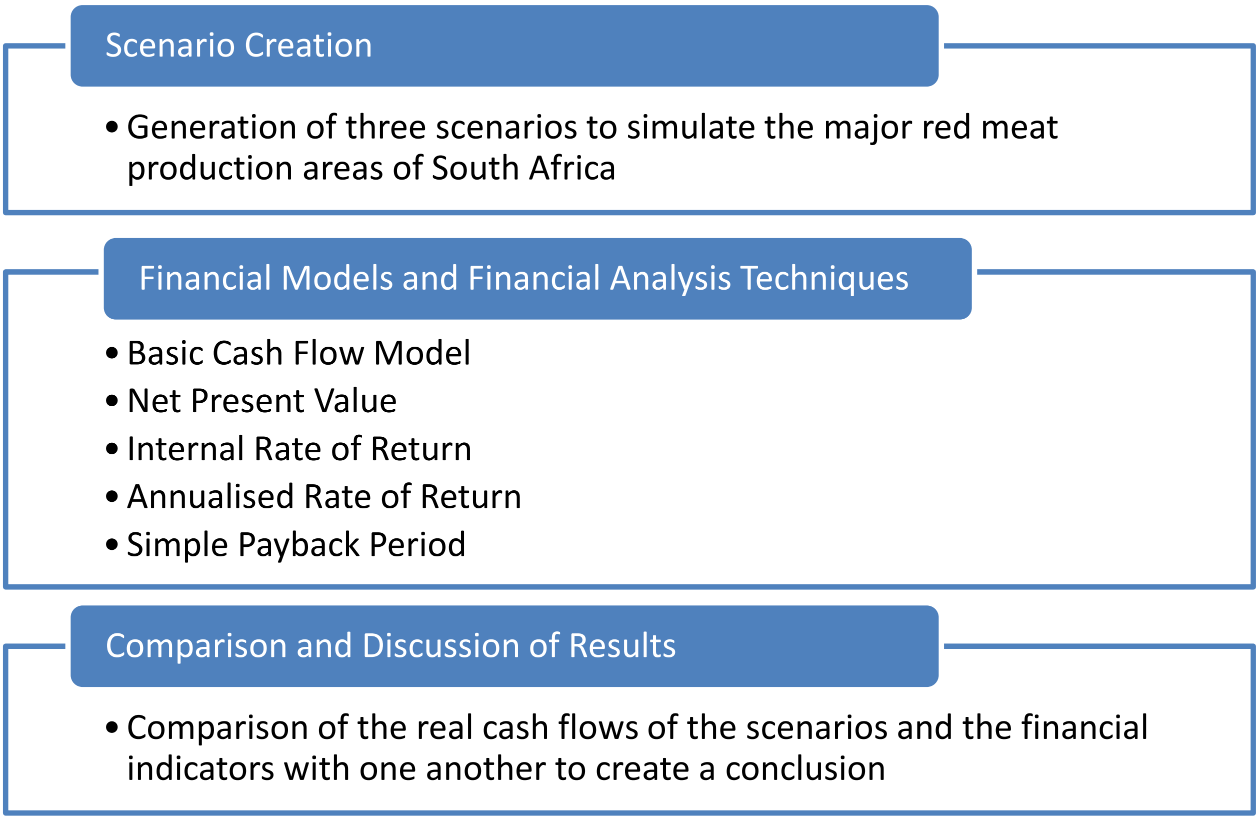

Figure 3.1: The basic procedures and financial analyses utilised in the study

3.2.1 Scenario creation

To simulate and simplify the major red meat production areas and, in particular, the beef production areas within South Africa, three scenarios were created. The scenarios were based on South Africa's annual precipitation, which increases from west to east. Moreover, they were directly correlated to the annual rainfall, and they represented the production capacity or potential of certain areas or biomes. In other words, they were based on the general economically feasible production capacity or average farm size of a particular area. In the western parts of South Africa, farms are generally larger with a lower carrying capacity than in the east. The potential of agricultural land increases from west to east because of the availability of better plant material due to the higher average rainfall.

The first scenario, which was a low-potential area, was created to simulate the western parts or marginal areas of South Africa, which include well-known areas, such as the Karoo and the Kalahari.

Table 3.1: First scenario simulating the low-potential areas of South Africa

SCENARIOS	
LOW POTENTIAL	
FARM SIZE	2000HA
CARRYING CAPACITY	15HA/LSU
TOTAL LSU's	200

The second scenario simulated the central production areas of South Africa including areas, such as the province of the North West, the western and central Free State and parts of Limpopo.

Table 3.2: Second scenario simulating the medium-potential production areas of South Africa

SCENARIOS	
MEDIUM POTENTIAL	
FARM SIZE	1000HA
CARRYING CAPACITY	8HA/LSU
TOTAL LSU's	1:1.2

The third scenario simulated the eastern, high-potential production areas of South Africa, including areas, such as KwaZulu Natal, the eastern Free State and parts of the Southern Cape.

Table 3.3: Third scenario simulating the high-potential production areas of South Africa

SCENARIOS	
HIGH POTENTIAL	
FARM SIZE	500HA
CARRYING CAPACITY	4HA/LSU
TOTAL LSU's	140

3.2.2 Financial models and analysis techniques.

3.2.2.1 Cash-flow model

Because this was a technical financial study, the basic information from each scenario was used to create a basic five-year cash-flow model for each scenario. The model was derived from general practice and was the standard accounting template used for cash-flow models across the globe.

Table 3.1 below illustrates the cash-flow model template as well as the assumptions made and commodity spot prices used in this study to compare future cash flows of the different production systems in different production areas

Table 3.4: Cash-flow model utilised in the study

BASIC CASH FLOW MODEL UTILISED IN THIS STUDY						
FARM SIZE						
CARRYING CAPACITY						
CASH FLOW PROJECTION						
COW HERD	2021	2022	2023	2024	2025	TOTAL
Cows						
Weaners						
Weaners Sold						
Cows Remaining						
Income from Cattle sold						
Vat						
Total Income						
Expenses						
Maintenance						
Lick& Feed						
Veterniary Costs						
Salaries						
Insurance						
Telecomunication						
Mortgage - Farm						
Mortgage - Cattle						
TOTALE UITGAWES						
SURPLUS						
OPENING BALANCE [JAN]						
CLOSING BALANCE [DES]						
* Assumptions						
- Gem. Kalf %	85%					
- Gem. Kalf Gewig	250	kg				
- Gem. Prys / Kg	R37.40	R / Kg				
Maintenance	R 50.00					
Feed & Lick Supplementation (Cow & C	R 850.00					
Feed & Lick Supplementation (Ox)	R 500.00					
Veterinary Costs	R 250.00					
Meat Price (Weaner calve)	R 37.40					
Meat Price (Ox)	R 46.03					
Wean Weight	250kg					
Slaughter Weight	300kg					

3.2.2.2 Net present value model

The NPVs for each scenario and production system were calculated by using a model derived from basic financial analysis techniques accepted worldwide. Table 3.5 below depicts this model.

Table 3.5: Model utilised to calculate NPVs throughout this study

NET PRESENT VALUE TEMPLATE USED IN THIS STUDY				
WACC	0%			
YEAR				PRESENT VALUE
	0	R 0.00		R 0.00
2021	1	R 0.00		R 0.00
2022	2	R 0.00		R 0.00
2023	3	R 0.00		R 0.00
2024	4	R 0.00		R 0.00
2025	5	R 0.00		R 0.00
NPV				R 0.00
	QUANTITY	PRICE	AMOUNT	
COW&CALF	0	R 0.00	R 0.00	
WEANER	0	R 0.00	R 0.00	
TOTAL			R 0.00	

3.2.2.3 Internal rate of return model

The IRR values for each scenario and production system were calculated by using a model derived from basic financial analysis techniques accepted worldwide. Table 3.6 below depicts this model.

Table 3.6: Model utilised to calculate IRRs throughout the study

INTERNAL RATE OF RETURN TEMPLATE USED IN THIS STUDY						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R 0.00					
CASHFLOW		R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
WACC						
10%						
SUM OF PV	R 0.00		IRR	#NUM!		
LESS INTITIAL OUTLAY	R 0.00					
NPV	R 0.00					

3.3 Comparing results

The last part of the study's methodology was to create a model and template to calculate basic financial indicators and compare the results of the financial analyses of the different scenarios. The financial indicators were return on investment (ROI), annualised return on investment (AROI) and simple payback period (SPP), which were derived from the data already calculated through the cash-flow model and the other two financial analysis techniques

Table 3.7: Model utilised to calculate financial indicators and compare scenarios

THE MODEL USED TO COMPARE SCENARIOS IN THIS STUDY						
	HIGH POTENTIAL		MEDIUM POTENTIAL		LOW POTENTIAL	
	COW-CALF	OX'S	COW-CALF	OX'S	COW-CALF	OX'S
TOTAL INCOME	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
TOTAL EXPENSES	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
SURPLUS	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
NPV	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
IRR	0%	0%	0%	0%	0%	0%
ROI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ANNUALIZED ROI	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SIMPLE PAYBACK PERIOD	0	0	0	0	0	0
TOTAL INCOME	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00
TOTAL INVESTMENT	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

In the following chapter, the results of the comparison of the financial analyses of the different scenarios will be discussed. Within the three scenarios, the viability of two production systems is compared through the following financial analysis techniques: basic cash-flow projection; NPV calculation; and IRR calculation. The results obtained from each calculation for each scenario are then compared to determine the most viable and long-term sustainable production system for each producing area.

4.2 Scenarios

The three scenarios created to simulate major cattle-producing areas within South Africa are illustrated in Table 4.1 below.

Table 4.1: Three different scenarios and their herd compositions

	SCENARIOS					
	HIGH POTENTIAL		MEDIUM POTENTIAL		LOW POTENTIAL	
	COW-CALF	OX'S	COW-CALF	OX'S	COW-CALF	OX'S
FARMSIZE	500HA		1000HA		2000HA	
CARRYING CAPACITY	4HA/LSU		8HA/LSU		15HA/LSU	
OX-FACTOR	1:1.1		1:1.2		1:1.5	
TOTAL LSU's	125	140	125	150	135	200
COWS	100	60	100	70	110	80
WEANERS	85	51	85	60	94	68
OX'S	0	40	0	50	0	60

As can be seen in the table above, three scenarios were created: high-, medium- and low-potential regions. The estimated herd compositions are given in the last three rows of the table. The estimates were rather conservative, as many models would assign a cow and calf to each available large stock unit. However, in the study scenarios, only 100 cows were included to make room for replacement heifers and bulls and accommodate the fodder and roughage that the weaners would utilise in the seven months that they would be on the farm.

4.3 Cash-flow statements

This section presents the results of the cash-flow models created for each scenario. Tables 4.2 to 4.7 below each represent a different scenario.

Table 4.2: Cash-flow model for the high-potential weaner production system

CASH FLOW MODEL FOR HIGH POTENTIAL SCENARIO: COW CALF PRODUCTION SYSTEM						
500HA						
4HA/LSU						
CASH FLOW PROJECTION						
COW HERD	2021	2022	2023	2024	2025	TOTAL
Cows	100	100	100	100	100	100
Weaners	85	85	85	85	85	425
Oxes	-	-	-	-	-	-
Weaners Sold	-85	-85	-85	-85	-85	-425
Ox Sold	-	-	-	-	-	-
Cows Remaining	100	100	100	100	100	100
Income from Cattle sold	R874 225	R874 225	R874 225	R874 225	R874 225	R4 371 125
Vat	-	-	-	-	-	-
Total Income	R874 225	R874 225	R874 225	R874 225	R874 225	R4 371 125
Expenses						
Maintenance	R25 000	R25 000	R25 000	R25 000	R25 000	R125 000
Lick& Feed	R157 250	R157 250	R157 250	R157 250	R157 250	R786 250
Veteriniary Costs	R46 250	R46 250	R46 250	R46 250	R46 250	R231 250
Salaries	-	-	-	-	-	
Insurance	-	-	-	-	-	R0
Telecomunication	-	-	-	-	-	R0
Mortgage - Farm	-	-	-	-	-	R0
Mortgage - Cattle	-	-	-	-	-	R0
TOTALE EXPENSES	R228 500	R228 500	R228 500	R228 500	R228 500	R1 142 500
SURPLUS	R645 725	R645 725	R645 725	R645 725	R645 725	R3 228 625
OPENING BALANCE [JAN]	R0	R645 725	R1 291 450	R1 937 175	R2 582 900	
CLOSING BALANCE [DES]	R645 725	R1 291 450	R1 937 175	R2 582 900	R3 228 625	

Table 4.3: Cash-flow model for the high-potential ox production system

CASH FLOW MODEL FOR HIGH POTENTIAL SCENARIO: OX PRODUCTION SYSTEM						
500HA						
4HA/LSU						
CASH FLOW PROJECTION						
CATTLE HERD	2021	2022	2023	2024	2025	TOTAL
Cows	60	60	60	60	60	60
Weaners	51	51	51	51	51	255
Oxes	40	40	40	40	40	200
Weaners Sold	-11	-11	-11	-11	-11	-55
Ox Sold	-40	-40	-40	-40	-40	-200
Cattle Remaining	100	100	100	140	140	460
Income from Cattle sold	R744 695	744695	R744 695	R744 695	R744 695	R3 723 475
Vat	-	-	-	-	-	-
Total Income	R744 695	R744 695	R744 695	R744 695	R744 695	R3 723 475
Expenses						
Maintenance	R25 000	R25 000	R25 000	R25 000	R25 000	R125 000
Lick& Feed	R96 500	R96 500	R96 500	R96 500	R96 500	R482 500
Veterniary Costs	R37 750	R37 750	R37 750	R37 750	R37 750	R188 750
Salaries	-	-	-	-	-	
Insurance	-	-	-	-	-	R0
Telecomunication	-	-	-	-	-	R0
Mortgage - Farm	-	-	-	-	-	R0
Mortgage - Cattle	-	-	-	-	-	R0
TOTALE EXPENSES	R159 250	R159 250	R159 250	R159 250	R159 250	R796 250
SURPLUS	R585 445	R585 445	R585 445	R585 445	R585 445	R2 927 225
OPENING BALANCE [JAN]	R0	R585 445	R1 170 890	R1 756 335	R2 341 780	
CLOSING BALANCE [DES]	R585 445	R1 170 890	R1 756 335	R2 341 780	R2 927 225	

Table 4.4: Cash-flow model for the medium-potential weaner production system

CASH FLOW MODEL FOR MEDIUM POTENTIAL SCENARIO: COW CALF PRODUCTION SYSTEM						
1000HA						
8HA/LSU						
CASH FLOW PROJECTION						
COW HERD	2021	2022	2023	2024	2025	TOTAL
Cows	100	100	100	100	100	100
Weaners	85	85	85	85	85	425
Oxes	-	-	-	-	-	-
Weaners Sold	-85	-85	-85	-85	-85	-425
Ox Sold	-	-	-	-	-	-
Cows Remaining	100	100	100	100	100	100
Income from Cattle sold	R874 225	R874 225	R874 225	R874 225	R874 225	R4 371 125
Vat	-	-	-	-	-	-
Total Income	R874 225	R874 225	R874 225	R874 225	R874 225	R4 371 125
Expenses						
Maintenance	R50 000	R50 000	R50 000	R50 000	R50 000	R250 000
Lick& Feed	R157 250	R157 250	R157 250	R157 250	R157 250	R786 250
Veterniary Costs	R46 250	R46 250	R46 250	R46 250	R46 250	R231 250
Salaries	-	-	-	-	-	
Insurance	-	-	-	-	-	R0
Telecomunication	-	-	-	-	-	R0
Mortgage - Farm	-	-	-	-	-	R0
Mortgage - Cattle	-	-	-	-	-	R0
TOTALE EXPENSES	R253 500	R253 500	R253 500	R253 500	R253 500	R1 267 500
SURPLUS	R620 725	R620 725	R620 725	R620 725	R620 725	R3 103 625
OPENING BALANCE [JAN]	R0	R620 725	R1 241 450	R1 862 175	R2 482 900	
CLOSING BALANCE [DES]	R620 725	R1 241 450	R1 862 175	R2 482 900	R3 103 625	

Table 4.5: Cash-flow model for the medium-potential ox production system

CASH FLOW MODEL FOR MEDIUM POTENTIAL SCENARIO: OX PRODUCTION SYSTEM						
1000HA						
8HA/LSU						
CASH FLOW PROJECTION						
CATTLE HERD	2021	2022	2023	2024	2025	TOTAL
Cows	70	70	70	70	70	70
Weaners	60	60	60	60	60	298
Oxes	50	50	50	40	40	230
Weaners Sold	-10	-10	-10	-10	-10	-50
Ox Sold	-50	-50	-50	-50	-50	-250
Cattle Remaining	120	120	120	110	110	548
Income from Cattle sold	R892 300	892300	R892 300	R892 300	R892 300	R4 461 500
Vat	-	-	-	-	-	-
Total Income	R892 300	R892 300	R892 300	R892 300	R892 300	R4 461 500
Expenses						
Maintenance	R50 000	R50 000	R50 000	R50 000	R50 000	R250 000
Lick& Feed	R114 250	R114 250	R114 250	R114 250	R114 250	R571 250
Veterniary Costs	R44 875	R44 875	R44 875	R44 875	R44 875	R224 375
Salaries	-	-	-	-	-	
Insurance	-	-	-	-	-	R0
Telecomunication	-	-	-	-	-	R0
Mortgage - Farm	-	-	-	-	-	R0
Mortgage - Cattle	-	-	-	-	-	R0
TOTALE EXPENSES	R209 125	R209 125	R209 125	R209 125	R209 125	R1 045 625
SURPLUS	R683 175	R683 175	R683 175	R683 175	R683 175	R3 415 875
OPENING BALANCE [JAN]	R0	R683 175	R1 366 350	R2 049 525	R2 732 700	
CLOSING BALANCE [DES]	R683 175	R1 366 350	R2 049 525	R2 732 700	R3 415 875	

Table 4.6: Cash-flow model for the low-potential weaner production system

CASH FLOW MODEL FOR LOW POTENTIAL SCENARIO: COW CALF PRODUCTION SYSTEM						
2000HA						
15HA/LSU						
CASH FLOW PROJECTION						
COW HERD	2021	2022	2023	2024	2025	TOTAL
Cows	110	110	110	110	110	110
Weaners	94	94	94	94	94	469
Oxes	-	-	-	-	-	-
Weaners Sold	-94	-94	-94	-94	-94	-470
Ox Sold	-	-	-	-	-	-
Cows Remaining	110	110	110	110	110	109
Income from Cattle sold	R966 790	R966 790	R966 790	R966 790	R966 790	R4 833 950
Vat	-	-	-	-	-	-
Total Income	R966 790	R966 790	R966 790	R966 790	R966 790	R4 833 950
Expenses						
Maintenance	R100 000	R100 000	R100 000	R100 000	R100 000	R500 000
Lick& Feed	R172 975	R172 975	R172 975	R172 975	R172 975	R864 875
Veteriary Costs	R50 875	R50 875	R50 875	R50 875	R50 875	R254 375
Salaries	-	-	-	-	-	
Insurance	-	-	-	-	-	R0
Telecomunication	-	-	-	-	-	R0
Mortgage - Farm	-	-	-	-	-	R0
Mortgage - Cattle	-	-	-	-	-	R0
TOTALE EXPENSES	R323 850	R323 850	R323 850	R323 850	R323 850	R1 619 250
SURPLUS	R642 940	R642 940	R642 940	R642 940	R642 940	R3 214 700
OPENING BALANCE [JAN]	R0	R642 940	R1 285 880	R1 928 820	R2 571 760	
CLOSING BALANCE [DES]	R642 940	R1 285 880	R1 928 820	R2 571 760	R3 214 700	

Table 4.7: Cash-flow model for the low-potential ox production system

CASH FLOW MODEL FOR LOW POTENTIAL SCENARIO: OX PRODUCTION SYSTEM						
2000HA						
15HA/LSU						
CASH FLOW PROJECTION						
CATTLE HERD	**2021**	**2022**	**2023**	**2024**	**2025**	**TOTAL**
Cows	80	80	80	80	80	80
Weaners	68	68	68	68	68	340
Oxes	60	60	60	60	60	300
Weaners Sold	-10	-10	-10	-10	-10	-50
Ox Sold	-60	-60	-60	-60	-60	-300
Cattle Remaining	138	138	138	138	138	670
Income from Cattle sold	R1 050 190	1050190	R1 050 190	R1 050 190	R1 050 190	R5 250 950
Vat	-	-	-	-	-	-
Total Income	R1 050 190	R1 050 190	R1 050 190	R1 050 190	R1 050 190	R5 250 950
Expenses						
Maintenance	R100 000	R100 000	R100 000	R100 000	R100 000	R500 000
Lick& Feed	R132 000	R132 000	R132 000	R132 000	R132 000	R660 000
Veterniary Costs	R52 000	R52 000	R52 000	R52 000	R52 000	R260 000
Salaries	-	-	-	-	-	
Insurance	-	-	-	-	-	R0
Telecomunication	-	-	-	-	-	R0
Mortgage - Farm	-	-	-	-	-	R0
Mortgage - Cattle	-	-	-	-	-	R0
TOTALE EXPENSES	R284 000	R284 000	R284 000	R284 000	R284 000	R1 420 000
SURPLUS	R766 190	R766 190	R766 190	R766 190	R766 190	R3 830 950
OPENING BALANCE [JAN]	R0	R766 190	R1 532 380	R2 298 570	R3 064 760	
CLOSING BALANCE [DES]	R766 190	R1 532 380	R2 298 570	R3 064 760	R3 830 950	

4.4 Net present values

This section presents the NPVs for each scenario. Tables 4.8 to 4.13 each represent a different scenario.

Table 4.8: Net present value calculation for the high-potential cow-calf production system

NPV FOR HIGH POTENTIAL WEANER PRODUCTION SYSTEM				
WACC	10%			
YEAR				PRESENT VALUE
	0	R -2 300 000.00		R -2 300 000.00
2021	1	R 645 725.00		R 587 022.73
2022	2	R 645 725.00		R 533 657.02
2023	3	R 645 725.00		R 485 142.75
2024	4	R 645 725.00		R 441 038.86
2025	5	R 645 725.00		R 400 944.42
NPV				R 147 805.79
	QUANTITY	PRICE	AMOUNT	
COW&CALF	100	R 23 000.00	R 2 300 000.00	
WEANER	0	R 10 285.00	R 0.00	
TOTAL			R 2 300 000.00	

Table 4.9: Net present value calculation for the high-potential ox production system

NPV FOR HIGH POTENTIAL OX PRODUCTION SYSTEM				
WACC	10%			
YEAR				PRESENT VALUE
	0	R -1 791 400.00		R -1 791 400.00
2021	1	R 585 445.00		R 532 222.73
2022	2	R 585 445.00		R 483 838.84
2023	3	R 585 445.00		R 439 853.49
2024	4	R 585 445.00		R 399 866.81
2025	5	R 585 445.00		R 363 515.28
NPV				R 427 897.16
	QUANTITY	PRICE	AMOUNT	
COW&CALF	60	R 23 000.00	R 1 380 000.00	
WEANER	40	R 10 285.00	R 411 400.00	
TOTAL			R 1 791 400.00	

Table 4.10: Net present value calculation for the medium-potential cow-calf production system

NPV FOR MEDIUM POTENTIAL WEANER PRODUCTION SYSTEM				
WACC	10%			
YEAR				PRESENT VALUE
	0	R -2 300 000.00		R -2 300 000.00
2021	1	R 620 725.00		R 564 295.45
2022	2	R 620 725.00		R 512 995.87
2023	3	R 620 725.00		R 466 359.88
2024	4	R 620 725.00		R 423 963.53
2025	5	R 620 725.00		R 385 421.39
NPV				R 53 036.12
	QUANTITY	PRICE	AMOUNT	
COW&CALF	100	R 23 000.00	R 2 300 000.00	
WEANER	0	R 10 285.00	R 0.00	
TOTAL			R 2 300 000.00	

Table 4.11: Net present value calculation for the medium-potential ox production system

NPV FOR MEDIUM POTENTIAL OX PRODUCTION SYSTEM				
WACC	10%			
YEAR				PRESENT VALUE
	0	R -2 124 250.00		R -2 124 250.00
2021	1	R 683 175.00		R 621 068.18
2022	2	R 683 175.00		R 564 607.44
2023	3	R 683 175.00		R 513 279.49
2024	4	R 683 175.00		R 466 617.72
2025	5	R 683 175.00		R 424 197.92
NPV				R 465 520.75
	QUANTITY	PRICE	AMOUNT	
COW&CALF	70	R 23 000.00	R 1 610 000.00	
WEANER	50	R 10 285.00	R 514 250.00	
TOTAL			R 2 124 250.00	

Table 4.12: Net present value calculation for the low-potential cow-calf production system

NPV FOR LOW POTENTIAL WEANER PRODUCTION SYSTEM				
WACC	10%			
YEAR				PRESENT VALUE
	0	R -2 530 000.00		R -2 530 000.00
2021	1	R 642 940.00		R 584 490.91
2022	2	R 642 940.00		R 531 355.37
2023	3	R 642 940.00		R 483 050.34
2024	4	R 642 940.00		R 439 136.67
2025	5	R 642 940.00		R 399 215.16
NPV				R -92 751.55
	QUANTITY	PRICE	AMOUNT	
COW&CALF	110	R 23 000.00	R 2 530 000.00	
WEANER	0	R 10 285.00	R 0.00	
TOTAL			R 2 530 000.00	

Table 4.13: Net present value calculation for the low-potential ox production system

NPV FOR LOW POTENTIAL OXPRODUCTION SYSTEM				
WACC	10%			
YEAR				PRESENT VALUE
	0	R -2 457 100.00		R -2 457 100.00
2021	1	R 766 190.00		R 696 536.36
2022	2	R 766 190.00		R 633 214.88
2023	3	R 766 190.00		R 575 649.89
2024	4	R 766 190.00		R 523 318.08
2025	5	R 766 190.00		R 475 743.71
NPV				R 447 362.91
	QUANTITY	PRICE	AMOUNT	
COW&CALF	80	R 23 000.00	R 1 840 000.00	
WEANER	60	R 10 285.00	R 617 100.00	
TOTAL			R 2 457 100.00	

4.5 Internal rate of return

This section presents the IRR for each scenario. Tables 4.14 to 4.19 each present the IRR calculation for each scenario.

Table 4.14: Internal rate of return analysis for the high-potential cow-calf production system

IRR FOR HIGH POTENTIAL WEANER PRODUCTION SYSTEM						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R -2 300 000.00					
CASHFLOW		R 645 725.00	R 645 725.00	R 645 725.00	R 645 725.00	R 645 725.00
WACC						
10%						
SUM OF PV	R 2 447 805.79		IRR	12%		
LESS INTITIAL OUTLAY	R -2 300 000.00					
NPV	R 147 805.79					

Table 4.15: Internal rate of return analysis for the high-potential ox production system

IRR FOR HIGH POTENTIAL OX PRODUCTION SYSTEM						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R -1 791 400.00					
CASHFLOW		R 585 445.00	R 585 445.00	R 585 445.00	R 585 445.00	R 585 445.00
WACC						
10%						
SUM OF PV	R 2 219 297.16		IRR	19%		
LESS INTITIAL OUTLAY	R -1 791 400.00					
NPV	R 427 897.16					

Table 4.16: Internal rate of return analysis for the medium-potential cow-calf production system

IRR FOR MEDIUM POTENTIAL WEANER PRODUCTION SYSTEM						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R -2 300 000.00					
CASHFLOW		R 620 725.00	R 620 725.00	R 620 725.00	R 620 725.00	R 620 725.00
WACC						
10%						
SUM OF PV	R 2 353 036.12		IRR	11%		
LESS INTITIAL OUTLAY	R -2 300 000.00					
NPV	R 53 036.12					

Table 4.17: Internal rate of return analysis for the medium-potential ox production system

IRR FOR MEDIUM POTENTIAL OX PRODUCTION SYSTEM						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R -2 124 250.00					
CASHFLOW		R 683 175.00	R 683 175.00	R 683 175.00	R 683 175.00	R 683 175.00
WACC						
10%						
SUM OF PV	R 2 589 770.75		IRR	18%		
LESS INTITIAL OUTLAY	R -2 124 250.00					
NPV	R 465 520.75					

Table 4.18: Internal rate of return analysis for the low-potential cow-calf production system

IRR FOR LOW POTENTIAL WEANER PRODUCTION SYSTEM						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R -2 530 000.00					
CASHFLOW		R 642 940.00	R 642 940.00	R 642 940.00	R 642 940.00	R 642 940.00
WACC						
10%						
SUM OF PV	R 2 437 248.45		IRR	9%		
LESS INTITIAL OUTL	R -2 530 000.00					
NPV	R -92 751.55					

Table 4.19: Internal rate of return analysis for the low-potential ox production system

IRR FOR LOW POTENTIAL OX PRODUCTION SYSTEM						
	2021	2021	2022	2023	2024	2025
INITIAL OUTLAY	R -2 457 100.00					
CASHFLOW		R 766 190.00	R 766 190.00	R 766 190.00	R 766 190.00	R 766 190.00
WACC						
10%						
SUM OF PV	R 2 904 462.91		IRR	17%		
LESS INTITIAL OUTL	R -2 457 100.00					
NPV	R 447 362.91					

4.6 Discussion

The results from the basic cash-flow model alone were not enough to confirm which production system was the most viable option. The identification and hence the confirmation of the most feasible production system for each production area were achieved by combining the cash-flow model with other financial analysis tools, including NPV, IRR, ROI, AROI and SPP. These results are presented in Table 4.20 below. Each scenario is discussed in more detail further on in this section.

Table 4.20: Combined results obtained from the study

	COMPARISON OF SCENARIOS					
	HIGH POTENTIAL		MEDIUM POTENTIAL		LOW POTENTIAL	
	COW-CALF	OX'S	COW-CALF	OX'S	COW-CALF	OX'S
TOTAL INCOME	R 874 225.00	R 744 695.00	R 874 225.00	R 892 300.00	R 966 790.00	R 1 050 190.00
TOTAL EXPENSES	R -228 500.00	R -159 250.00	R -253 500.00	R -209 125.00	R -323 850.00	R -284 000.00
SURPLUS	R 645 725.00	R 585 445.00	R 620 725.00	R 683 175.00	R 642 940.00	R 766 190.00
NPV	R 147 805.00	R 427 827.26	R 53 036.12	R 465 520.75	R -92 751.55	R 447 362.91
IRR	12%	19%	11%	18%	9%	17%
ROI	190.05%	207.85%	190.05%	210.03%	191.07%	213.71%
ANNUALIZED ROI	23.77%	25.21%	23.77%	25.42%	23.82%	25.70%
SIMPLE PAYBACK PERIOD	3.561887801	3.05989461	3.705344557	3.109379002	3.935048372	3.206906903

The following section focusses in more detail on the results for each production system in each scenario based on the financial model that determined the feasibility of the different production systems.

4.6.1 Results of the high-potential scenario

The results of the high-potential scenario were based on the assumptions stipulated in Section 1.5.2 for the creation of a high-potential scenario. Table 4.21 below summarises the results for this scenario where a cow-calf system was the preferred method of production.

Table 4.21: Financial indicators for the high-potential cow-calf scenario.

	HIGH POTENTIAL
	COW-CALF
TOTAL INCOME (5 YEARS)	R 4 371 125.00
TOTAL INVESTMENT	R 2 300 000.00
ANNUAL REVENUE	R 874 225.00
TOTAL EXPENSES	R -228 500.00
SURPLUS	R 645 725.00
NPV	R 147 805.00
IRR	12.00%
ROI	190.05%
AROI	23.77%
SPP	3.561887801

The financial results in Table 4.21 above show that the first scenario had an NPV of R147 805.00, which indicated a viable investment. All negative NPV values should not be considered. The same was applied to the IRR, which was also positive. The SPP value indicated that the payback period could be met within three and a half years, which suggested a sound opportunity. The ROI indicated a positive value of 190.05% over five years, and the AROI indicated a positive value of 23.77%, which is a lot better than what is received in the money market and is thus a viable investment. According to all the financial indicators, this production method is worth carrying out in a high-potential environment.

Table 4.22: Financial indicators for the high-potential ox scenario

	HIGH POTENTIAL
	OXEN
TOTAL INCOME (5 YEARS)	R 3 723 475.00
TOTAL INVESTMENT	R 1 791 400.00
ANNUAL REVENUE	R 744 695.00
TOTAL EXPENSES	R -159 250.00
SURPLUS	R 585 445.00
NPV	R 427 827.26
IRR	19.00%
ROI	207.85%
ANNUALIZED ROI	25.21%
SIMPLE PAYBACK PERIOD	3.05989461

The financial results in Table 4.22 above showed that the investment had an NPV of R427 827.26 and an IRR of 19%. Any IRR value higher than the prime interest rate (7.75%) indicates a viable investment. The NPV and IRR values indicated that this production method is viable. The SPP indicated that the investment should break even after basically three years, which is a relatively short period. An investment with an ROI greater than 150% is regarded as excellent. This analysis indicated an ROI of 207% and an AROI of 25.21%, which suggested an above average investment. Both production methods are feasible in the high-production scenario. Moreover, the choice can be based on personal preference and available funds, as the ox production method has a small capital requirement.

4.6.2 Results of the medium-potential scenario

The following section discusses and compares the results obtained for the medium-potential scenario. Table 4.23 below summarises the results for this scenario where a cow-calf system was the preferred method of production.

Table 4.23: Financial indicators for the medium-potential cow-calf scenario.

	MEDIUM POTENTIAL
	COW-CALF
TOTAL INCOME (5 YEARS)	R 4 371 125.00
TOTAL INVESTMENT	R 2 300 000.00
ANNUAL REVENUE	R 874 225.00
TOTAL EXPENSES	R -253 500.00
SURPLUS	R 620 725.00
NPV	R 53 036.12
IRR	11.00%
ROI	190.05%
AROI	23.77%
SPP	3.705344557

The financial results in Table 4.23 above showed that the investment had an NPV of R530 36.12, which suggested a probably unviable investment. Although the NPV was not negative, very negative NPV values should not be considered. The same can be applied to the IRR, which was also very low and close to the discount rate. The SPP value indicated that the payback period was 3.7 years which is a desirable value. The ROI indicated a value of 190%, resulting in an AROI value of 23.77%, which is also very good. According to all the financial indicators, the cow-calf medium-potential scenario is viable but not necessarily desirable.

Table 4.24: Financial indicators for the medium-potential ox scenario

	MEDIUM POTENTIAL
	OX
TOTAL INCOME (5 YEARS)	R 4 461 500.00
TOTAL INVESTMENT	R 2 124 250.00
ANNUAL REVENUE	R 892 300.00
TOTAL EXPENSES	R -209 125.00
SURPLUS	R 683 175.00
NPV	R 465 520.75
IRR	18.00%
ROI	210.03%
AROI	25.42%
SPP	3.109379002

The financial results in Table 4.24 above showed that the investment had an NPV of R456 520.75, which was extremely good in comparison with the R53 036.12. of the cow-calf production system. The IIR of 18%, the ROI of 210% and the AROI of 25.42% were all very desirable values. The ox production system in this scenario also had higher annual revenue and lower capital expenditure, which suggested that this is the more viable and feasible of the two production methods.

4.6.3 Results of the low-potential scenario

The following section discusses and compares the results obtained for the low-potential scenario. Table 4.25 below summarises the results for this scenario where a cow-calf system was the preferred method of production.

Table 4.25: Financial indicators for the low-potential cow-calf scenario

	LOW POTENTIAL
	COW-CALF
TOTAL INCOME (5 YEARS)	R 4 833 950.00
TOTAL INVESTMENT	R 2 530 000.00
ANNUAL REVENUE	R 966 790.00
TOTAL EXPENSES	R -323 850.00
SURPLUS	R 642 940.00
NPV	R -92 751.55
IRR	9.00%
ROI	191.07%
AROI	23.82%
SPP	3.935048372

The financial results in Table 4.25 above showed that the investment had an NPV of – R92 751.55, which suggested an unviable investment. All negative NPV values should not be considered. The same can be applied to the IRR, which was also below the discount rate that was used for the calculations. The SPP value indicated that the payback period was nearly four years, which was the longest of all six scenarios. The ROI indicated a positive value of 190%, but all the financial indicators suggested that this method is not feasible over the long term under these circumstances.

Table 4.26: Financial indicators for the low-potential ox scenario.

	LOW POTENTIAL OX
TOTAL INCOME (5 YEARS)	R 5 250 950.00
TOTAL INVESTMENT	R 2 457 100.00
ANNUAL REVENUE	R 1 050 190.00
TOTAL EXPENSES	R -284 000.00
SURPLUS	R 766 190.00
NPV	R 447 362.91
IRR	17.00%
ROI	213.71%
AROI	25.70%
SPP	3.206906903

The financial results presented in Table 4.26 above revealed that the investment had an NPV of R447 362.91 which was once again extremely good in comparison with the -R92 751.55 of the cow-calf production system. The high IIR of 17%, the ROI of 213%, and the AROI of 25.70% were all very desirable values. The financial indicators suggested that the ox production system is a more viable option in the marginal production areas of South Africa and that farmers in these areas should consider using this method to mitigate the effects of drought and volatile weaner prices. In addition, in all three scenarios, the capital requirements for ox production are lower, and if the cash-flow challenges that accompany the 18-month oxen production system can be overcome, farmers could have a profitable enterprise.

4.5 Evaluation of financial analysis tools and indicators

The results of the ROI, SPP, IRR and NPV calculations for the different scenarios are discussed in this section.

Firstly, when observing the financial indicators of the scenarios, all but one had a positive NPV. All the NPV values presented in Table 4.20 above were in favour of the ox production system. When the NPV was analysed specifically, the value shown in Table 4.20 indicated the value of future cash flows presented in today's value. Every project with a positive NPV should be carried out, and projects with a negative NPV should be rejected.

IRR is a metric used in capital budgeting techniques to measure projects with different lifetimes. The IRR is a discount rate that makes the NPV of all cash flows equal to zero.

If the IRR is more than the discount rate, as was the case in most of the scenarios, the project can be carried out. Any IRR less than the prime interest or discount rate should be rejected, as was the case of the low-margin cow-calf scenario. In the study, the IRR for most of the scenarios was above the discount rate of 10%. The higher the IRR, the more desirable and viable is the method of production.

SPP is the cost of the investment divided by the average annual cash flow. The shorter the payback, the more desirable the investment. All of the scenarios had desirable payback periods of less than five years. Most commercial banks in South Africa give medium-term loans of five years for buying cattle, and therefore for a production method to be viable, it has to be able to recover the investment cost in less than five years.

An ROI greater than 100% is seen as good, and an ROI greater than 150% is regarded as excellent, although an ROI greater than 150% should never be the aim. In Table 4.20 above, it can be observed that the ROI for all the scenarios was above 150%.

4.6 Summary of discussion

Three scenarios with two production methods in each were compared in this chapter with the aid of basic cash-flow models, followed by the calculation of the NPV, the IRR, the ROI, the AROI and the SPP for each analysis.

In the high-potential scenario, the results of the two methods were quite similar. Therefore, both production methods might be considered viable and feasible options, although each has its pros and cons. In the end, the decision would come down to personal preference.

In the medium-potential scenario, the results of the two methods were once again similar, and the choice of method would also depend on personal preference. However, the ox production system started to creep ahead with lower capital requirements, higher annual turnovers and better values in all of the financial indicators. This suggested that the ox production system is the more feasible production method.

In the low-potential scenario, the financial indicators of the cow-calf production method were negative, although this method had a positive cash flow, and cash flow is king. Nevertheless, the NPV and IRR were negative, which should make commercial farmers in marginal areas of South Africa sceptical about this production method. Maybe this is also the reason why so many commercial farmers in the marginal areas of South Africa struggle to make a living. Therefore, they should consider changing their production method.

From an operations management point of view, the more marginal areas a farm has, the more suited it is to an ox production system because most of its land will be unusable for cows with calves. Unfortunately, in the low-potential areas of South Africa, farms become more mountainous and more susceptible to droughts, deforestation or invasive bush encroachment, which makes ox production more viable and feasible. Nevertheless, in these areas, as revealed in the study, the cow-calf production method might generate a positive cash flow and be a viable option for some farmers. However, margins would be small, and although the cash flow might cover the direct input costs of the herd, it may not necessarily cover all the overhead costs of the farm. Here, the differentiating factor of long-term sustainability would depend on the lifestyle and the debt burden of the specific farmer, which would vary from farm to farm.

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter provides a summary of the study in terms of the research objectives. In addition, it presents the limitations of the study as well as recommendations for practice and research.

5.2 Meeting the objectives of the study

The objectives of this study, as set out in Chapter 1, Section 1.2, were reached, as summarised below.

The first objective was achieved by conducting a detailed literature review to obtain a thorough understanding of the South African beef production industry, the different production systems and appropriate financial tools to do a comprehensive feasibility study.

The second objective was achieved by creating different realistic scenarios to simulate the major beef-producing areas in South Africa. Three scenarios were created for the technical financial study.

The third and most important objective was to compare the feasibility, profitability and cash flow of the two major production systems in the three scenarios. This was achieved by compiling cash-flow models for each production method in each scenario. In addition, using the data from these models, the financial indicators, NPV, IRR, ROI, AROI and SPP were calculated.

The fourth objective was to compare the operational strengths and weaknesses of each production system with each another and formulate a long-term sustainable system for each scenario. The data for the strengths and weaknesses were obtained from the results of the analyses of the two methods, and the long-term sustainability was the natural outflow of the more viable and feasible option in each of the scenarios, as discussed in Chapter 4.

5.3 Limitations of the study

The researcher used the best of his knowledge and abilities in applying the research methods to the available data and developing a model. However, a consideration of the various limitations to and variables in the study could contribute to the development of a more accurate model.

The current model only takes into account direct costs and leaves out overhead costs, including mortgages on farmland and cattle, both of which are major contributors to most cash-flow models of any agricultural enterprise. However, these overhead costs vary from producer to producer, depending on the maturity of the enterprise and the risk appetite of the managing director. In the study, the capital budgeting techniques and basic commodity prices had set equations and public data to work with. However, the cash-flow calculations and scenario creation relied on assumptions based on the researcher’s knowledge and skills.

There were a few limitations to using the NPV technique in the analysis. For example, as the technique relies significantly on assumptions and estimates, inaccurate values might be used in the calculations. However, despite its limitations, the NPV can still be a useful capital budgeting tool if applied correctly.

The high ROI percentages revealed in the study might have been due to the research being conducted on the agricultural sector, which is well known to experience a high turnover and a low margin. Moreover, in the study, no overhead costs were taken into account, which would have had a major influence on the ROI percentages. The AROI is probably a more realistic percentage to use in comparing investment options. However, a professional or a full-time commercial farmer with a relatively low debt burden and available land might have few better investment options than cattle. Moreover, whatever production system is followed, it would be better than investing in the money market.

In the study, the skewness of data might have had a minor influence on NPV, IRR and SPP. However, the data were accurate enough to draw conclusions. Moreover, if an in situ model for a specific farm or situation were created, the extra variables could easily be added to both production systems. However, because the overheads for the specific farm would be the same in both systems, the results would also be the same and thus cancel each other out.

5.4 Recommendations for agricultural practice

Based on the results presented in Chapter 4, it is recommended that commercial beef producers make use of financial analysis tools to assess the health and long-term sustainability of their enterprise or organisation. This data should be used to make daily decisions and formulate long-term strategic plans. Turnover is not an indicator of financial success, and in the agricultural sector, it is easy to move a lot of money around without experiencing bottom-line growth.

Commercial farmers should be wary of this problem and investigate ways to solve it, such as moving from a cow-calf to an ox production system. An ox production system is less labour intensive, has lower mortalities and has a lower capital requirement. In addition, it allows farmers to mitigate the effects of drought because an ox is more liquidable than a cow and/or young calf. Furthermore, as South African producers have limited control over most of their input costs and are price takers when selling their product, an ox production system would allow them to add value in good times and obtain more for the product that they worked hard to produce.

In the high-potential areas of South Africa, the choice is open to personal preference, as a lot of cattle farms are accompanied by cash crop farms, which provide roughage in the winter months. This means that a cow-calf production system would be chosen because the crop residues could be utilised in the winter months by the cows and calves. Thus, the extra forage would subsidise the natural grazing and improve the overall carrying capacity of the farm. Nevertheless, commercial producers in the more marginal areas of the country are urged to think of innovative ways to add value; otherwise, long-term sustainability will not be an achievable goal.

5.5 Recommendations for future research

For further research on the feasibility of different production systems, it is recommended that the following studies should be conducted:

- A comparison of detailed in situ (real) farm situations using the current research model, which would facilitate accurate outcomes
- An evaluation of the feasibility of using different breeds in each production system

- An evaluation of the feasibility of value-adding branding by including Certified Angus Beef ® or grass-fed beef, for example
- An exploration of the feasibility of a feedlot farming or an accelerated ox programme
- An exploration of the feasibility of using registered stud cattle in combination with an ox programme to add value

REFERENCE LIST

AMT. 2021. *Weekly livestock report: 29 November 2021*. *https://nahf.co.za/wp-content/uploads/48-AMT-Weekly-Livestock-Report-No-48-2021.11.29-up4mlc.pdf* Date of access: 07 Dec. 2021.

BFAP (Bureau for Food and Agricultural Policy). 2015. *Baseline agricultural outlook 2015–2024.* http://www.bfap.co.za/wp-content/uploads/2018/08/bfap_baseline_2014.pdf Date of access: 08 Oct. 2020.

BFAP (Bureau for Food and Agricultural Policy). 2021. *Baseline agricultural outlook 2021–2030*. https://www.bfap.co.za/wp-content/uploads/2021/09/BFAP-Baseline-2021.pdf Date of access: 07 Dec. 2021.

Berkhout, N. 2019. *South Africa: Imports dominate poultry market.* https://www.poultryworld.net/Meat/Articles/2019/10/Case-study-Imports-dominate-South-African-poultry-market-491074E/#:~:text=Increased%20reliance%20on%20poultry%20imports&text=Frozen%20bone%2Din%20chicken%20and,EU%20(12%25%20share). Date of access: 08 Oct. 2020.

DAFF (Department of Agriculture, Forestry and Fisheries). 2014. *Abstract of agricultural statistics 2014*. Pretoria, South Africa: Resource Centre, Directorate: Communication Services.

DAFF (Department of Agriculture, Forestry and Fisheries). 2015. *Abstract of agricultural statistics 2015*. Pretoria, South Africa: Resource Centre, Directorate: Communication Services.

DAFF (Department of Agriculture, Forestry and Fisheries). 2016. *Abstract of agricultural statistics 2016*. Pretoria, South Africa: Resource Centre, Directorate: Communication Services.

De Jong, J. & Phillips, L. 2013. South Africa’s beef industry: what does the future hold? *Farmer’s Weekly*, 31 Aug, 2013.

De Wet, P.S. 2018. *A Financial Evaluation of RFID Technology in Sheep Feedlots.* Bloemfontein: University of the Free State. (Magister Agriculturae).

https://scholar.ufs.ac.za/bitstream/handle/11660/10149/DeWetP.pdf?sequence=1&isAllowed=y Date of access: 07 Oct. 2020.

Farmer's Weekly. 2021. *What SA's red meat industry must fix before scaling up exports.* https://www.farmersweekly.co.za/opinion/by-invitation/what-sas-red-meat-industry-must-fix-before-scaling-up-exports/#:~:text=South%20Africa%20is%20a%20net,makes%20sense%20to%20increase%20exports Date of access: 22 Apr. 2022.

Foster, L.A., Fourie, P.J. & Neser, F.W.C. 2014. The profitability and production of a beef herd on transitional Cymbopogon-Themeda veld, receiving three different levels of lick supplementation. *South African Journal of Animal Science,* 44(5):31- 35.

Grobler, S.M. 2016. *Alternative management systems to increase beef production under extensive conditions.* Bloemfontein: University of the Free State. (Philosophiae Doctor). http://scholar.ufs.ac.za:8080/xmlui/bitstream/handle/11660/5400/GroblerSM.pdf?sequence=1&isAllowed=y Date of access: 08 Oct. 2020.

Hayes, A. 2020. *Internal rate of return*. https://www.investopedia.com/terms/i/irr.asp#:~:text=IRR%20is%20the%20annual%20rate,of%20annual%20return%20over%20time. Date of access: 08 Oct. 2020.

Hoffmann, W.H. 2010. *Farm modelling for interactive multidisciplinary planning of small grain production systems in South Africa.* Stellenbosch: Stellenbosch University. (Philosophiae Doctor). https://scholar.sun.ac.za/bitstream/handle/10019.1/5269/hoffmann_farm_2010.pdf?isAllowed=y&sequence=2 Date of access: 08 Oct. 2020.

IDC. 2018. *A Study on the potential product development for the commercialisation and value add to beef products*. https://www.idc.co.za/wp-content/uploads/2018/11/Beef-Study-Final-Report.pdf Date of access: 08 Oct. 2020.

Kenton, W. 2020. *Net present value*. https://www.investopedia.com/terms/n/npv.asp Date of access: 08 Oct. 2020.

KZNDARD (Kwa-Zulu Natal Department of Rural Development). 2019a. *Beef production*: *production systems.* https://www.kzndard.gov.za/guideline-documents/2-uncategorised/374-beef-production Date of access: 08 Oct. 2020.

KZNDARD (Kwa-Zulu Natal Department of Rural Development). 2019b. *Beef production: nutrition*. https://www.kzndard.gov.za/images/Documents/RESOURCE_CENTRE/GUIDELINE_DOCUMENTS/PRODUCTION_GUIDELINES/Beef_Production/Nutrition.pdf Date of access: 22 Apr. 2022.

Le Roux, P. 2020. *NWK arena: oorweeg alle opsies vir jou kudde.* https://www.nwkarena.co.za/2020/11/19/oorweeg-alle-opsies-vir-jou-kudde/ Date of access: 22 Apr. 2022.

Maré, F. 2020. *Trade opportunities do exist for the South African red-meat industry.* https://www.ufs.ac.za/templates/news-archive/campus-news/2020/december/understanding-the-red-meat-export-markets Date of access: 22 Apr. 2022.

Maree, C. & Casey, N.H. 1993. *Livestock Production Systems*. 1st edition. Pretoria: Agri-development Foundation

MeatCo Namibia. 2020. *Beef production systems.* https://www.meatco.com.na/news/714/Beef-Production-Systems/ Date of access: 22 Apr. 2022.

Meat Promotion Wales. 2021. *Beef finishing systems options for beef farms in Wales*. https://meatpromotion.wales/images/resources/Beef_finishing_systems_.pdf Date of access: 22 Apr. 2022.

Meissner, H.H., Scholtz, M.M. & Palmer, A.R. 2013. Sustainability of the South African livestock sector towards 2050. Part 1: Worth and impact of the sector. *South African Journal of Animal Science*. 43(3):282- 297.

NAMC (National Agricultural Marketing Council). 2021. *Input cost monitor: the story of meat and wool.* https://www.namc.co.za/wp-content/uploads/2021/04/Trends-in-selected-Agricultural-input-prices-March-2021.pdf Date of access: 22 Apr. 2022.

RMRD SA (Red Meat Research and Development of South Africa). 2020. *Research and development plan for the large and small stock meat industries in South Africa*. http://www.rmrdsa.co.za/REDMEATINDUSTRY/Scopeoftheindustry.aspx Date of access: 08 Oct. 2021.

Rutherford, N.H., Lively, F.O. & Arnott, G. 2021. A review of beef production systems for the sustainable use of surplus male dairy-origin calves within the UK. *Frontiers in Veterinary Sciences*, 27 April 2021.

Sage Journal. 2018. *Ensuring rigor in qualitative data analysis: a design research approach to coding combining NVivo with traditional material methods*. https://journals.sagepub.com/doi/full/10.1177/1609406918786362 Date of access: 08 Oct. 2020.

Saki, A. 2020. *Economic sustainability of extensive beef production in South Africa*. Stellenbosch: Stellenbosch University Faculty of AgriSciences. (Master of Science). https://scholar.sun.ac.za/bitstream/handle/10019.1/108214/saki_economic_2020.pdf?sequence=2&isAllowed=y Date of access: 08 Oct. 2020.

Scheepers, F. 2020. *Agri orbit: osboerdery: 'n handige opsie vir diversifikasie.* https://www.agriorbit.com/2022/osboerdery-n-handige-opsie-vir-diversifikasie/ Date of access: 22 Apr. 2022.

Spies, D.C. 2011. Analysis and quantification of the South African red meat value chain. Bloemfontein: University of the Free State. (Philosophiae Doctor). http://scholar.ufs.ac.za:8080/bitstream/handle/11660/1901/SpiesDC.pdf?sequence=1&isAllowed=y Date of access: 08 Oct. 2020.

Stats SA (Statistics South Africa). 2017. *Census of commercial agriculture, 2017.* https://www.statssa.gov.za/publications/Report-11-02-01/Report-11-02-012017.pdf Date of access: 22 Ap.r 2022.

Taovila, A. 2020. *Cash flow*. https://www.investopedia.com/terms/c/cashflow.asp Date of access: 08 Oct. 2020.

Van Marle, J. 1974. The breeding of beef cattle in South Africa: past, present and future. *South African Journal of Animal Science,* 4:297-304.

ANNEXURES

Annexure A: Ethics approval

NORTH-WEST UNIVERSITY ®
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Web: http://www.nwu.ac.za

Economic and Management Sciences Research
Ethics Committee (EMS-REC)

30 August 2021

Dr J Jordaan,
Per e-mail
Dear Dr Jordaan

EMS-REC FEEDBACK: 27082021
Student: Minnaar, JJ (28022009)(NWU-00074-21-A4)
Applicant: Dr J Jordaan - MBA

Your ethics application on, ***A feasibility of steers and oxen production system as a diversification mechanism in the 21st Century,*** which served on the EMSREC meeting of 27 August 2021, refers.

Outcome:

Approved as a minimal risk study. A number **NWU-00074-21-A4** is given for one year of ethics clearance.

Please note that the ethics approval of this application is subject to the Covid-19 protocols.

Kind regards,

Mark Rathbone

Digitally signed by Mark Rathbone
DN: cn=Mark Rathbone, o=North-West University, ou=Business management, email=mark.rathbone@nwu.ac.za, c=ZA
Date: 2021.08.31 10:20:25 +02'00'

Prof Mark Rathbone
Chairperson: Economic and Management Sciences Research Ethics Committee (EMS-REC)

1

Annexure B: Registration of thesis title

Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za

Higher Degree Administration
Tel: 018 299 2626
Email: 21711542@nwu.ac.za

10 November 2021

Dear Mr Minnaar

REGISTRATION OF TITLE

Note has been taken that you wish to submit your (mini-)dissertation/thesis for examination. The registered title as it must appear on the examining copies and on the title page of the final copies is indicated below. An example of your title page will be sent together with this letter.

Determining the feasibility of a steers-and-oxen-beef production system in South Africa

The above-mentioned title may under **no circumstances** be changed without consulting your supervisor and obtaining the approval from the relevant committee in the mentioned faculty, in regard of which this office must be furnished with the latest approved title.

In the instance that you wish to submit for examination, please inform your supervisor/promoter accordingly. *Also ensure absolute adherence to the prescripts of A Rule 4.10 for the submission of a Master's study and of A rule 5.10 for the submission of Doctoral thesis.*

Please notify me and your supervisor/ promoter if you are unable to submit for examination, as this would affect the schedule of your examiners expecting your copy for examination.

Your attention is drawn to the following matters regarding the above.

- You may submit your examination copies from **20 September 2021 to 10 December 2021, to possibly qualify for the May/June graduation ceremony in 2022.**
- **Submissions received after 10 December 2021 will be considered in time for examination towards possible graduation during the July/August 2022 graduation series and re-registration for 2022 will be required.**

You are required to submit your examination copy in the following format:

- **One electronic copy in Word format and one electronic copy in PDF format to be submitted in a drop box created for you for this purpose on the eFundi website on Higher Degrees MBA - 2021. You may also submit via email, or in person, over the counter to an HDA official.**

The following forms must be submitted with your examination copies:

- **The signed Solemn Declaration form**
- **TurnItIn report (Only the summary)**
- **Copy of your ID**
- **Personal particulars form (only applicable for PhD students)**

1

Please visit the DIY Student 360º to ensure that your personal details are correct.

Visit the Personal Detail on DIY to update your information. Please update your courier address to ensure that your degree certificate will be sent to the correct address after a ceremony.

Please visit the overview tab on eFundi HIGHER DEGREE – MBA 2021 for more information with regards to submission.

For ease of reference, herewith a reference to the following useful resources:

- General Academic Rules (A-Rules):
- Manual for Master's and Doctoral Studies:
- Policy on academic integrity:
-

I trust you find the above in order. Please do not hesitate to contact the undersigned for any more related information.

Yours sincerely

Ms N Blom
for REGISTRAR

Original details: (10812187) M:\HDA Toolbox\Phase 2\1 Title Registration\Title registration letter.docm
22 February 2018

File reference: 7.1.11.1

Annexure C: AMT Weekly Livestock Report

AMT

SETTING THE TREND

Weekly Livestock Report
#48
29 November 2021

www.amtrends.co.za

Inquiries:
Cell: 073 140 2698
E-mail: info@amtrends.co.za

Annexure D: AMT Beef Weekly Market Report

BEEF

AMT Weekly Market Report

SETTING THE TREND

Live Weaner	A2/A3	C2/C3
R41.14 PER KG (LIVE)	R54.24 per kg	R47.11 per kg

Market feel:

Demand is staying on a higher level which is supporting prices that remain relatively stable on a higher level. Weaner prices increased the past week due to lower availability. It is expected that the weaner price can trend sideways over the short term and gain some support in December again. A and C grade prices can remain on a sideways/upward trend as we move towards the end of the year.

Beef (Excl VAT) - Producer selling prices in c/kg						Forecast
Week ending	27-Nov-20	29-Oct-21	12-Nov-21	19-Nov-21	26-Nov-21	03-Dec-21
Class A2/3	4984	5310	5376	5430	5424	5437
Class AB2/3	4826	5269	5260	5264	5263	5271
Class B2/3	4521	5040	5020	5102	5032	5038
Class C2/3	4385	4625	4570	4788	4711	4720
Weaners (200-240kg) (R/kg)	38.85	40.17	40.08	40.64	41.14	41.04
Feedlot hides (green) (R/kg)	2.56	4.20	3.89	4.03		
Veld hides (green) (R/kg)	2.14	3.86	3.58	3.87		

Price movements

Weaners - The price is 1.24% higher compared to the previous week, 2.43% higher than a month ago and 5.91% higher than last year the same time. Based on historic trends, the price can trend downward over the coming week.

A2/3 - The price is 0.10% lower compared to the previous week, 2.15% higher than a month ago and 8.83% higher than last year the same time. Based on historic trends, the price can trend upward over the coming week.

C2/3 - The price is 1.61% lower compared to the previous week, 1.86% higher than a month ago and 7.43% higher than last year the same time. Based on historic trends, the price can trend upward over the coming week.