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Cost Considerations for Rooibos Tea Production System Planning

by
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Declaration

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Summary

Rooibos tea, *Aspalathus linearis*, is an endemic subshrub to South Africa and is the only plant in the *Aspalathus* genus with an economic value. The production cycle of Rooibos tea is nine years with an average of four harvests. Production of Rooibos tea is semi-intensive and a crucial consideration for producers is production cost due to relatively low yields. Since there is significant variation in farm types, yields, farming orientation, mechanisation and limited alternative enterprise selection, there is a lack of understanding of the full cost of tea production.

The aim of this study is to determine the break-even yield for Rooibos producers in areas to improve the decision-making process to produce more cost-effectively. One of the characteristics of the Rooibos industry is recurring cycles where there is a shortage in the market for Rooibos tea which leads to high prices, this is followed by an increase in production, which leads to an oversupply in Rooibos tea and low to very low prices in the market. Therefore, the research question is what are the design criteria and implementation ability of a financial decision support tool to measure the impact of different production processes and yields on the production cost of cultivated Rooibos tea? The research techniques used include enterprise budgets, a literature study and gathering secondary data. In the process, a Rooibos tea cost calculator in Excel is created to calculate the total production cost per kilogram of dried tea produced and to calculate the break-even yield in terms of wet Rooibos tea harvested.

First, an understanding of the Rooibos tea production process was needed to create the model. The understanding was formed by having discussions about the production process and how the industry works. Implementing the concept of activity-based costing and the equations to determine the break-even point, the model is created. In order to ensure the model is user-friendly it was used in different rounds of testing to identify possible problems.

In this research project, there is a comparison of three different Rooibos production areas namely Clanwilliam, Sandveld and Tierberg to illustrate the difference in locations, soil composition, climate, planting density, yield, and production cycles. This is followed by a comparison between the total allocated production cost per hectare and the total cost per hectare. In the different areas, the total cost per hectare for 2023 is R6 219,35 in Clanwilliam, R4 108,18 in the Sandveld area, and in the Tierberg area, the cost is equal to R8 275,29 per hectare. The average cost per kilogram between 2021 and 2023 is equal to R23,20 in Clanwilliam, R28,79 in the Sandveld, and R33,48 in the Tierberg area. Only in Clanwilliam in 2023 was a producer able to break even.

The main conclusions of the research project are that a deeper understanding of the production process is evident in the model construction and that the activity-based costing principle, and the inclusion of break-even analysis are useful attributes.

Opsomming

Rooibostee, *Aspalathus linearis*, is ‘n endemiese substruik in Suid-Afrika en is die enigste plant in die Aspalathus-genus met ‘n ekonomiese waarde. Die produksiesiklus van Rooibostee is nege jaar met ‘n gemiddeld van vier oeste. Produksie van Rooibostee is semi-intensief en ‘n deurslaggewende oorweging vir produsente is die produksiekoste as gevolg van die relatief lae opbrengste. Aangesien daar aansienlike variasie in plaastipes, opbrengste, boerdery-oriëntasie, meganisasie en beperkte alternatiewe ondernemingskeuse is, is daar ‘n gebrek aan begrip van die volle koste van teeproduksie.

Die doel van hierdie studie is om die gelykbreekopbrengs vir Rooibosprodusente in gebiede te bepaal om die besluitnemingsproses te verbeter deur om meer kostedoeltreffend te produseer. Een van die kenmerke van Rooibosbedryf is die herhalende siklusse waar daar ‘n tekort in die mark vir Rooibostee is wat aanleiding gee tot hoër pryse. Dit gee aanleiding tot ‘n toename in produksie wat lei tot ‘n ooraanbod in die mark en ‘n daling in die prys. Daarom is die navorsingsvraag wat is die ontwerpskriteria en implementeringsvermoë van 'n finansiële besluitnemingsondersteuningsinstrument om die impak van verskillende produksieprosesse en opbrengste op die produksiekoste van gekweekte Rooibostee te meet? Die navorsingstegnieke wat gebruik word, sluit in ondernemingsbegrotings, 'n literatuurstudie en die insameling van sekondêre data. In die proses word 'n Rooibosteekostemodel in Excel geskep om die totale produksiekoste per kilogram gedroogde tee geproduseer te bereken en om die gelykbreekopbrengs te bereken in terme van nat Rooibostee wat geoes is.

Eerstens is 'n begrip van die Rooibosteeproduksieproses nodig om die model te skep. Die begrip is gevorm deur gesprekke te voer oor die produksieproses en hoe die bedryf werk. Met die implementering van die konsep van aktiwiteitsgebaseerde kosteberekening en die berekening om die gelykbreekpunt te bepaal, is die model geskep. Om te verseker dat die model gebruikersvriendelik is, is dit in verskillende rondtes getoets om die moontlike probleme te identifiseer.

In hierdie navorsingsprojek is daar 'n vergelyking getref tussen drie verskillende Rooibos-produksiegebiede naamlik Clanwilliam, Sandveld en Tierberg om die verskil in liggings, grondsamestelling, klimaat, plantdigtheid, opbrengs en produksiesiklusse te illustreer. Dit word gevolg deur 'n vergelyking tussen die totale toegekende produksiekoste per hektaar en die totale koste per hektaar. In die verskillende gebiede is die totale koste per hektaar vir 2023 R6 219,35 in Clanwilliam, R4 108,18 per hektaar in die Sandveld-omgewing, en in die Tierberg-omgewing is die koste gelyk aan R8 275,29 per hektaar. Die gemiddelde koste per kilogram tussen 2021 en 2023 is gelyk aan R23,20 in Clanwilliam, R28,79 in die Sandveld, en R33,48 in die Tierberg-omgewing. In 2023 kon slegs die produsent in die Sandveld-omgewing gelykbreek.

Die hoofgevolgtrekkings van die navorsingsprojek is dat 'n dieper begrip van die produksieproses duidelik is in die modelkonstruksie en dat die aktiwiteitsgebaseerde kostebeginsel, en die insluiting van gelykbreek-analise nuttige eienskappe is.

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LDV: Light-duty vehicles

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Chapter 1: Research Proposal

1.1 Background

Aspalathus, the genus, is made up of more than 270 species of which most are prevalent in the Cape Floristic Region (CFR) (Joubert & de Beer, 2011:869). CFR is a unique region for three reasons: being a biological region of global significance, being the smallest of the six floral regions, and the only one entirely within a single country, namely South Africa (Younge & Fowkes, 2003:15). Of the 9 000 plant species, at least 70% cannot be found anywhere else on earth (Younge & Fowkes, 2003:15).

Rooibos, *Aspalathus linearis,* is part of the *Aspalathus* genus (Joubert & de Beer, 2011:869). In South Africa, comprising about 280 species, *Aspalathus* L. is the largest genus of Fabaceae, with most of the species found in the Western Cape (Stirton & Muasya, 2016:35). *Linearis* is a reference to the needle-like leaves found on the plant (Rooibos Council, 2020:5). Rooibos is the only species in the genus that has an economic value (Cupido, 2005). Rooibos tea is an erect, slender-stemmed subshrub that can reach a height of between 1.35-2m (Morton, 1983:165). The plant consists of a strong taproot that can reach depths of 2m or more, red-brown branches about 60cm long, linear, needle-like leaves of 2-6cm, and flowers that are mainly yellow (Morton, 1983:165). Each seedpod contains one tiny seed which is released when the pod splits open (Barends-Jones, 2020:5). The average lifespan of the rooibos plant is six years, with an average of four harvests (Rooibos Council, 2020:5). It is important to allow a rest period of two to three years before planting again, allowing the soil to rejuvenate itself (Rooibos Council, 2020:5). Producers tend to plant grains such as barley, oats, or triticale during these rest periods to increase the nutrients available in the soil.

The tea can either be harvested from wild tea or cultivated plants (Barends-Jones, 2020:5). The average lifetime yield of a rooibos plant is 1 800 kg/ha over its total lifetime (Rooibos Council, 2020:5). The term "Rooibos" refers to the traditional fermentation process that takes place due to oxidation (Rooibos Council, 2020:5). During this process the colour of the leaves changes from green to brown, and a change in the phenolic composition occurs (Marini, de Beer, Walters, de Villiers, Joubert & Walczak, 2017:115). The fermented Rooibos tea has a sought-after sensory characteristic with a slightly woody, honey-like, herbal-floral flavour, subtle astringency, and a slightly sweet taste (Marini *et al*., 2017:115; Joubert & Schulz, 2006:139).

The structure of the South African Rooibos Industry can be divided into three levels: the farm level, processing level, and trade level (Barends-Jones, 2020:16). At the farm level, primary production and activities related to the tea drying court are performed (Barends-Jones, 2020:16; Department of Agriculture, Forestry and Fisheries, 2016:20). At the tea court, the raw material is cut and fermented (Department of Agriculture, Forestry and Fisheries, 2016: 20). Processing happens at the second level and consists of the following activities: the cut tea is steam pasteurised, graded, sieved, and de-dusted (Barends-Jones, 2020:16; Department of Agriculture, Forestry and Fisheries, 2016:20). Lastly, the tea is packed into different products; tertiary-level processing is also known as the marketing stage (Department of Agriculture, Forestry and Fisheries, 2016:20).

At the beginning of the 20th century, Rooibos tea had no commercial value, but thanks to Benjamin Ginsberg, who began to market Rooibos tea, it is now consumed locally and internationally (Joubert & de Beer, 2011:869; Morton, 1983:164). During World War II a shortage of Oriental tea occurred, leading to an increased demand for Rooibos tea. Due to a shortage of high-grade seeds, more inferior grades were marketed (Mourton, 1983:168). With the establishment of the Clanwilliam Tea Cooperative in 1948 and the formation of the Rooibos Tea Control Board in 1954, the industry was stabilised (Barends-Jones, 2020:5). Due to the increased global demand for Rooibos tea, wild-harvested rooibos supplies declined while commercial monotypic cultivation increased (Le Roux, Keet, Mutiti & Ellis, 2017:87).

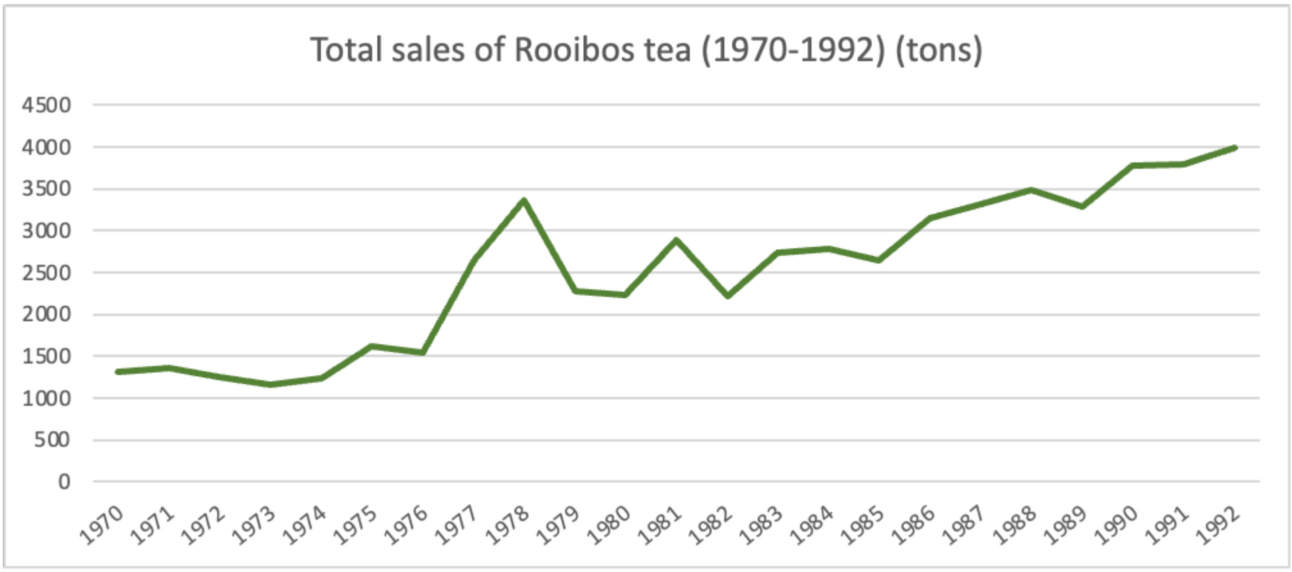

Figure 1.1: Total Sales of Rooibos Tea (tons) (1970-1992)
Adapted from: Joubert & de Beer (2011)

Figure 1.1 shows an upward trend in the total sales of Rooibos tea in tons between 1970 and 1992. This represents both local and export data. The dramatic decline observed after 1979 was due to three disastrous seasons. Following a severe drought and flooding in 1980, a fungus disease had an impact on the availability of Rooibos tea (Morton, 1983:168).

South African Rooibos is exported to more than 60 countries worldwide, with the biggest importers being Germany, Japan, the Netherlands, the United States of America and the United Kingdom (Rooibos Council, 2020).

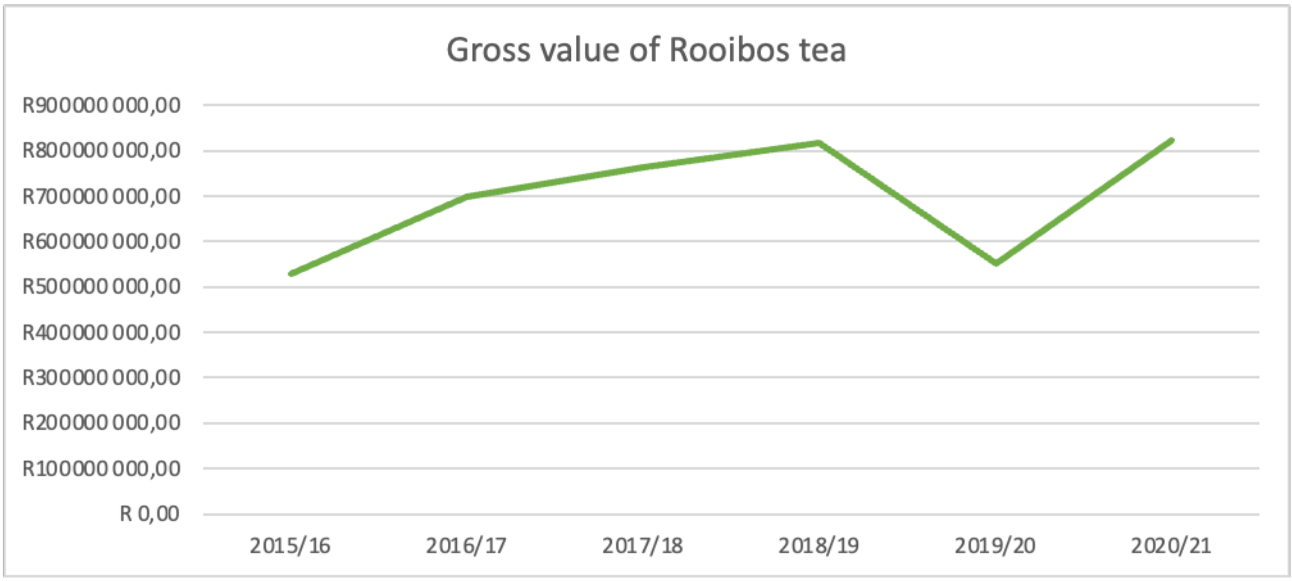

Figure 1.2: Gross Value of Rooibos Tea
Adapted from the Department of Agriculture, Land Reform and Rural Development (2022:77)

Figure 1.2 is a graphical illustration of the gross value of Rooibos tea from 2015 to 2021. Steady growth in the gross value took place from 2015/16 to the 2018/19 season. The decrease in the gross value of Rooibos tea in the 2019/20 season can also be seen in Figure 1.3. A decrease in price due to an oversupply of Rooibos tea in the market and good rains can be linked to the decrease in the gross value of Rooibos tea in 2019/20.

With the rise in popularity, the term Rooibos was protected in 2013 when the South African government published the final Merchandise Marks Act 17 of 1941 (Republic of South Africa. 2013) prohibition notice in the Government Gazette on the rules and the labelling of Rooibos products. Section 15(1) of the Merchandise Marks Act (911/2013) states that the name Rooibos can only be used to refer to the extract, infusion, or dry product that is 100% pure Rooibos that has been wild-harvested or cultivated in the specified geographic area (Republic of South Africa. 2013).

On May 31, 2021, Rooibos/Red Bush was registered as a product of protected designation of origin and protected geographical indications established by Article 11 of Regulation of the European Union (No. 1151/2012). The area where harvesting in the wild and cultivation, drying and fermenting can occur is determined by two criteria. Firstly, it must be in the fynbos biome and, secondly, within the winter rainfall area of South Africa (European Union, 2020:48). The reason for the limitation on the geographical region is that the specific composition and taste are directly related to where it is grown (European Union, 2020:48). When the weather gets hotter and drier, the accumulation of polyphenols takes place, influencing the taste (European Union, 2020:48). If the weather does not get hotter and drier at the end of the season, less polyphenol accumulates. Antioxidants consist of reducing agents that include polyphenols, vitamin E, vitamin C and carotenoids (Tapiero, Tew, Nguyen Ba & Mathé, 2002:200). These reducing agents protect the body's tissues against associated pathologies such as coronary heart disease, inflammation, cancers and oxidative stress (Tapiero *et al.,* 2002:200).

Rooibos tea production is semi-intensive, and due to relatively low yields, the production cost is a crucial consideration for producers. Due to significant variations in farm types, yields, farming orientation, mechanisation and limits to alternative enterprise selection, there is a need for a better understanding of the full cost of Rooibos tea production. Producers tend to focus on the year-to-year cost and not the full production cycle. Thus, a full-cost framework and benchmark tool will assist producers in learning from each other, a natural way of improving industry-wide efficiency.

This study is essential due to the fluctuations in the price of the Rooibos tea market. One of the characteristics of the Rooibos industry is the recurring cycles where there is a shortage in the market leading to high prices, followed by an increase in production, which leads to an oversupply and low to very low prices (Joubert & de Beer, 2011:872). There are many instances that illustrate this argument. The price was at a record high in 2004 at R16.00 per kilogram, but after a steady decline in price, it was equal to only R4,50 per kilogram in 2010 (Joubert & de Beer, 2011:872). This farm gate price was last observed eleven years earlier, in 1999 (Joubert & de Beer, 2011:872). Figure 1.3 illustrates the fluctuations of Rooibos tea produced per kilogram. In 2014, the price per kilogram increased from R14,11 to R53,40 in 2018. The price again decreased between 2018 and 2022 to a low of R14,20 per kilogram. Droughts are usually the reason for shortages resulting in a change in the price (Joubert & de Beer, 2011:872). Between 2015 and 2017, the Western Cape had below-average rainfall, which resulted in the worst drought since 1904 (Otto, Wolski, Lehner, Tebaldi, van Oldenborgh, Hogesteeger, Singh, Holden, Fučkar, Odoulami & New, 2018:1). Oversupply is another contribution to lower prices. Lower prices were achieved at the farm level during 2006, 2007 and 2008. The low prices were due to record harvests of 10 000 tons in 2006, 14 000 tons in 2007 and 18 000 tons in 2008 (Joubert & de Beer, 2011:872).

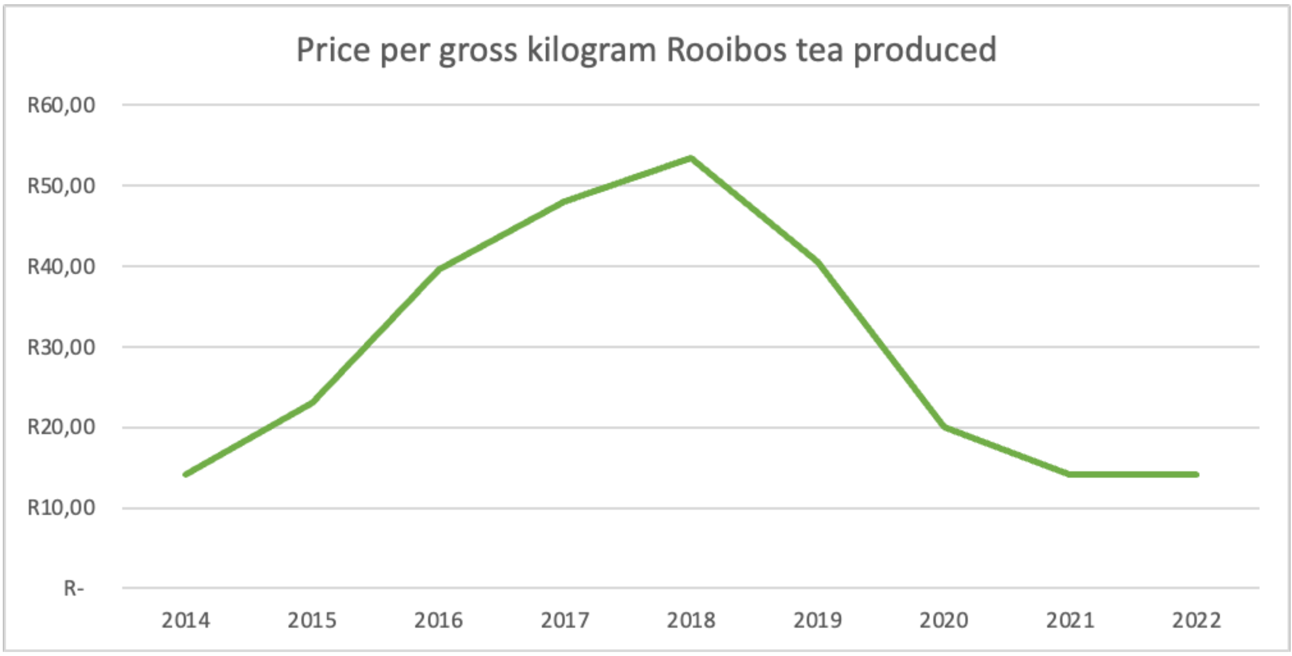

Figure 1.3: Price Per Gross Kilogram of Rooibos Tea Produced
Adapted from: Harris (2022)

1.2 Problem Statement and Research Question

With this in mind, it is clear that research regarding the break-even yield for Rooibos tea producers in different regions is required. This should improve producers' decision-making processes to produce more cost-effectively. Costing will play an essential part in designing the criteria for decision-making. This will enable producers to improve their planning for the future by creating different scenarios to see what impact certain decisions will have on production cost and yield, for example, the decision to plant or, rather push for another year of production.

The main research question for this project is: what are the design criteria and implementation ability of a financial decision support tool to measure the impact of different production processes and yields on the production cost of cultivated Rooibos tea?

1.3 Objectives of the Research

The objective of this research thesis is to develop and demonstrate the use of a financial decision support tool to calculate the financial effects of various Rooibos tea production procedures and yield on production costs for specific areas.

In support of the main aim, the following objectives are set:

- To determine the activities involved in producing Rooibos tea for each phase of the cycle.
- To determine the cost of each activity involved in the production process.

- To assess the three areas of production.
- To construct a farm-level budget model that integrates the production processes with the resulting financial implications of changes to these parameters.
- To determine the financial break-even point for Rooibos tea production cycles in the different areas of production.

1.4 Proposed Method

A literature study, discussion to identify focus areas, and financial budgeting in the form of an enterprise budget will be performed. The information retrieved from the literature study and secondary data will help determine the different activities in the production process. Although representative farm enterprise budgeting models are available, practices have changed significantly. Industry norms and standard machine costing principles will be used to calculate the cost of each activity over the span of a typical production cycle of about nine years.

All the costs for producing Rooibos tea are to be investigated by using enterprise budgets that will be activity-based; the cost of each activity and when the activity takes place will be measured against a baseline to see the difference it makes when a decision takes place and if it influences the yield and profit made by a producer. Each activity influences the break-even yield. Therefore, research techniques include enterprise budgets, a literature study and gathering secondary data.

1.5 Structure of the Study

Chapter one creates a background for why there is a need for this research to be undertaken. It takes a look at the history of the Rooibos industry in South Africa and the current problems producers experience. Chapter two is a literature study that will cover the following topics: break-even analysis, activity-based costing, an overview of Rooibos tea cultivation and Rooibos tea production processes, standards and certification, Rooibos tea production regions, and the Rooibos tea production process case study.

In Chapter three the Rooibos production cost calculator and the financial model created to determine the break-even yield of Rooibos tea production in certain areas will be discussed, expanding on the construction of the model followed by the layout of each sheet. Chapter four is an illustration of what a populated Rooibos production cost calculator will look like by using the case study to populate the model.

Chapter five discusses the differences in soil composition, climate, planting density, yield, production cycle and total cost per hectare between the three identified areas. The break-even analysis compares the break-even point between the areas, followed by the sensitivity analysis.

Chapter six is a summary of the study, stating the results, a conclusion and a recommendation for future research. This chapter will assist Rooibos producers with their decision-making process.

Chapter 2: Principles of Costing and Rooibos Tea Production

2.1 Introduction

The main aim of this research project is to determine the farm-level implications of different production processes for Rooibos tea in selected areas. Rooibos tea is an indigenous plant, farmed extensively and almost exclusively in areas and soils where higher-value crops are not feasible. Like most agricultural products in South Africa, the marketing of Rooibos tea was highly regulated, and producers were not exposed to the true challenges of marketing and productivity requirements. For this reason and the fact that Rooibos tea can be stored for long periods of time, the fine-tuned costing of tea production was neglected after the abolishment of the South African Rooibos Control Board. The Control Board is established to create order in the industry, and this led to a statutory one-channel, marketing system under the Marketing Act of 1937 (Hayes & Karaan, 2000:34). The Board was able, by law, to regulate the marketing and production of Rooibos tea by acting as the sole seller and sole buyer of Rooibos tea and prohibited the selling of Rooibos to any party without approval (Hayes & Karaan, 2000:34). The board was abolished on 1 October 1993, and after the abolishment no organisation dealing with matters of mutual concern existed before the establishment of the South African Rooibos Council (SARC) in 2005 (Joubert & de Beer, 2011:871). The SARC was established to coordinate activities relating to research and development, generic marketing, and sustainable resource management (Joubert & de Beer, 2011:871).

An attempt is made to construct a conceptual model for cost estimation that aims to measure the financial implications of alternative production decisions. The Rooibos tea production cycle includes an establishment year, year two, and the last year of removal, which does not contribute to income but has cost considerations. The years in between contributes as a source of income. A detailed understanding of the background is required to be able to construct a model to determine the break-even point of Rooibos tea production costs in different regions. First it should be explained how to calculate the break-even point, followed by how the model is created using activity-based cost analysis. The second component of this chapter involves an introduction to the Rooibos tea production process (a case study explanation) and the different Rooibos tea production regions.

2.2 Break-even Analysis

According to Taylor (2022:28), a break-even analysis can be defined as a type of modelling technique used to determine at what point zero profit will take place in physical units sold or produced. Walker (2007:87) defines the break-even point as the level of production where neither profit nor loss occurs. The break-even analysis has three components: cost, volume and profit (Taylor, 2022:29).

(9)

Total cost (TC) is all the costs of producing a service or good (Rutherford, 2013:599). In the short term, the total cost can be divided into two categories, namely fixed and variable costs, but in the long run, five years or longer, all costs are variable (Rutherford, 2013:599).

Equation 2.1: Total Cost

$$total\ cost = total\ fixed\ cost + total\ variable\ cost$$

or

$$TC = c_f + vc_v$$

Where: c_f = fixed cost

c_v = variable cost

v = volume

The Routledge Dictionary of Economics (2012:623) defines variable cost as "*a cost varying with the level of output*". Walker (2007:14) defines variable cost as a "*cost that varies with a measure of activity*". Therefore, when no production cost takes place, the variable cost will be equal to zero. Variable cost can be modelled according to one of three options, and the type of graph depends on the activity that takes place. For example:

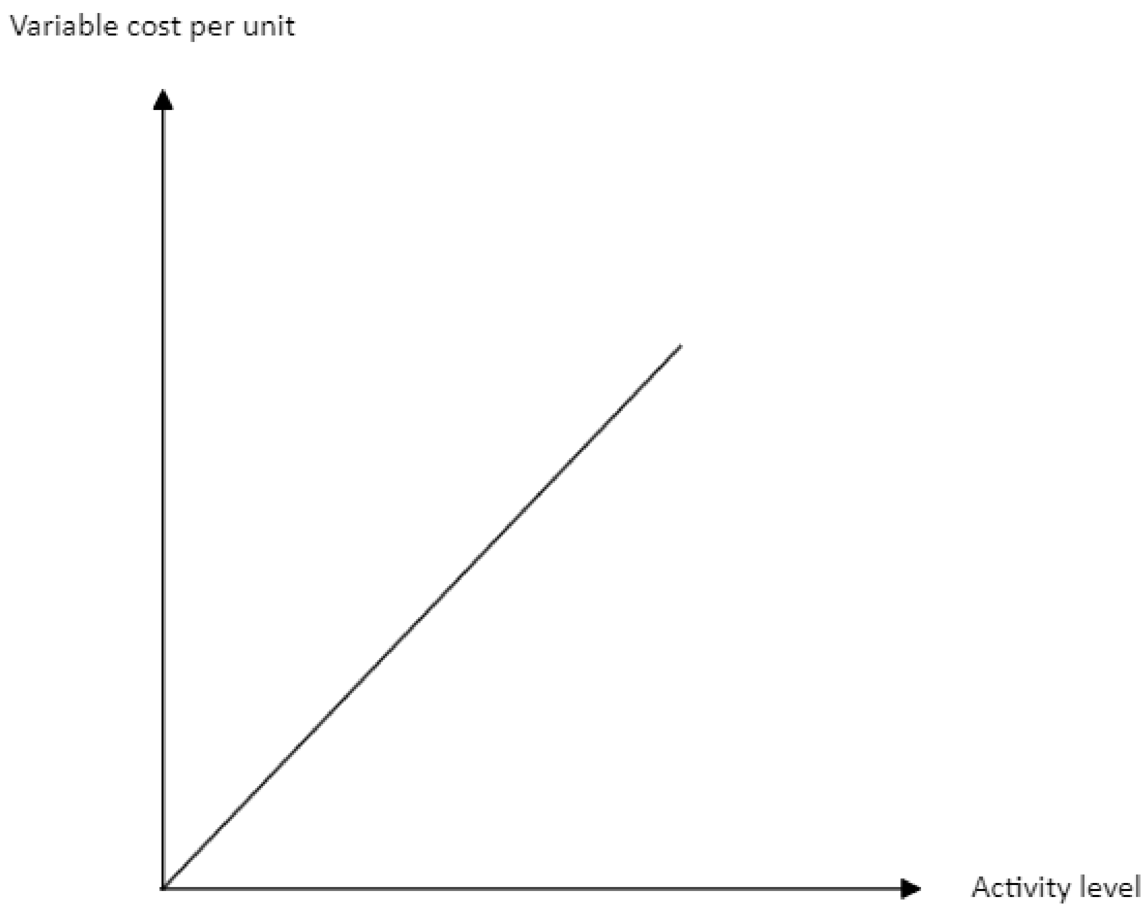

Figure 2.1: Linear Variable Cost Per Unit
Adapted from Walker (2007:14)

Figure 2.1 illustrates a linear variable cost graph. This graph shows that if no activity occurs, the variable cost equals zero. If activity increases by 20%, the variable cost will increase by 20%. The gradient of the line is dependent on the variable cost per unit (Walker, 2007:14).

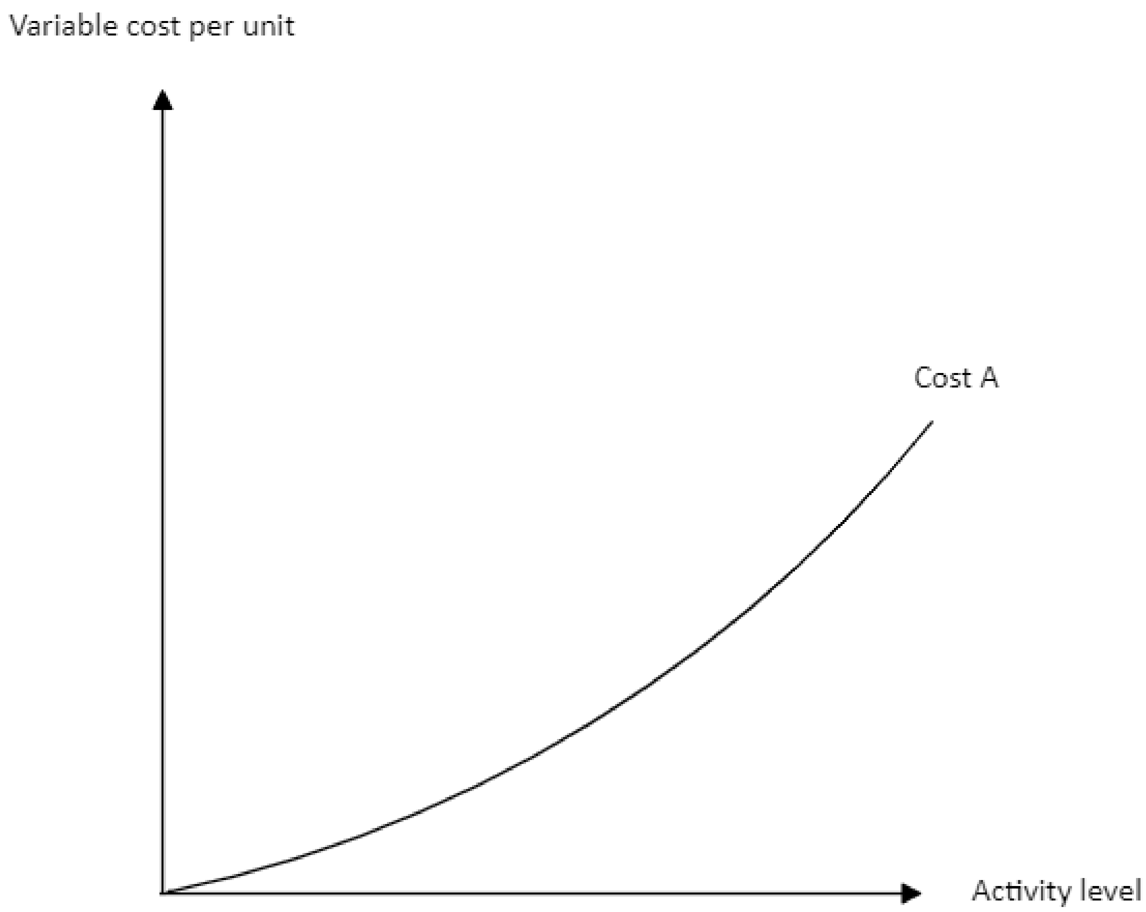

Figure 2.2: Non-linear Variable Cost Per Unit
Adapted from Walker (2007:15).

Figure 2.2 illustrates that with each consecutive unit of activity, the total variable cost increases in a non-linear or exponential fashion (Walker, 2007:15). An example of this type of cost is acquiring more units of direct labour.

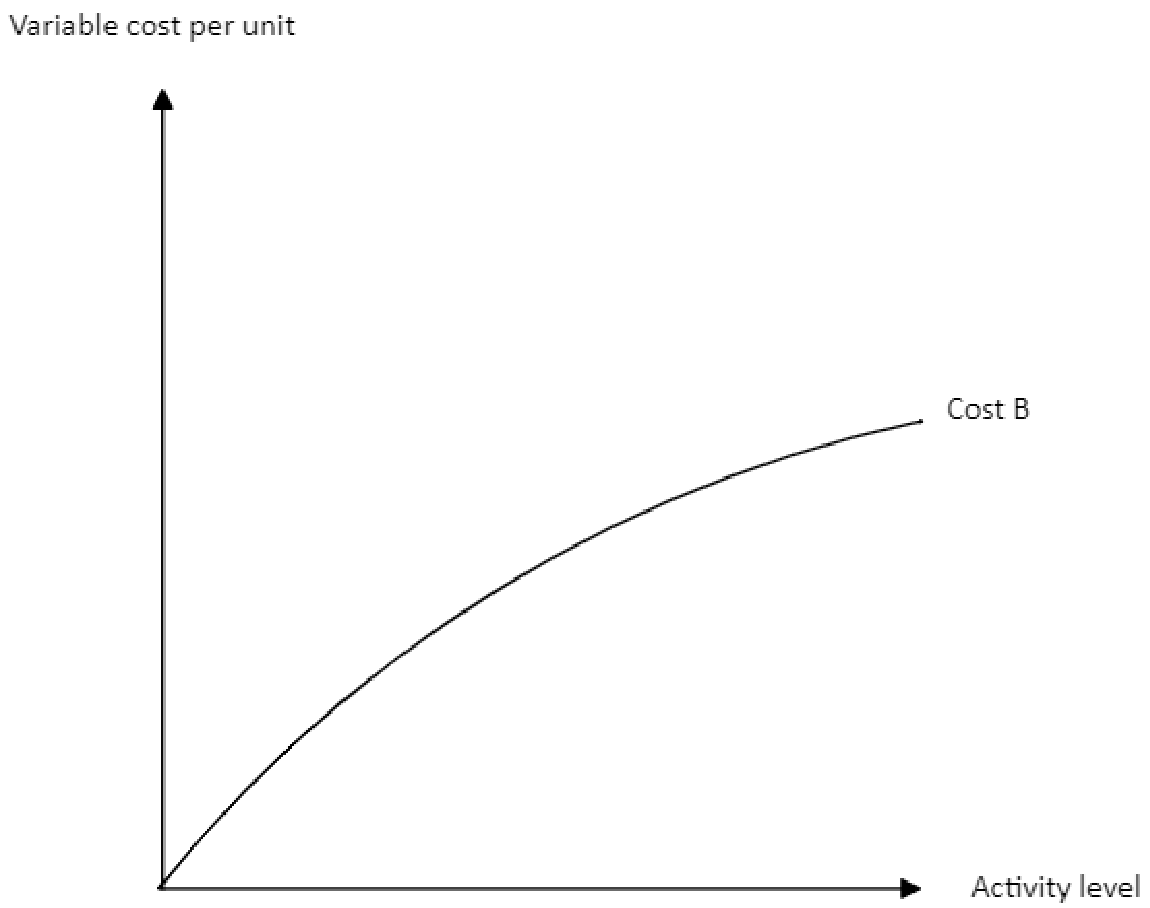

Figure 2.3: Non-linear Variable Cost Per Unit
Adapted from Walker (2007:15).

Figure 2.3 illustrates that with each additional unit produced, the total variable cost per unit of activity decreases (Walker, 2007:15). An example of this will be direct material where a quantity discount is possible, or in the case of economies of scale. According to Britannica Academic (2005), economies of scale occur when an increase in output leads to a reduction in the average cost of a product.

A fixed cost is incurred even when output is zero (Rutherford, 2013:224). Examples of fixed costs include items such as rent on equipment and plants, management and staff salaries, insurance, depreciation, and advertising (Taylor, 2022:29). It is the costs of factors of production and equipment that are contracted for a minimum period and over the long run, five years and longer, they become variable due to contracts that can be revised (Rutherford, 2013:224).

The second component, volume, can be expressed as the number of units produced and sold or as a percentage of total capacity (Taylor, 2022:29). In Equation 2.1, *v* is the volume (number of units) sold.

The last component is profit. Total revenue (TR) (Equation 2.2) is the income generated from selling a product or service. It is calculated as price multiplied by volume sold (Taylor, 2022:29). Profit (Z) is the surplus revenue over cost (Rutherford, 2013:479).

Equation 2.2: Total Revenue

$$TR = vp$$

Where: *p* = price per unit

Equation 2.3: Total Profit

$$total\ profit = total\ revenue - total\ cost$$
$$Z = vp - (c_f + vc_v)$$
$$Z = vp - c_f - vc_v$$

The break-even point can be calculated using Equation 2.3 when *Z* equals zero (Taylor, 2022:30). The break-even point creates a point of reference for a company to determine what quantity needs to be produced and sold to create neither profit nor loss.

The other formula used to determine the break-even point can be illustrated as follows (Tsorakidis, Papadoulos, Zerres & Zerres, 2008:6):

Equation 2.4: Break-even Point

$$BEP = \frac{Fixed\ Costs}{Selling\ Price - Variable\ Cost/unit}$$

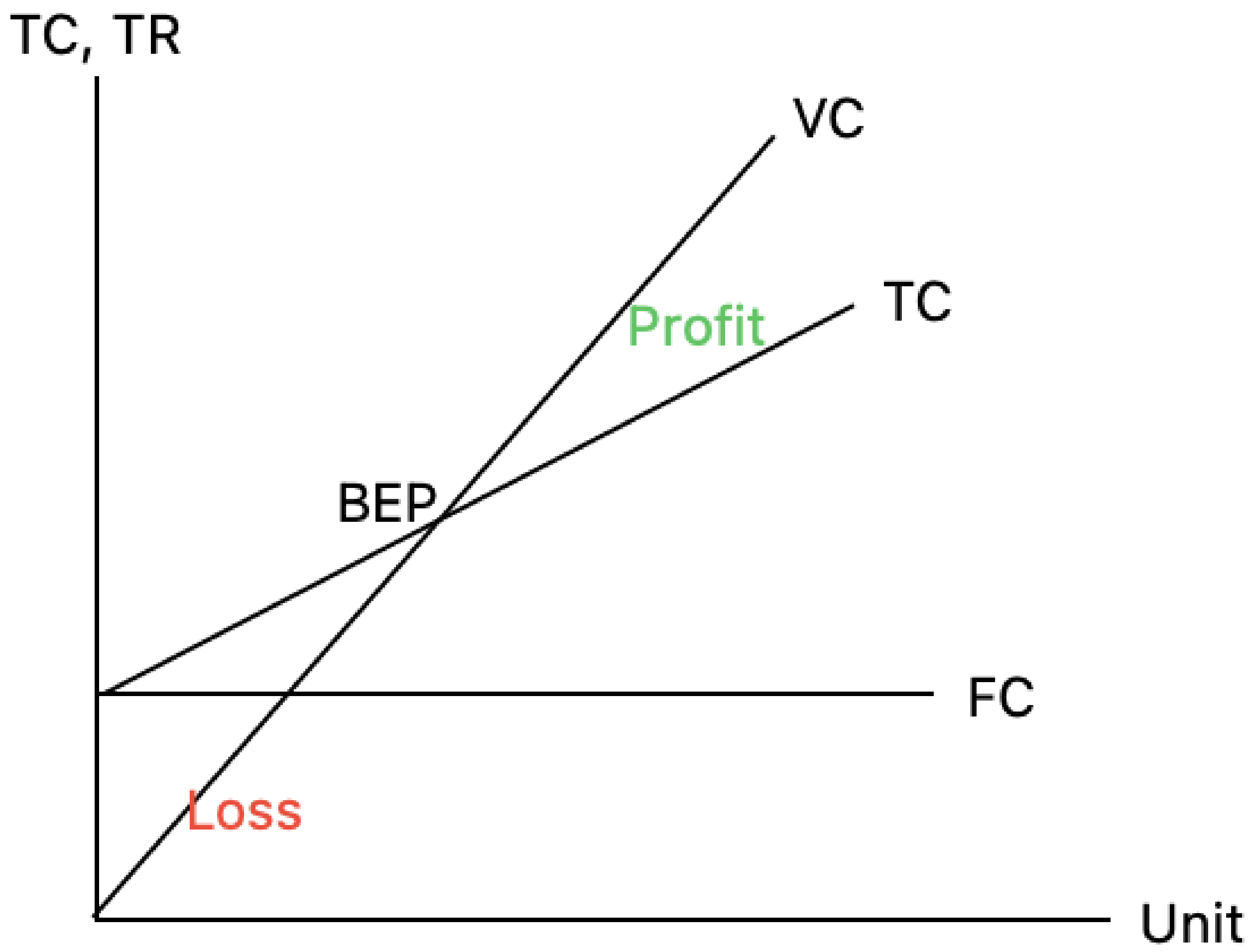

Figure 2.4: Break-Even Point Graph
Adapted from Tsorakidis *et al*. (2008:6).

2.3 Activity-based Costing

First introduced in the 1980s, activity-based costing (ABC) was used as a method to accurately measure all the business's costs and link them to the goods and services produced (Burton, 2011:15). There was a need for companies to move away from traditional cost accounting methods due to increased automation (Burton, 2011:15). More automation meant that there was an increase in overhead costs (Burton, 2011:15). Walker (2007:53) defines overhead costs as an expenditure on materials, and labour, or services that cannot be economically linked to a specific saleable cost unit. Rutherford (2013:439) defines overhead cost as "fixed costs to pay for the administration of an organisation". The level of output does not influence overhead costs. Overhead and indirect costs can be used interchangeably. Using the ABC method to analyse costs, it is possible for the producer to determine which actions create more profit or contribute to losses (Burton, 2011:15).

2.3.1 Activity-based Costing Definition

ABC assigns indirect costs incurred to services, products, or any other cost objects (Gosselin, 2006:641). Professors Kaplan and Cooper advocate ABC as a more accurate method to allocate common indirect costs to products (Milne & Milne, 2011:56). This cost accounting technique happens in two stages. First, all significant activities need to be identified by the organisation. Then the indirect costs need to be assigned to the different activities by the way the resources are consumed by the various activities (Gosselin, 2006:641). Secondly, indirect costs are allocated to activity cost pools or activities are assigned to services, products, or other cost objects in proportion to the amount of the cost driver consumed by each of them (Gosselin, 2006:641). Therefore, in the second stage of ABC, costs are allocated to the services, products, or any other cost objects in proportion to their consumption of this activity (Gosselin, 2006:641). Before the six steps of implementation are applied to a company, senior management must commit and plan properly to ensure the success of an ABC program (Burton, 2011:15).

2.3.2 Steps to Implement Activity-based Costing

According to Witherite and Kim (2006:31), there are four steps identified to implement ABC costing. The following paragraphs will be a discussion of the various steps.

2.3.2.1 Step 1: Identify and Classify the Activities Related to the Company's Products

The first step is to identify all the activities in all areas of the value chain (Witherite & Kim, 2006:31). A type of "activity dictionary" should be compiled. Activities can either be classified as unit-level, batch level, product level or facility level (Witherite & Kim, 2006:31). If resources or activities are performed specifically for an individual unit of service or product, it is a unit level activity (Witherite & Kim, 2006:32). Batch-level activities are resources acquired and activities performed to make a batch or group of similar products (Witherite & Kim, 2006:32). Activities and resources needed to produce and sell a specific service or good is identified as product level activities (Witherite & Kim, 2006:32). Facility-level activities and resources are those used to perform general capacity or produce goods (Witherite & Kim, 2006:32).

The reason for classifying activities and resources is to create accurate descriptions of how the activities take place and the resources needed (Witherite & Kim, 2006:32).

2.3.2.2 Step 2: Estimate the Cost of Activities Identified in Step 1

It is necessary to estimate the cost to perform each activity for activity-based accounting (Witherite & Kim, 2006:33). The associated cost should include the cost of human resources and the cost of physical resources, which include the associated cost of buildings and equipment (Witherite & Kim, 2006:33).

2.3.2.3 Step 3: Calculate a Cost-Driver Rate for Each Activity

The activity cost identified in step two is used to calculate the cost-driver rates the company should use for assigning activity cost to services and goods (Witherite & Kim, 2006:33). The cost-driver rate is the estimated cost of resource consumption per unit of the cost driver for each activity (Witherite & Kim, 2006:33).

2.3.2.4 Step 4: Assign Activity Costs to Products

The final step in the process is for the costs to be assigned using cost-driver rates for each activity of the product (Witherite & Kim, 2006:33).

2.3.3 Costing Principles Applied Within the Budgeting Practice

Budgeting is a written plan of future activities expressed in financial values (Louw & Standard Bank of South Africa Limited, 2017:187). It is especially useful to test for the expected effect of variables related both to the physical and biological production system and the financial outcome of farming. The physical production system consists of the various interrelationships that drive the production of outputs as well as the wide range of factors that affect these expected quantities. In the case of Rooibos tea there is a very direct relationship between the age of the tea bush and expected yield, weed management and yield, and pest management and yield. The financial system consists of the financial values, processes of inputs and outputs, interest rates and land, and other asset values. A budgeting system works exactly like a recordkeeping system, and the same cost allocation principles are applied, adhering to standard accounting principles. The effect is a financial model that shows the financial implications of various changes to the system, activities within the system, or expected fluctuations due to natural or economic variability.

2.4 Rooibos Tea Cultivation Overview

Initially, Rooibos was commercialised from wild-harvested plants (Stander, Brendler, Redelinghuys & Van Wyk, 2019:67). Benjamin Ginsberg, Pieter Lafras Nortier and Olof Bergh were the first to produce Rooibos tea on an industrial level (Stander *et al.*, 2019). In 1925 Bergh harvested large amounts of Rooibos on his farm in the Pakhuis Mountains (Stander et al., 2019). Nortier collected seeds in a valley called Grootkloof and in the Pakhuis Mountains, which are now known as the Redtea-type or the Nortier-type (Stander *et al*., 2019). At first, poor germination yields delayed commercial production, but by scouring the seeds before planting them in trays, Nortier found the germination yield increased (Stander *et al*., 2019).

Various types of the Rooibos tea plant exist, although only the red type is normally used for processing (Joubert & Schultz, 2006:138). The red type can be divided into the Nortier type, which is cultivated, or the wild-growing Cederberg type (Joubert & Schultz, 2006:138). Other varieties include the black, red-brown, and grey types of Rooibos tea, harvested in the wild for processing (Joubert & Schultz, 2006:138). By 1966 the marketing of the black and grey types of Rooibos tea was discontinued due to poor quality and the lack of the characteristic flavour of the red type (Joubert & Schultz, 2006:138).

Different types of propagation were experimented with. It showed that *in vitro* and cuttings had a low survival rate, whereas propagating plants from seeds had the best survival rate (Joubert & Schultz, 2006:138). Rooibos was adapted to grow in generally arid conditions (Rooibos Council, 2022:5). The roots can reach up to two metres or more underneath the surface, enabling them to reach water (Rooibos Council, 2022:5). In its natural habitat, the plant will reach heights of up to 1.5 metres (Rooibos Council, 2022:5). Cultivated plants generally reach lower heights between 0.5 and 1.5 metres, depending on the soil conditions, climate and age (Rooibos Council, 2022:5). The active growth cycle of the plant starts at the beginning of summer and increases towards the middle of summer. Winter rainfall is required for this summer's growth to start (Rooibos Council, 2022:5). The lifecycle of the plant is impacted by water availability, humidity, air temperature, latitude, slope angle and coarse sandy soil (Rooibos Council, 2022:5).

2.5 Rooibos Tea Production Process Overview

The seedlings, propagated from seeds, are planted between June and August (Joubert & Schultz, 2006:138). Approximately 8 000 to 10 000 seedlings are planted per hectare at a height of between 100 and 150 mm (Joubert & Schultz, 2006:138). After eight months, the plant is topped to stimulate branching (Joubert & Schultz, 2006:138). Some producers refer to this as the first harvest. After 18 months of growth, the first proper harvest takes place during the summer (Joubert & Schultz, 2006:138). After three years the plant is in full production, where it can yield between 70 and 125g of dry tea per fully-grown bush (Joubert & Schultz, 2006:138). The average lifetime yield of a plant is 1 800kg/ha over the full cycle that includes the growing and rest periods (Rooibos Council, 2022:5). The best harvest takes place four to five years after planting, and some bushes start to die in year seven (Joubert & Schultz, 2006:138). The average lifespan of the plant is six years, with an average of four harvests (Rooibos Council, 2022:5). It is considered good agricultural practice to allow the fields to rest for a period of two to three years before replanting with Rooibos (Rooibos Council, 2022:5).

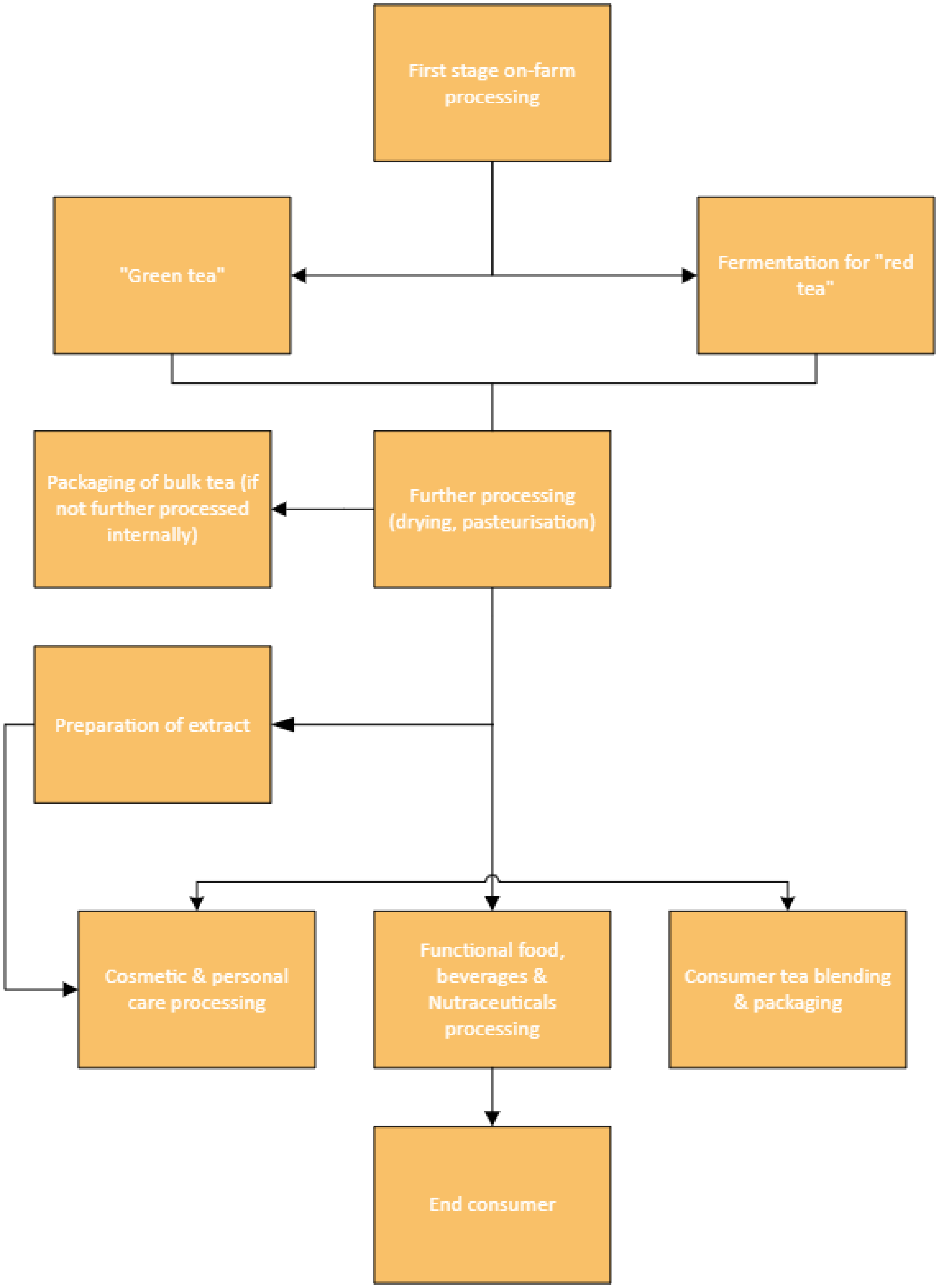

Figure 2.5: Rooibos Tea Processing Stages
Adapted from: Department of Agriculture, Forestry and Fisheries (2016:21).

Harvesting traditional rooibos tea starts in the summer and lasts until early autumn (Joubert & Schultz, 2006:138). This is done either manually or mechanically by cutting the bushes a few centimetres above the topping line (Joubert & Schultz, 2006:138). If any flowers are present, it gives the tea an unpleasant flavour (Joubert & Schultz, 2006:138). According to Figure 2.5, this is the first level of the processing stages.

Level two, presented in Figure 2.5, depends on whether the tea is sold as “green tea”, without fermentation or as red tea after the fermentation process is completed. Unfermented Rooibos or green Rooibos is harvested, cut, and dried promptly (Rooibos Council, 2022:5). Research shows that green Rooibos, compared to fermented Rooibos, has a higher antioxidant capacity (Joubert & Schultz, 2006:139).

The fermentation process of Rooibos starts with shredding the shoots into three-to-four-millimetre lengths, placing them in a “fermentation” heap and bruising either by hand or machine (Joubert & Schultz, 2006:139). Water follows with another round of bruising and mixing. During the night fermentation occurs, and the following morning, the heap is spread open to dry in the sun (Joubert & Schultz, 2006:139).

The fermentation process is essential in changing the aroma of the wet tea from grassy, hay-like to honey-caramel, sweet or apple-like to sour (Joubert & Schultz, 2006:139). The sour aroma is an indication of overfermentation (Joubert & Schultz, 2006:139). As soon as the tea has the characteristic red-brown colour and sweet, honey-like aroma, it is spread open on the court in a thin layer to dry in the sun (level three, Figure 2.5) (Joubert & Schultz, 2006:139). Figure 2.6 shows the Rooibos aroma wheel. This is a visual representation of all the Rooibos tea aromas and indicates whether the taste is positive or negative. The wheel is also used in the grading of tea.

To accelerate drying and breaking up any lumps, brushing is done (Joubert & Schultz, 2006:139). A negative aspect of brushing is the large quantities of tea dust that form and have to be separated by sifting later (Joubert & Schultz, 2006:139). Once the required fine cut is obtained, it is steam-pasteurised to ensure the tea meets the necessary microbial standards (Joubert & Schultz, 2006:139).

Once further processing is done, the tea can follow a variety of routes, namely the preparation of extract, extract or fine-cut tea used for cosmetic and personal care, fine-cut tea used for consumer tea blending and packaging, functional food, beverage and nutraceutical processing. All these products are produced to satisfy the needs of the consumer.

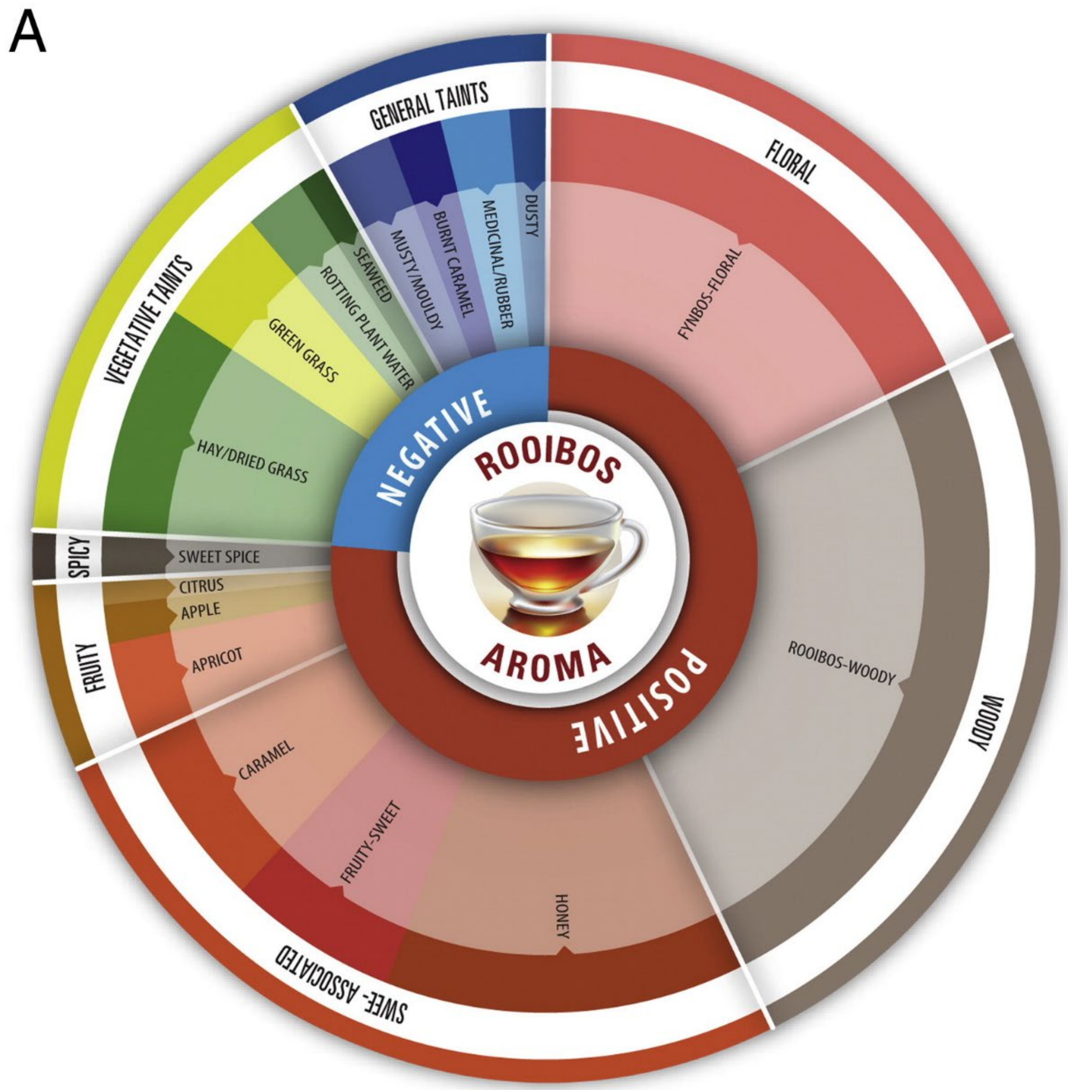

Figure 2.6: Rooibos Aroma Wheel
Source: Jolley, van der Rijst, Joubert & Muller (2017:165).

2.6 Rooibos Tea Standards and Certification

Standards are important because they ensure the product meets the expectations of the consumer who purchases it (Pretorius, Harley & Ryser, 2011:7). Therefore, the consumer gets a producer who undertakes that the products they supply have been produced according to the stipulated guidelines and will meet the expectations of the consumer (Pretorius, Harley & Ryser, 2011:7). Different standards focus on different aspects of the product or the way the product is produced (Pretorius, Harley & Ryser, 2011:7). Examples of different standards include:

- Sustainability,
- Environment-friendly production processes,
- Product quality,
- Product safety,
- Fair prices for producers,
- Fair treatment of workers (Pretorius, Harley & Ryser, 2011:7; Rooibos Council, 2022:14).

Once the producer decides to which standard they want to conform, they need to apply for certification (Pretorius, Harley & Ryser, 2011:7). After a thorough examination, an external auditor will decide if the producer conforms to the set standards (Pretorius, Harley & Ryser, 2011:7).

For the Rooibos industry, there are various international and national standards applicable that include the Sustainability certification, Social certification and EU organic certification.

Table 2.1: Different Standards and Certification

Standard	Logo	Standard	Logo
Rainforest Alliance		Sustainable Agriculture Network	
UTZ		Fairtrade International	

UEBT		SA-GAP	
GlobalGAP		USDA organic	
HACCP		NOP COR organic	
Japan Agricultural Standards (JAS)		FSSC 22000	
EU Organic		ISO 22000	

Adapted from: Rooibos Council (2022:14).

The International Organisation for Standardisation (ISO) controls most of the international standards (Pretorius, Harley & Ryser, 2011:8). Their seal of approval can be seen in Table 2.1. The goals of the ISO include:

- Protection of consumers purchasing a product with the certification badge (logo),
- Ensuring efficient development, supply and manufacturing of products,
- Ensuring that innovation and technology are shared and distributed,
- Facilitating fair trade between countries,
- Establishing guidelines for governments on international safety, hygiene and environmental legislation (Pretorius, Harley & Ryser, 2011:8).

In 2018, Rainforest Alliance and UTZ merged in response to the critical challenges that face us as humanity: climate change, deforestation, social inequity and systemic poverty (Rooibos Council, 2022:13). The Union for Ethical BioTrade (UEBT) and Rainforest Alliance developed a joint Herbs & Spices Program where all the certified ingredients can carry the Rainforest Alliance Certified seal, as can be seen in Table 2.1 (Rooibos Council 2022:13). UEBT defines practices that respect biodiversity and the people (Rooibos Council 2022:13).

Organic certification means that the product is produced and processed without the use of chemicals (Pretorius, Harley & Ryser, 2011:9). This is a guarantee that the product will not have a negative effect on the people using it as well as on the environment, and that the product is sustainably produced (Pretorius, Harley & Ryser, 2011:9). Having a product organically certified is difficult because more than one standard exists (Pretorius, Harley & Ryser, 2011:9). Examples of organic standards include the National Organic Program (NOP), Japan Agricultural Standards, EU Organic, USDA organic and more.

Fairtrade is an alternative approach to conventional trading and relies on a partnership between producers and consumers (Pretorius, Harley & Ryser, 2011:9). Fairtrade offers producers better trading conditions and prices by setting a minimum price and premium (Pretorius, Harley & Ryser, 2011:9). If the Fairtrade logo is present on a product, it means the traders and producers in the value chain have met all the criteria of the Fairtrade standards (Pretorius, Harley & Ryser, 2011:9).

The last important standard is HACCP, specifically for the drying court. HACCP stands for Hazard Analysis Critical Control Point. This standard is a preventative approach to food safety (Pretorius, Harley & Ryser, 2011:13). The aim is to identify the biological, physical and chemical risks that might be present in the preparation of food and then minimise or eliminate the risks before the product is used by humans (Pretorius, Harley & Ryser, 2011:13).

2.7 Rooibos Tea Production Regions

Between 1997 and 2008, the area planted with Rooibos tea doubled to 40 000 ha in the Western/Northern Cape (Waarts & Kuit, 2008:3). In 2009, there was 60 000 ha planted, keeping in mind the crop rotation of two years that the ground needs to rest (Pretorius, 2009:23). This expansion is due to new producers entering the sector and the fact that in the 1990s, it was relatively easy to obtain permits to clear virgin lands (Waarts & Kuit, 2008:3). Being able to obtain permits meant that existing plantations could be expanded, and farmers were able to produce more (Waarts & Kuit, 2008:3). However, these permits are not as easy to come by anymore and a whole process including an environmental study needs to be completed. Between 1997 and 2007 the production of Rooibos tea tripled from 5 000 Mt to 15 000 Mt, and in 2008 it increased to 18 000 Mt produced (Waarts & Kuit, 2008:3). An increase in global demand for Rooibos tea led to an increase in commercial monotypic cultivation, and the production of wild-harvested Rooibos tea declined (Le Roux et al., 2017:87).

At present, there are only a handful of small-scale farmers that sell wild Rooibos products. Wild Rooibos products are seen as a niche products and are sold as unfermented, certified organic, free-trade, and/or environmentally sustainable tea products (Le Roux et al., 2017:87). As a source of income, wild Rooibos have regained prominence in recent years (Joubert & de Beer, 2011:871). In the Southern Bokkeveld (Heiveld) and the Cederberg (Wupperthal), small-scale producer organisations started to sell wild Rooibos under Fair Trade and organic certification to international niche markets (Joubert & de Beer, 2011:871). Wupperthal produces approximately ten tons of wild Rooibos annually (Joubert & de Beer, 2011:871) from the 100 hectares under production, as seen in Table 2.2.

Aspalathus linearis is an endemic CCR legume with a wide geographic range that spans parts of the Western and Northern Cape Provinces in South Africa (Le Roux et al., 2017:87). This region is characterised by high beta diversity turnover and soil with varying nutrient conditions (Le Roux et al., 2017:87). Rooibos can be found in Nieuwoudtville in the north, Bokkeveld in the east and the Sandveld from west to south (Pretorius, 2009:23). Due to climate change, which led to higher temperatures, and a decline in rainfall, and higher demand, the Rooibos industry expanded to the South West with an increase in production in the Sandveld as well as in the Nieuwoudtville area (Pretorius, 2009:23).

Rooibos needs deep, well-drained, sandy, acid soil (Joubert & Schultz, 2006:138). The quality of Rooibos increases if it is planted at a higher ground level, and has a higher mineral content, and has lower temperatures (Pretorius, 2009:23). The highest quality Rooibos is produced in mountainous areas, and the lowest quality is from the Sandveld (Pretorius, 2009:23).

As seen in Figure 2.7, production is mainly concentrated in the Clanwilliam area. However, the expansion threatened the biodiversity of the GCBC (Joubert & de Beer, 2011:870). The SARC partnered with Cape Nature to form the RBI in 2007. The aim of this initiative is to increase sustainable land management practices in the GCBC (Waarts & Kuit, 2008:10). The initiative is working with Rooibos producers to develop guidelines for sustainable land management (Waarts & Kuit, 2008:10). RBI supports the GCBC project, which aims to protect the Fynbos ecosystem by creating a corridor (Waarts & Kuit, 2008:10). This corridor allows species to migrate to the area if needed (Waarts & Kuit, 2008:10). In Figure 2.7, the GCBC is the green-outlined section, and it is evident that the majority of Rooibos production happens in this corridor.

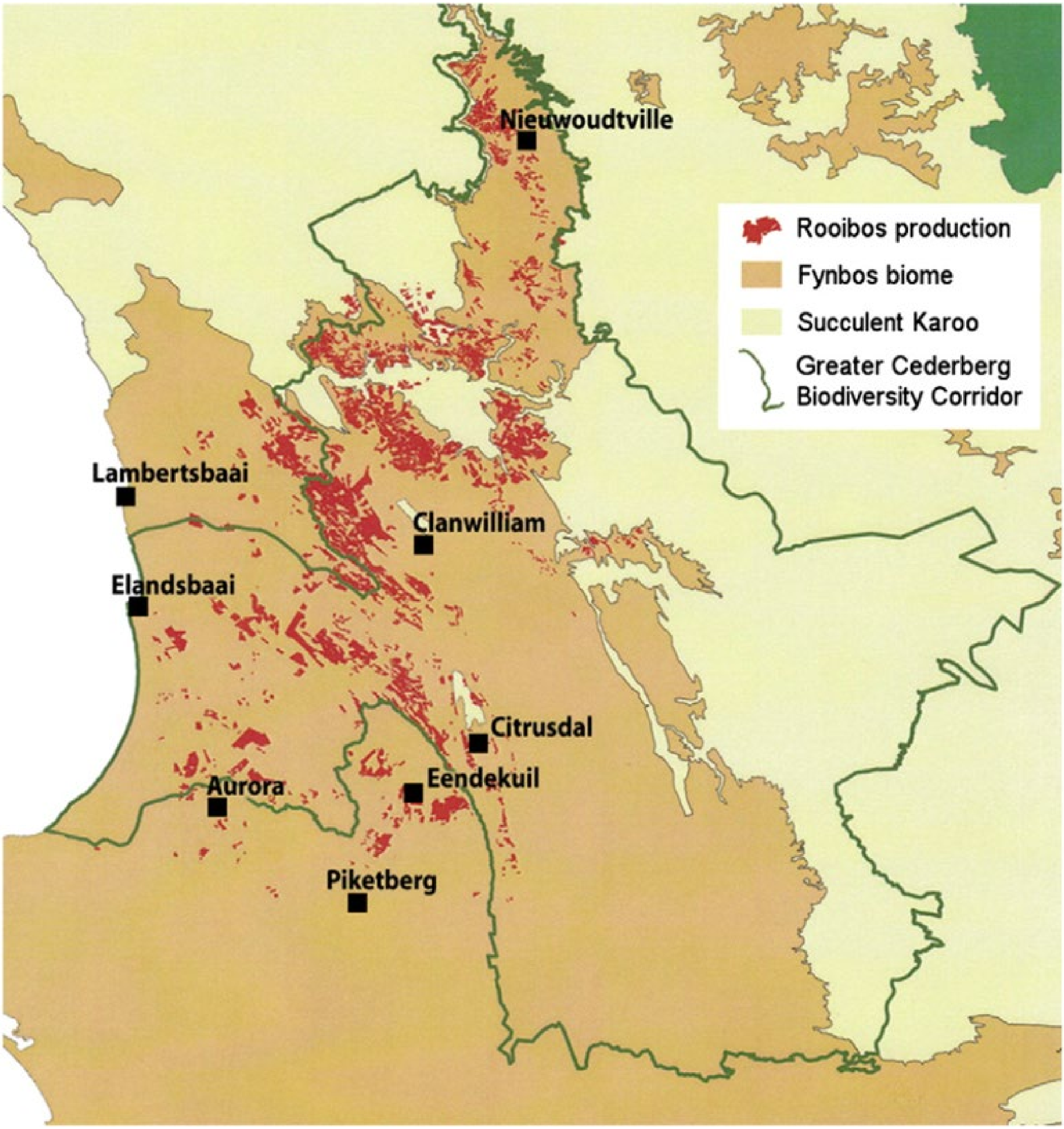

Figure 2.7: Rooibos Production Areas in and Around the GCBC
Source: Joubert & de Beer (2011:870)

Rooibos production is divided into sixteen regions by one of the processing companies. Yearly, a private company conducts an aerial survey to determine how much land in hectares is under production. The 2021 data can be seen in the table below:

Table 2.2: Rooibos Regions Under Production (ha) in South Africa during 2021

	Region:	**Ha per region:**
1.	Aurora-Redelinghuys-Banghoek	7412,88
2.	Bergendal-Elandskloof-Koelfontein	4159,62
3.	Elandsbaai-Leipoldtville-Paleisheuwel	5991,3
4.	Gifberg	2322,75
5.	Graafwater-Grootfontein-Trawal	3544,64
6.	Malmesbury-Darling-Hopefield	5775,66
7.	Nardousberg-Agterpakhuis	10610,82
8.	Niewoudtville	2720,03
9.	Olifantsvallei-Clanwilliam-Citrusdal	3147,24
10.	Piketberg-Porterville-Gouda	9452,26
11.	Seekoeivlei-Op Die Berg	8274,1
12.	Suid Bokkeveld	1997,59
13.	Tierberg-Van Nielsberg	389,63
14.	Vanrynsdorp-Pendoringkraal-Oudrif	3621,66
15.	Welbedacht-Achterfontein	453,32
16.	Wupperthal	100
TOTAL AREA PLANTED		**69973,5**

Adapted from: De Villiers (2022)

2.8 Rooibos Tea Production Process Case Study

Since there is no blueprint for producing Rooibos tea, a case study will be used to describe the process. Elands Bay situated at a height of 240 metres above sea level, with an annual rainfall of 269 mm, the climate is referred to as a local steppe climate due to the little rainfall during the year (Climate Elandsbaai, n.d.). The average temperature for the region is 16.7 °C, with February reaching the highest temperatures and July the lowest (Climate Elandsbaai, n.d.). Producers are UEBT certified according to their different standards and; therefore, the production process will differ from that of conventional farmers.

Since the contract price for Rooibos tea in 2023 was R25 per kilogram, there has been a shift in the thinking of producers to implement a “less expensive” production process instead of the typical process (Pretorius, 2023). The less expensive process removes the sowing of small grains and the use of fertilisers in the two years when the soil lays fallow.

Due to the decrease in Rooibos tea's price per net clean kilogram, the alternative production process was used to populate the model described in Section three. The production process is described below.

2.8.1 Year One: Soil Preparation

The first action to take place is soil preparation. This is when old tea bushes and weeds are removed from the field. It is done by using a 90-kW tractor with a 2 m blade that cuts off the root system. Once this is done, labourers need to remove the *Willdenowia incurvate*, commonly known as Sonkwas Restio (Eng.) or sonkwasriet (Afr.) (Nndanduleni, 2019) by hand. The reason for this is that the Sonkwas Restio has a very strong root system, and the blade is not always successful in removing the whole plant. The workers also pick up the tea bushes that have been removed.

2.8.2 Year Two: Planting

Figure 2.9: Plant Ripper With a Fertiliser Tank Attached
Source: Britz (2022a)

In year two, the Rooibos seedlings are planted. The first step is to disc the land. This is done with a plant ripper that has been modified by placing a fertiliser tank on it (Figure 2.9). This enables the producer, if the price of Rooibos is high enough, to spread fertiliser, for example, chicken manure, while discing the land. Currently, the price is low, and no fertiliser is applied during planting.

Once the soil is loosened a 74-kW tractor is used for tamping down to establish the rows where the planter should plant.

July is the ideal time to plant. It is important that sufficient rainfall precede planting. The most important requirement for the seedling to grow is moisture in the ground. Without moisture, the plant is under severe stress. Producers can choose to either buy seedlings from a local nursery or produce their own. Producers mostly buy their seedlings. They typically use a Checchi and Maggli Transplanter, better known as a Handjieplanter. Figure 2.10 shows how four workers are working together with the tractor driver to plant the seedlings.

Figure 2.10: Checchi and Maggli Transplanters Working in the Sandveld
Source: Britz (2022b)

The labourer (one placed on each side of the wheel) feeds seedlings into the machine, which then plants the seedlings. The rate at which they plant depends on how fast the tractor is driven. The Checchi and Maggli Transplanter, as shown in Figure 2.10, plants two rows at a time and is only able to plant a hectare in three hours.

Figure 2.11 shows the freshly planted row of seedlings behind the Checchi and Maggli Transplanter.

Figure 2.11: Rooibos Seedlings Planted Using Checchi and Maggli Transplanters
Source: Britz (2022c)

In September, once the plant is well established, a mixture of pesticides that include Lamda and Mulan is applied by a boom sprayer for pest control (Louw, 2022). It is important to have a balance regarding the weeds. The land should not be totally clean because soil cover is important to help prevent erosion and damage due to high winds. It also helps to maintain the level of moisture in the soil. This balance is important for sustainability.

2.8.3 Year Three: Top Harvest

The first harvest takes place at the end of April and the beginning of May. Due to the plant still being young, this is called a top harvest. Typically, this tea is not processed since it can be tough, but some farmers prefer to mix the top harvest with the harvest from older teas to boost their yields. If the weather does not allow harvesting in April or May, they wait until after the winter to top the harvest in September. At this stage, the plant is bigger; therefore, the yield of the top harvest is more significant and it might be beneficial to process the top harvest. The harvest method applied is harvesting by hand with a sickle. In the case of top harvests, permanent labour is used. In a team of five, the labourers can harvest five hectares in a day.

As top harvesting is very expensive, the labourers leave the freshly cut tea on the ground in this case study. Mechanical weed control is advised by using the light disc. The soil around the root system of the Rooibos needs to be loosened, otherwise the plant tends to stop growing. Normally the disc action to loosen the soil happens in August. This is also the last time pesticides can be used because the farmer is penalised if there is residue on the leaves when they deliver the harvest to the processor. The Lamda and Mulan mixture is used once again.

2.8.4 Year Four: First Harvest

Mechanical weeding involves discing the field before the harvest takes place. This loosens the soil around the bush and enhances growth. It also means that the bush does not compete with the weeds for nutrients and sunlight.

The PA plants (pyrrolizidine-alkaloid-containing plants) should be removed during the year. The processor penalises the farmer according to the percentage of PA plants in the harvest. Removing these plants is expensive. This is done by walking in the field, searching for the plants and removing them by hand. Once all the plants are removed, they are transported to another location where they are burned. Every time it rains, new PA plants are present in the field. In Figure 2.12, the red arrows show how the PA plants infiltrate the Rooibos field and how challenging it is to identify these plants.

Figure 2.12: PA Plants in a Rooibos Field in Nieuwoudtville
Source: van Wyk & Long (2014)

Typically one worker walks through the field before harvesting begins and removes the PA plants. The worker removing PA plants can cover five hectares in one day.

Harvest takes place in the summer (December to February). Seasonal workers harvest the tea by hand using a sickle (Figure 2.13). The freshly cut tea is then bounded into bundles of 10–15 kg. The harvested tea of each seasonal worker is weighed and logged at a central point. From this point, the tea is transported to processing facilities.

Figure 2.13: Tea Harvested by Hand
Source: BBC News (2019)

The seasonal workers are paid per kilogram. The foreman negotiates the rate which depends on the state of the vegetation. If the seasonal worker is unable to harvest enough tea to be able to get to the minimum wage of R25,42 per hour, the rate will be increased.

After the harvest, scheduled pest control should take place. The certification companies discourage a set schedule for pest control but prefer that it should take place when needed. Between the middle of February and April, there are often many leafhoppers in the field. These insects damage the Rooibos by sucking all the moisture out of the plant. This pest can be controlled by using a boom sprayer. Figure 2.14 shows how the damage to a leafhopper can be stopped by spraying pesticides with a boom sprayer.

Figure 2.14: Spraying of the Rooibos Field With a Boom Sprayer
Source: Van der Merwe (2019)

2.8.5 Year Five: Second Harvest

This year follows the same process as the first harvest. The bush is still small enough for the producer to small-disc the field with a Harrow Offset Disc of 1.6m without negatively affecting the tea bush. The same combination of Lamda and Mulan is applied to the field via a boom sprayer, as shown in Figure 2.14.

2.8.6 Year Six and Seven: Third Harvest and Fourth Harvest

The third and fourth harvests have the same sequence of actions. This, however, differs from the first and second harvests. By this time, the bush is four or five years old and the light disc will damage the tea bush and will not be used. Only pesticides are sprayed by Boom Sprayer.

2.8.7 Year Eight and Nine: Fallow

It is important that the field rest after an average of four harvests take place. In years eight and nine, the field is left in its current state. In the next two years, if the tea bush has not yet died, it will most likely die, and weeds will appear. Producers often introduce cattle into the field. Cow manure fertilises the land, and since fertiliser is expensive, it is a cheaper way to put nutrients back into the ground.

2.9 Conclusion

Rooibos tea originated from the harvest of wild plants and only relatively recently developed into a commercially produced agricultural commodity. The tea market and associated prices are relatively volatile. These factors demand tighter financial control over the tea production process. This research project is aimed at the development of a logical and sound cost planning system for Rooibos tea production systems. This chapter introduced the two important principles of break-even yields and activity cost to the financial planning framework that will be used in the development of the planning system.

The second part of this chapter provided an overview and background on the commercial production of Rooibos tea. The important factor is the cyclical nature of Rooibos tea production which typically lasts for a nine-year period. Each year, the producer has some important cost bearing considerations, and these were all introduced. The financial budgeting model and how it integrates and mimics this production cycle will be discussed in the following chapters. The main aim is to establish a working budgeting model that can assist producers in evaluating the expected financial implications of their management decisions.

Chapter 3: Rooibos Production Cost Calculator

3.1 Introduction

To calculate the production cost and consequently the expected profit the producer can expect, a production cost model, based on cost accounting, was constructed for Rooibos tea production. Chapter 2 introduced the Rooibos tea production cycle and two important financial management principles applicable to Rooibos tea production.

The budget model is based on a representative farm enterprise budget, secondary data and a literature study. Since Rooibos tea production works in a nine-year cycle, the model is constructed for each year of the cycle and ultimately integrates every year to calculate all relevant costs associated with tea production. The producer should always start by populating the model for each block in year one.

The goal of the model is to:

- Calculate the per kilogram production cost of the tea,
- Calculate the break-even production yield, and
- Be user-friendly.

In Section 3.3, the different sheets of the production cost calculator built in Excel will be discussed.

3.2 Model Construction Procedure

In order to create a model that takes every step of the production process into account, an in-depth understanding of the process is required. Since the production process between producers and areas varies, the production process was discussed step by step to get a better idea of the different components needed in the model. Five different Rooibos tea producers from different areas participated in the discussion. Using both the knowledge gained from discussions and a template used by The Department of Agriculture, the first version of the model was created. In order to test how the model works practically, the same five producers that participated in the discussion tested the model by inserting their own data into the model to calculate a per kilogram cost. This first run helped to identify areas that needed improvement and needed to be restructured.

After multiple discussions and rounds of testing with the five producers, a final production cost model was explained to the council of the newly established Rooibos Tea Producers Organisation. The discussion with the organisation took place the 8th of June 2023 at Marcuskraal, Citrusdal. At the explanation of the model, various ideas were discussed to improve both the practicality and accuracy of the model. Volunteers of the council stepped forward to help test the model. Five volunteers that represent their various production areas tested the model. To ensure that communication took place in an orderly manner a WhatsApp group was created with the five volunteers of the council, two additional volunteers, Dr. Hoffmann and Gerhard Pretorius, Environmental Consultant. Areas that needed improvement and additional ideas to improve the model were identified on this WhatsApp group. The final version of the model can calculate the cost per kilogram and the break-even point for different scenarios. It took various attempts and discussions to reach the goals of the model as set out in Section 3.1.

Group discussions were used as the main form of information to build the model. Since little literature regarding the production process of Rooibos tea exists, it was important to gather information from various producers in various areas. Rooibos tea producers tend to build or adapt their own machinery to fulfil a certain role and therefore it was important to gather the information straight from the source.

3.3. The Rooibos Production Cost Calculator

The model consists of 42 Excel sheets and more than 99 000 formulas and functions. This allows the user to calculate the cost of tea per dried kilogram and the break-even point of production. The producer can use the break-even point as a goal that needs to be reached and as a tool assisting with decision-making. The information retrieved from the model can also be a tool for negotiating the price of Rooibos tea.

Most input cells in the model consist of drop-down menus to improve the interface with the aim of ensuring that it is user-friendly. The cells containing formulas are protected to prevent accidental deletion. To start with, the model assumptions are all set at zero and is to be populated by the producer. As a result, the model output shows errors, the result of dividing by zero. Once the model is populated the error messages in Addendum A-K will show values.

3.3.1 User Guide

The model starts with a user guide. Opening the model can be overwhelming; therefore, a guide is created to help the user through the different steps and sheets in the model. It also states clearly that if incorrect information is fed into the model, the model will calculate an incorrect result. Sheet one clearly illustrates that the blue-coloured cells are the live cells.

A calculator function is built into sheet one for converting horsepower to kilowatts and vice versa. The model works in kilowatts; therefore, entering the correct unit is very important.

Addendum A is an example of how the user guide is constructed.

3.3.2 Total Cost

Referring to Addendum B, the total cost page is arguably the most important sheet of the model. This sheet can be divided into three different sections. Section One, Table 3.1 (Addendum B), calculates the total cost and total cost per kilogram automatically by inserting the total kilogram net (dried) tea produced. The various data points used to calculate the cost per kilogram is retrieved from the applicable sheets.

Section Two, Table 3.2 (Addendum B), calculates the break-even point. Once the producer inserts a conversion rate of wet to dried tea and the price per kilogram received, Equation Three (Chapter 2) is used to calculate the break-even point per kilogram of dried tea. From that calculation a conversion to tonnage is performed. The wet tea tonnage is calculated because it is the unit in which the tea is harvested.

Section Three, Table 3.3 (Addendum B), shows the impact of the different scenarios. For example, if the price and yield change in increments of 10%, what impact will it have on profitability? These answers are then measured against total cost which changes the colour of the cell to either red or green. If the income is higher than the cost, the cell will change to green automatically, and if the income is less than the total cost generated, the cell will be red.

3.3.3 Labour

The labour sheet was the most challenging to construct. Multiple iterations resulted in the current version deemed the most user-friendly and accurate. In the case of labour, accurate calculations are important as it is the largest expense when farming with Rooibos tea. Following trial and error, the optimal method to calculate the labour cost component of production was not an average cost for each pool of labourers but to insert each labourer’s activity individually.

Table 3.4 shows the allocation of labour cost to the activity that includes piecework. Using the data presented in Table 3.5 the process of estimating the expected labour cost for each activity. The head count column is used where a team is required to complete the activity. The number of days used to complete the activity allows for only part of the workday being dedicated to the activity. By dividing the time required to complete the activity by the workday hours, the number of days can be calculated. Allocation to an activity is simply chosen from the drop-down menu created. The type of labour is the category chosen to complete the activity namely permanent, temporary or piecework labour. The wage received indicates the difference between normal working hours and overtime.

The name column allocates a name to the work being done and is used by Xlookup formula to calculate the daily cost. The total cost for labour is calculated by multiplying the head count by the number of days by the daily cost.

To set up the drop-down menu for the labour sheet, a distinction is made between permanent labour, temporary labour and piecework. For permanent and temporary labour, the basis is the same. The information needed includes the name, number of hours per workday, number of days per normal work week, cash wage (Rand per day), uniform received in Rand per day, housing received as a Rand per day amount and water and electricity (Rand per day). A function is created to measure the efficiency of the labour. This measurement is done by comparing the efficiency of the labourer against the pieceworker that is deemed as 100% effective. The comparison is justified due to the pieceworker being paid for example per kilogram harvested and is therefore motivated to harvest as much possible to receive a higher wage. Total compensation is calculated by the sum of all the benefits and cash wages, times the labour efficiency. Overtime is calculated by multiplying the wage by the percentage hours of overtime.

3.3.4 Activity Description

The purpose of the activity description sheet is to streamline the process of implementing the model. Once the different activity descriptions required are completed, the user can select the activity from the drop-down menu created. Addendum D is a visual representation of how the activity description sheet is constructed.

3.3.5 Inputs

The input sheet (Addendum E) is divided into four different categories. Table 3.6 allows for the motor oil price over the nine-year cycle. This cost is used for calculating the variable machinery cost for light duty vehicles or trucks.

Tables 3.7 to 3.9 are for fertiliser use (Table 3.7), planting material inputs (Table 3.8) and herbicides and pesticides (Table 3.9) to be inserted, creating a list to simplify the calculation of the cost attached to the fair inputs applied in the production of Rooibos tea. These tables allow for inserting the dosage or units per ha that should be used. Inputs could differ according to the soil analysis that has been done. It is possible for the producer to insert each field’s dosage.

3.3.6 Fixed Asset Register

The fixed asset register is a data-intensive sheet and also the most complex. To improve user friendliness, it is divided into various tables. The tables are also used to determine the production cost more accurately.

The tables include the following (Addendum F):

- Tractors (2-wheel normal drive tractors and 4-wheel normal drive tractors)
- Combine harvesters
- Trucks with no trailers
- LDV (4-wheel drive)
- Motors
- Other machinery (L/100km or L/hr)
- Daily implements
- Drying court-specific implements

The types of costs are important when it comes to calculating the production cost that is assigned to the fixed asset register. The difference between variable and fixed costs is a key consideration in this model. In this case, an example of fixed cost is the depreciation value, salvage value and annual license cost. Examples of variable costs include repair and maintenance costs and fuel costs.

The formulas and assumptions are largely based on the formulas used in the Guide to Machinery Cost (Department of Agriculture, Land Reform and Rural Development, 2022). If the user of the model does not deem these assumptions to be accurate according to the information gathered, the option is there to adjust the assumptions.

3.3.6.1 Tractors (2-wheel normal drive tractors and 4-wheel normal drive tractors)

The producer needs to populate Table 3.10 to be able to calculate the production cost at the end. First, the live cells need to be populated, namely the name of the tractor, the kilowatt output, the original purchase price, the average life period of the tractor in hours and finally the average hours used per annum. Using the assumptions of Table 3.11, the salvage value is calculated as 10% (or the percentage the producer prefers) of the purchase price.

The average investment is calculated as the average purchase price plus the salvage value divided by two. Depreciation cost per hour is calculated by subtracting the salvage value from the average purchase price divided by the life period in hours. According to the Department of Agriculture, Land Reform and Rural Development (2022), Guide to Machinery Cost, the insurance and license cost per hour can be calculated by multiplying a percentage (0.75%) by the average investment divided by the hours per annum. Interest cost is calculated the same way as the insurance and license cost

(Table 3.11). Total fixed cost per hour is the sum of depreciation cost, insurance and licence cost and interest cost.

The only variable cost calculated in Table 3.10 is the repair and maintenance cost. It is calculated by multiplying a percentage (120%) with the average purchase price divided by the life period in hours. Another variable cost is fuel cost. By using the power demand table, part of Table 3.10, the total litres used per hour can be calculated depending on the power demand.

3.3.6.2 Combine Harvester

Table 3.12, Addendum F, is used to calculate the total fixed and variable cost per hour. The same formulas are used in Table 3.12 as in Table 3.11, the table discussed in Section 3.3.6.1. The only difference is that the fuel usage, litre per hour, is calculated by using the assumptions set out in Table 3.13.

3.3.6.3 Trucks With No Trailers

Table 3.14 calculates the Rand per kilometre cost of trucks with no trailers. Variables include the original purchase price, fuel usage (L/100km), average life period (km) and average use per annum (km). The need to differentiate between the fuel usage of each truck is important because not all trucks have that same fuel usage. Salvage value, average investment, depreciation cost, insurance cost and interest cost are calculated by using the assumptions in Table 3.15. It is the same as discussed in Section 3.3.6.1. Annual license cost, cent per kilometre, is calculated by dividing the actual annual licence cost by the average use per annum.

Variable cost is calculated differently than in the case of tractors and combine harvesters. Since the variable cost is calculated as a Rand per kilometre cost and not a Rand per hour, the cost per kilometre is multiplied by the distance filled in. Another difference that needs to be taken into consideration is the fact that the tyre costs are calculated separately and not included in the repair and maintenance cost. The user of the model can change the assumptions in Table 3.15 regarding the cost per tyre and the life period of the tyres.

3.3.6.4 LDV (4-wheel drive)

The composition of the calculation for the LDV is significantly different to that of the tractors, but similar the approach for the trucks. Table 3.16 shows that the user of the model can give a specific name to the vehicle used. This also ensures that the correct vehicles are used for the calculation if more than one vehicle has the same specifications.

The variables that need to be filled in, includes the name of the vehicle, the purchase price, fuel consumption, average useful life, average use per annum and the assumptions used to calculate the variable cost, fixed cost, and total cost. The user of the model can enter the average distance the tyres last and the purchase price of the specific tyre. There is no distinction between petrol and diesel models due to the fuel price that is filled in with the use of each activity. With the help of the assumptions set out in Table 3.17 the various calculations are made.

3.3.6.5 Electric Motors

The space for electric motors is created by being able to insert the name given to each motor, for example water pump two. The size of the motor is added, with the KVA required calculated in Table 3.19. The user of the model can manipulate this number by changing the assumptions in Table 3.19. Further, in Table 3.18 the producer should populate the table by inserting the purchase price, average life period in hours, and the average use per annum. Table 3.19 shows the specific assumptions for electric motors. The salvage value, interest cost and repair and maintenance cost percentages can be manipulated to fit the perfect scenario of the user.

3.3.6.6 Other Machinery (L/100km or L/hr)

In the case of machinery that does not fit the previous categories and for machinery that is niche or self-built, other machinery can be used to present these machines. The reason why there is a split between litre per 100 kilometres and litre per hour is because the fuel usage can be measured by either of these methods. For example, the fuel usage of a digger is measured as litre per hour. The user of the model should use their discretion when deciding in which category the machinery belongs. The layout of the table to calculate the running cost of the machinery is set out in Table 3.20.

The assumptions of the two separate tables are the same (Table 3.21). The variables that need to be filled in, includes the name, purchase price, fuel usage, average useful life, average use per annum and the repair and maintenance cost as a percentage of the purchase price. Once those variables are filled in, the salvage value, average investment, depreciation cost, insurance and license costs and interest costs are calculated. The total fixed costs comprise of the depreciation cost, insurance and licence cost and interest costs. Variable cost includes the repair and maintenance cost and the fuel usage cost. The fuel cost is calculated once the distance is filled in.

3.3.6.7 Daily Implements

Due to the nature of Rooibos tea farming, daily implements can be pooled together to create one list. The cells that need to be populated includes the name, purchase price, average life period, average usage per annum and the repair and maintenance costs as a percentage of the purchase price. This is all set out in Table 3.22.

The sum of depreciation, insurance and licence and interest cost is the total fixed cost. The only calculation considered for variable cost is the repair and maintenance cost.

3.3.6.8 Drying Court-Specific Implements

To make the model more user-friendly, drying court-specific implements are listed separately. The list of implements will be too long on the drop-down menu otherwise. The only difference between the two categories of implements is that variable cost consists of more than just the repair and maintenance cost. These implements often have components that have a limited lifespan. The model can calculate the cost of replacing those components by considering the number of components, cost per component and the lifespan. The model also considers the cost of the components that need replacement more than once in a season.

3.3.7 Non-Allocatable Cost

Sheet 7, non-allocatable cost, is divided into three sections: non-allocatable, overhead and labour costs.

3.3.7.1 Non-Allocatable Cost

Table 3.26, Addendum G, calculates the total non-allocatable cost for the year. Activities that cannot be allocated to a specific land are inserted into Table 3.26. These costs include having to fetch the labourers in town and bring them back to the farm or taking the freshly harvested tea to the processors and more.

The activity description is picked from a drop-down menu, sourced from the activity description sheet. The newest fuel price needs to be filled in to calculate the variable machinery cost. Choosing a category for machinery decreases the list of different machinery in the next cell.

If a tractor is used for a particular activity the power demand should be filled in. The applicable power demand influences the calculation of fuel consumption and consequently the variable machinery cost. The implement used is next selected from the drop-down menu. The last variable that needs to be filled in is the hours the machinery is in us. In the case of trucks, LDV and other machinery using L/100km, a distance in kilometres is needed to calculate the relevant cost. The work pace of implements is calculated as 90% of the machinery hours.

The variable and fixed costs regarding machinery and implement costs are calculated by using various IF and Xlookup formulas. Variable machinery is calculated by multiplying the machinery hours with the variable machinery cost calculated in the fixed asset register and the fuel cost. Variable implements are calculated in the same way, except for no fuel cost. Fixed machinery and fixed implements are calculated the same way, by using the Xlookup formula to lookup the fixed cost per hour or kilometre and multiplying the answer with either the distance travelled, or the hours used.

Total variable cost is the sum of variable machinery and variable implements. Total fixed cost is the sum of fixed machinery and fixed implements. The total cost is the sum of total variable costs and total fixed costs.

3.3.7.2 Overhead Costs

Table 3.27, Addendum G is used for overhead costs. According to the Rutherford (2013:439), overhead costs can be defined as fixed costs paid for the administration of the organisation. It is costs that do not vary with the level of output (Rutherford, 2013:439). Therefore, in the case of this model, an example of an overhead cost is management salaries.

3.3.7.3 Sundry Expenses

The sundry expenses table, Table 3.28, is inserted into the model to create a space for the once off, non-allocatable cost. It is not possible to insert these costs into Table 3.26 due to the nature of the cost or any other table. An example is the purchase of new harvesting equipment that needs to be replaced every two years.

3.3.8 Certification

The producer can allocate all the costs related to producing certified Rooibos tea and comply with the rules and regulations for specific markets. The producer can allocate a cost to a field that is in rehabilitation and add the loss of income as an opportunity cost to comply with certification regulations. Other expenses related to certification include auditing costs and hiring a third party to ensure all certification documents are in order.

3.3.9 Nursery

The nursery sheet is divided into three separate tables: nursery labour cost, nursery spray program and nursery activity description and total cost. This sheet is only applicable to producers that grow seedlings.

3.3.9.1 Nursery Labour Cost

To calculate the nursery labour cost, Table 3.29 (Addendum I) is to be populated. There are two ways, either by inserting the activities of each day or as a summary (a once-off). The head count of the number of labourers is to be filled in followed by the number of days that the activity takes place. The activity allocation is next by selecting the appropriate description from the drop-down menu. Once the type of labour is selected the Rand per day will be determined by using a Xlookup value. The total cost is calculated by multiplying the number of days by the Rand per day value.

3.3.9.2 Nursery Spray Program

With the values inserted into the inputs sheet (Addendum E), the drop-down menu is populated. From the drop-down menu the category of input, fertilizer, planting material, or weed and pesticides inputs are available. The product list drop-down is dependent on the category of input that is chosen. The units per hectare need to be inserted by filling in the cells. The cost per hectare is then calculated by multiplying the units per hectare times the cost of a unit. The cost per hectare is multiplied to get the total cost.

3.3.9.3 Nursery Activity Description and Total Cost

In Table 3.31 the total cost of the nursery is calculated, and it is also converted to a cost per kilogram. The activity description drop-down list is retrieved from the list created in Addendum D. Since the fuel price is volatile and an answer that is as accurate as possible is required, the fuel price needs to be inserted with each activity. This action also simplifies the calculation of the fuel cost and therefore variable machinery cost.

The machinery categories on the drop-down includes two-wheel and four-wheel tractors, trucks without trailers, light duty vehicles, combine harvesters and other machinery where fuel usage is measured per hour or per hundred kilometres. Depending on the choice, a relevant drop-down menu listing with all the different options of the specific category will appear. The power demand column is only applicable to the tractors where the user of the model has the option to choose between low, medium or high gear. The last variable is the distance column that is used in the fuel usage calculation for trucks, light duty vehicles and other machinery where the fuel usage is measured per 100 kilometres. The next column is where the implement used is chosen from the drop-down menu displaying all the daily implements, in Table 3.21.

The Nursery sheet has a separate spray program table (Table 3.30). In the case of machinery or implement use, the column named input and product must be filled in. If it is not used it can stay blank. With the use of a Xlookup formula, the product cost is calculated from the input sheet using the dosage filled in on Table 3.6-3.8.

Once the work pace of the machinery is filled in, indicating the hours the machinery uses to work per hectare, the implement work pace is calculated as 90%. From there the variable machinery cost, variable implement cost, fixed machinery and fixed implement cost is calculated by using various Xlookup formulas. The total cost is calculated as the sum of the cost of activities on the land, labour cost and the spray program. This final answer is then used to calculate the cost per hectare and the cost per kilogram seeds used in the year populated.

3.3.10 Drying Court (Sheet 10)

Like the nursery sheet (Sheet 9), the drying court sheet is only applicable to producers that dry their own tea. In the case that this process is outsourced, the processing cost will be included in the non-allocatable sheet (Sheet 7).

3.3.10.1 Drying Court Questions and Cost-per-hour Calculation

The questions in Table 3.32 are part of the information used to calculate the hourly cost of the drying court. Once the size of the drying court, the lifetime, usage per year, the opportunity cost in terms of the rent received on the capital investment if alternatively invested and the percentage of repair and maintenance is filled out, the cost per hour and depreciation cost per hour can be calculated using the additional information obtained from Table 3.33.

3.3.10.2 Drying Court Composition

To calculate the physical cost of building the drying court there are two options. Either the mixture of elements needed to build one square-meter and the cost of the elements can be filled in. The other option is to fill in the overall cost for the whole drying court and not to calculate each section separately. The choice of method is dependent on the information available to the producer.

3.3.10.3 Drying Court Labour Cost

In Table 3.34, head count is where the producer inserts how big the team required is to complete the activity. The next column shows how much time is used to complete the activity, it is possible to insert a decimal. Allocation to activity is a drop-down list where the relevant activities are chosen. Once the type of labour is chosen, with a Xlookup formula the cost of labour will be calculated by multiplying the head count by the number of days by the total compensation with labour efficiency.

3.3.10.4 Drying Court Machinery

Table 3.35 and Table 3.36 is where the drying court machinery cost is calculated. Table 3.35 calculates the drying court machinery fuel consumption. At first the fuel price is filled in. Next the category of machinery using fuel is chosen with the drop-down menu listing the different options. Power demand explains the gear in which the tractor is being used. Implement category gives the option between drying court specific implements and daily implements. In the implement category the implement used in the action is listed. Both machinery and implement hours should be filled in.

The only difference between Table 3.35 and Table 3.36 is the fact that in Table 3.36 electricity is used to power the machinery. In the first column the electricity price per unit should be filled in. In the fourth column electricity usage per hour, should be filled in.

In both tables, variable machinery consists of maintenance and repair cost and the total electricity or total fuel cost. Variable implements consist of the maintenance and repair cost associated with the implements.

3.3.10.5 Drying Court Total Cost

The drying court total cost is the sum of the drying court cost, total labour cost, total machinery using fuel cost and the total electricity cost. This cost is then also displayed on the total cost sheet (Addendum B), where it is part of the total cost per kilogram calculation. Fixed machinery and fixed implements are calculated in the same manner. The cost is determined using a Xlookup formula. Total cost is the sum of total variable costs and total fixed costs.

3.3.11 Land

The different land pages are representative of each camp, this is where the information of the previous sheets are integrated. If there are not enough land pages for the different camps, the user of the model should combine two camps that is in the same year of the cycle. By changing the name of the land, on the total cost sheet, the name will change throughout the model. It is very important to insert the total hectares of the land, without that information the model will not be able to calculate the total cost per hectare of the land.

Like the non-allocatable sheet (Table 3.25), the calculation starts by choosing the activity description from the drop-down sheet. The list is derived from the activity description sheet (Addendum D). Next, the fuel price is used to calculate the variable cost of the machinery, together with the repair and maintenance cost that is derived from the fixed asset sheet by using an Xlookup formula.

The machinery column provides a drop-down list that gives different options of machinery. Once a choice is made, a co-dependent list is derived from the fixed asset sheet in the “type” column. If tractors are chosen in the machinery column, the relevant power demand should also be chosen. This influences the fuel usage by choosing if the tractor is in low, medium or high-power demand.

The distance column is important for the fuel cost for trucks, LDVs and machinery in which the fuel usage is measured as litre per 100 kilometres. Hidden to the user of the model, the fuel and oil cost is calculated in a separate column where it is multiplied by the distance and added to the variable machinery cost.

In the implement column the user has the option to choose one of the daily implements listed. In this column the user does not have an option to choose a drying court specific implement.

The input column is once again a drop-down menu displaying the options for fertiliser, planting material, or weed and pesticides. Depending on the option chosen in this column, a dependent drop-down menu will be displayed in the product column. As discussed in section 3.3.5, the dose should be applied according to the results of the soil analysis or the specific guidelines of the product. With the use of an Xlookup formula, the product cost per hectare is calculated.

The work pace of the machinery is the next important variable. The hours or the decimal of the number of hours the machinery is used to work a hectare should be filled in. 90% of the hours spent for machinery is the hours used for work pace implements.

Multiplying the hours or kilometres and taking all the previous columns into consideration the Rand cost per kilometres is calculated. The total variable cost is the sum of variable machinery and variable implements. Total fixed cost comprises of fixed machinery and fixed implements. The sum of total variable cost and total fixed cost is the total cost per hectare. Multiplying the total cost per hectare by the hectares of the land is the total cost. The total cost is then displayed on the total cost sheet (Sheet 2).

3.4 Conclusion

Rooibos tea production is cyclical with the production cycle lasting up to nine-years. Therefore, it is important that the costing tool created must be flexible to accommodate any number of scenarios. The first part of the chapter is a discussion on which process was followed to create the model and what goals this model should achieve.

The second section is an overview of how the various sheets of the model are constructed and implemented. Examples of the layout of the sheets are presented in the addendums. Once the model is populated with the necessary information, it should be able to calculate the production cost of net kilogram of dried Rooibos tea produced. This model is the tool used to compare the production cost for the three different identified areas used for this study.

CHAPTER 4: IMPLEMENTATION OF ROOIBOS PRODUCTION COST CALCULATOR

4.1 Introduction

Chapter 3 discussed the various elements of the model in-depth. To illustrate how the model works and calculate the production cost per kilogram of Rooibos tea or the break-even point, the model is populated with typical data. This chapter shows how each aspect is calculated with the use

To illustrate the calculation of the production cost per kilogram of Rooibos tea or the break-even point, the model is populated with typical data. This chapter builds on Chapter 3 which discussed the layout of the model. Only the sheets in the Excel model are applicable and used to calculate this “hypothetical” model. There are two ways to populate the model, insert each activity every time it happens or as a summary. The model populated for this example is done in a summary manner.

In this hypothetical scenario, a farm in the Elandsbay-Leipoldville-Paleisheuwel area is mimicked. This production area consists of a total of 5 991.3 hectares of Rooibos tea. The hypothetical farm consist of 211.2 hectares of Rooibos tea. An average Rooibos tea farm normally consist of 200 hectares under Rooibos tea production and other farming activities that include sheep farming. The climate and soil composition of the farm influence the production activities. The farm is at the height of 240 meters above sea level, with an annual rainfall of 269 mm, a climate referred to as a local steppe climate due to the little rainfall during the year (Climate Elandsbaai, n.d.). The average temperature for the region is 16.7 °C, with February reaching the highest temperature and July the lowest (Climate Elandsbaai, n.d.). To illustrate the influence of certification on production cost, this theoretical farm is certified according to the UEBT standards. This means that other production activities will take place which may not necessarily take place on a conventional farm. This producer also opted to buy seedlings from a nursery and rather take the harvested tea to a processor instead of investing capital in a drying court.

4.2 Total Cost

Arguably, the total cost sheet is the most important of all. It is divided into three different areas: total cost of production, break-even analysis and scenario simulation.

4.2.1 Total Cost of Production

To calculate the total cost per kilogram of dried tea, the total volume produced must be accurately filled into the model. This is the only additional information needed in Table 4.1. The names inserted in each land sheet, to identify the camps, are drawn from the sheet and displayed in column one of

Table 4.1. It is necessary to display the name because it prevents uncertainty regarding the cost connected to that specific camp. A simple equal formula, both the name and total cost per camp are displayed. The same is applicable in the case of non-allocatable costs, overhead costs, labour costs, sundry expenses, certification, drying court and the nursery.

Using a sum formula, the total cost is calculated. The total cost in this case is equal to R691 945,57. It is estimated according to the production years that only 110,30 hectares is harvested, producing 17 535,05 kilograms net dried tea. Dividing the total cost of production by the kilograms produced, means that the total cost per kilogram of dried tea is equal to R38,89.

4.2.2 Break-Even Analysis

The break-even analysis, Table 4.2, calculates the break-even point given the total cost calculated in Table 4.1. The conversion percentage of wet to dried tea is important, due to the difference from producer to producer and processor. In this example a 48% conversion rate is assumed to reflect the weight loss that takes place due to the removal of moisture in the tea. This is where the producer can play around with different scenarios. If, for example, the price per kilogram of dried Rooibos tea is R35,00 the break-even point in terms of wet tea is 40,59 tons.

4.2.3 Scenario Simulation

Table 4.3, the scenario simulation is conditionally formatted in Excel to show that if the income received is greater than the total cost, the cell will be displayed in green. If the cell is red, it means the total cost exceeds the total income and if the cell has no colour, the producer neither makes a profit nor a loss.

To show the reality of the situation displayed in Table 4.1, the total cost per kilogram, the same yield and a price of R33 are inserted in the scenario simulator. Without an increase in yield, only if the price increases by twenty percent, will the producer be able to make a profit. In another scenario, if the price stays constant, yield needs to increase by twenty percent to show a profit.

4.3 Labour

The labour sheet is important in this model since labour cost is a considerable percentage of the total cost. The labour cost calculation is shown in Table 4.4 and Table 4.5. In Table 4.4 the labour cost allocation is calculated and includes both permanent labour and temporary labour. In the first column, the number of people is important if a team is used to complete the activity. In the example the team consists of five people. Only the number of days is filled in and the reason for the decimal in the table is the fact that a calculation was done to determine the number of days. To prepare the land, it takes five people a day to clear three hectares of land from tea bushes and weeds. Therefore, if the land prepared is 13,3 hectares, it takes five people 4,43 days to clear 13,3 hectares of land. Throughout the example, this method is used to determine the number of days needed to complete a certain activity. The producer understands how many hectares a day it takes that specific team to complete the activity.

A list of the various activities is set up in sheet 4 (see next section), enabling the producer to simply type out the activity description once and use this list throughout the whole of the model by choosing the description from the drop-down menu. In the third column, the producer selects the description that best fits the activity.

In the fourth column, the type of activity is either permanent or temporary labour and enables the Xlookup formula to look up the wage of the labourer in either table. This decision also influences the list displayed under names. In the case of this example, permanent labour is chosen so the producer can pick the correct labourer. Since not all labourers receive the same wage, the name helps the Xlookup formula to identify the correct wage that needs to be displayed and used for the total cost calculation.

Table 4.5 indicates the labour cost allocation for piecework. The piecework wage is calculated in two parts, harvesting cost and housing cost. In the example, the producer supplies housing for the period they are busy harvesting. The different teams are inserted in the table, followed by the number of members of each team and the number of days that harvesting took place. The housing cost for the number of days they harvest is calculated in this manner. In this example team one, which consists of five people, harvested for 4,73 days in total; therefore, the housing cost calculated in Table 4.8, is multiplied by five and by 4,73 days to calculate a housing cost of R2 339,19. The remuneration linked to harvesting is calculated by using the per kilogram harvested cost beforehand with the team leader of the harvesters. The price negotiated in this case is R0,60 per kilogram harvested. Multiplying R0.60 by 92 682.64 kg gives a total harvesting cost of R55 609.58. The sum of the housing and harvesting cost is R62 632,02. Total labour cost is equal to R123 646,53.

Table 4.6 shows the calculation of the wages when taking the efficiency rate into account. The first column gives the user the option of either inserting a name or if the team receives the same wage, the team's name. The next column is the contracted hours followed by the number of working days in a normal work week. The cash wage is indicated, and the next column is an estimated cost of the uniform received per day. The first four columns are populated according to the example: Chaka Manikwa on average works nine hours per day for five days a week. He receives a cash wage of R180 per day and the uniform he receives is equal to R15,91 per day.

Next, the housing per day needs to be calculated. In column twelve of Table 4.6 the cost of building a 70m^2 house is shown. One of the assumptions is that over twenty-five years the building is depreciated; therefore, the yearly cost is four percent of the cost of building the house. Another assumption is that the repair and maintenance of the house are equal to three percent of the cost of building the house. The sum of the depreciation, repair and maintenance costs divided by the number of weeks in a year, is the total cost of housing per week. This is further broken down into the total cost of housing per day. According to the example, the cost of building a house is R310 000. Four percent of the building cost is R12 400 and three percent of the cost is R9 300. Therefore, the sum of R12 400 and R9 300 divided by fifty-two is R417,31. The R417,31 divided by five is R83,46. This means the housing cost per day is R83,46.

In column six of Table 4.6, the housing cost calculation is being pulled through, while column seven is an estimation of the water and electricity cost per day. In the example, it is estimated that the water and electricity cost per day is R15,55. The labour efficiency influences the cash wage paid. If the labourer takes longer to complete the task, the wage is higher. The user of the model estimates that Chaka Manikwa is 75% efficient. This means taking efficiency into account the total compensation is R354.92. The 50% overtime payment is equal to R474,92 and 100% overtime is equal to R594,92. Efficiency is also taken into account for overtime compensation.

Both Table 4.7 and 4.8 follows the same layout and calculation sequence. In Table 4.7 the temporary labour is divided into teams. To simplify the model and make it easier to use, the teams can be inserted if the efficiency and compensation of all the team members are the same. Team A (Table 4.7) works a total of nine hours in a normal working day, five days a week. The cash wage each member of the team receives is R180. They do not receive uniforms, housing or water and electricity. The efficiency of the team, measured against piecework is 75%. This means that the total compensation with labour efficiency considered is R240 per day. The 50% overtime payment is equal to R360 and 100% overtime is equal to R480 per day.

In Table 4.8 the labour cost of piecework is calculated. Team 1 works nine hours a day, five days a week in normal circumstances. They do not receive a uniform, but they do receive housing for the season. The cost of housing is calculated as explained in Table 4.6. The same assumptions are made regarding the fact that the building is depreciating at four percent a year and repair and maintenance cost is three percent of the cost of building the house. Members of Team 1 also receive a daily water and electricity benefit of R15,55 per day. This brings the total benefit per day to R99,01, including the housing and water and electricity benefit.

4.4 Activity Description

The activity description list (Addendum N) is populated with activities that occur during the nine years of Rooibos tea production. The producer can add additional items as needed throughout the production period. Using the list means more concise language is used when populating the model. In the example, additional items are added to the list.

4.5 Inputs

The input sheet is divided into four different input categories. The motor oil cost is only applicable when calculating the variable machinery cost in the case of LDV or trucks without trailers. In this example, the oil price per litre of R60 is retrieved from the Machinery Cost Guide for Western Cape Grain Producers (Overberg Agri (Edms) Bpk, Agrimark Grain (Kaap Agri) & Sentraal-Suid Koöperasie Bpk (SSK), 2022: 29).

Table 4.10 lists all the various fertilisers used by the producer in the current production cycle. It is possible to load additional fertilisers if the producer is still unsure if they will be using them in the current cycle. For example, in Table 4.10 dolomitic lime is listed as one of the fertilisers. By entering the unit, the product is purchased and the price of the unit, calculating the cost per hectare is R297 per unit multiplied by the single unit used per hectare. In this case a ton of dolomitic lime is used per hectare; therefore, the cost per hectare is R297.

In Table 4.11 the various planting material used during the cycle is filled in. This planting material includes not just the Rooibos seedlings, but also the grains used in the fallow years to restore the health of the soil. In the example, the producer expects to use barley in the fallow period. Barley is purchased in tons with a price of R4 800 per ton. When barley is sowed, the usage per hectare is 50kg. This gives a per-hectare cost of R240. The calculation per hectare is the same as in both Table 4.10 and Table 4.11.

4.6 Fixed Asset Register

The fixed asset sheet creates plentiful space for various machinery and implements. However, in the example only some of the categories are used and only these categories will be discussed in the following section.

4.6.1 Tractors

In Table 4.13, using the assumptions set out in Table 4.14, the variable and fixed cost of the tractors is calculated. Starting with the two-wheel drive tractors, there are two that are used on the farm, the Orange Tafe 45 DI and the Landini Solis 90. To demonstrate how the model calculates the cost, the example of the Orange Tafe 45 DI will be discussed.

First, the name and the kilowatt of the tractor need to be filled in. The 35 kW Orange Tafe 45 DI was purchased for R347 500. It is estimated that the average life period of the tractor is 10 000 hours with an average usage of 750 hours per year. These are the only variables that need to be filled in. The salvage value is ten percent of the purchase price (R347 500) and is calculated as R34 750. Next, the average investment is calculated as the sum of the purchase price and the salvage value divided by two, R347 500 plus R34 750 divided by two is equal to R191 125. Depreciation cost is calculated by discounting the purchase price of R347 500 with R34 750 and dividing it by the life period in hours. This calculations shows the depreciation cost to be R31,28 per hour.

According to the Guide to Machinery Cost, the insurance and licence cost per hour can be calculated as 0,75% of the average investment divided by the hours used per year (Department of Agriculture, Land Reform and Rural Development, 2022). With an average investment of R191 125 multiplied by 0,75% divided by 750 hours, the insurance and licence cost is equal to R4,46 per hour. The same type of calculation is done for the interest cost per hour. Interest cost per hour, according to the Guide to Machinery Cost, is 9,75% times R191 125 divided by 750 hours; therefore, the interest cost per hour is R24,85 (Department of Agriculture, Land Reform and Rural Development, 2022). The total fixed cost per hour is the sum of the depreciation, insurance and license and interest cost which is equal to R60,58 per hour.

At this stage the only variable cost that can be calculated is the repair and maintenance cost. Fuel cost cannot be calculated because it depends on the fuel cost and the gear used. This cost is only calculated when the use of the tractor is selected. The repair and maintenance costs are calculated as 120% of the purchase price divided by the life period in hours. Therefore, 120% times R347 500 divided by 10 000 hours is equal to R34,75 per hour.

4.6.2 Trucks With No Trailers

In Table 4.15, the only truck used in Rooibos tea production is the four-ton Isuzu 400. This truck was purchased for R915 000 and the fuel consumption is 15 litre per 100 kilometre. The lifetime of the Isuzu is estimated as 300 000 kilometres with a yearly usage of 15 000 kilometres. Using Table 4.16's assumptions, the salvage value of the Isuzu can be calculated as ten percent of the purchase price, which leaves you with a R91 500 salvage value. To calculate the average investment, the sum of the purchase price and salvage value is divided by two. When calculated for the Isuzu, the investment is R503 250. Till this point in Table 4.15, all the calculations made, are used to determine the fixed and variable costs.

Depreciation cost per kilometre is calculated as the average purchase price minus the salvage value divided by the life period in kilometres. The depreciation cost of the Isuzu is R915 000 minus R91 500 divided by 300 000 kilometres, which puts the depreciation cost at R2,75 per kilometre. The insurance and licence cost per kilometre is calculated as 7,5% of the average investment divided by the yearly usage; therefore, the cost is equal to R2,52 per kilometre. The last fixed cost calculated is the interest cost. The average investment divided by 15 000 kilometres, the yearly usage, results in the interest cost per kilometre as R3,27. The sum of depreciation, insurance, licence, and interest cost is R8,53 per kilometre, the fixed cost.

In the case of the truck, the variable cost consists of repair and maintenance, tyres, a contingency factor, fuel and oil costs. However, Table 4.15 does not calculate the oil and fuel costs due to the fuel price changing continuously throughout the year. Repair and maintenance cost is calculated as 50% of the purchase price (R915 000) divided by the life period in kilometres (300 000 kilometres); therefore, the repair and maintenance cost is R1,53 per kilometre.

The tyre cost per kilometre is calculated by using the assumptions for tyres in Table 4.16. First, the number of sets of tyres needs to be calculated. The sets of tyres are calculated as the life period of the truck divided by the life period of the tyres in kilometres. For the Isuzu, over a lifetime of 300 000 kilometres divided by 45 000 kilometres, 6,67 sets of tyres will be used. The tyre cost is then calculated by multiplying the cost of a set of tyres, consisting of four tyres plus one spare, times the number of sets used in the lifetime divided by the average kilometres in a life period. The tyre cost per kilometre for the Isuzu is R0,31. Contingency factor costs are calculated as ten percent of the fuel, oil, repair and maintenance, and tyre cost. This calculation can only be done partially in Table 4.15. Ten percent of repair and maintenance and tyre cost is equal to R0,18 per kilometre. In Table 4.15 the variable cost without the oil and fuel cost can be seen to be equal to R2,02 per kilometre.

4.6.3 Light-Duty Vehicles

The per kilometre cost calculation for the LDV is very similar to the truck cost calculation discussed in section 4.6.2. For this example the producer has two LDVs, a red and a blue Toyota Hilux Single Cab. First, the variables need to be filled in. This includes the name of the LDV, the purchase price, fuel usage (litre per 100km), average life period and average use per annum. In the case of the Red

Hilux, it was purchased for R326 300 with a fuel usage of seven litres per 100km. The estimated life period is 160 000km and the average usage per year is 20 000km.

The salvage value of the Red Hilux, in Table 4.17, is ten percent of the purchase price which is equal to R32 630. Average investment is determined by the sum of the purchase price and salvage value divided by two. The sum of R326 300 and R32 630, divided by two is R179 465.

The depreciation cost per kilometre is the difference between the purchase price and salvage value divided by the life period of the LDV. Thus, R326 300 minus R32 630 divided by 160 000km means the depreciation cost per kilometre is R1,84. According to the Machinery Cost Guide for Western Cape Grain Producers, insurance and licence cost can be calculated as 7,5% of the average investment divided by the kilometres per year (Overberg Agri (Edms) Bpk, Agrimark Grain (Kaap Agri) & Sentraal-Suid Koöperasie Bpk (SSK), 2022: 29). The insurance and licence cost of the Red Hilux is equal to R0,76 per kilometre. Interest cost is 9,75% of the average investment of R179 465, divided by the yearly usage. The interest cost is equal to R0,87 per kilometre. Fixed cost consists of depreciation, insurance and licence and interest costs. The fixed cost of the Red Hilux is R3,38 per kilometre.

The variable cost of the LDV is calculated in the same manner as trucks without trailers, the only difference is the assumptions set out in Table 4.18. The total variable cost is equal to R1,37 per kilometre, fuel and oil costs excluded. This is further broken down to R1,02 repair and maintenance cost, R0,23 tyre cost and R0,12 contingency factor.

4.6.4 Daily Implements

The last tables discussed in this section are Table 4.17 and Table 4.18, the daily implements. In these tables, all the implements used daily are listed and their cost per hour calculated. To illustrate how the calculation is done, the cost of the plant ripper per hour will be discussed. The plant ripper has a purchase price of R60 000 and its estimated average life period is 4 800 hours with an average yearly usage of 240 hours. The salvage value of the plant ripper is determined as ten percent of the purchase price which is equal to R6 000. Average investment is calculated as the sum of the purchase price and the salvage value divided by two. R60 000 plus R6 000 divided by two means the average investment is equal to R33 000.

The depreciation cost is calculated as the purchase price minus the salvage value divided by the life period of the implement. R60 000 minus R6 000 divided by 4 800 hours is equal to R11,25 per hour depreciation cost. Using the assumptions set out in Table 4.18, insurance and licence costs can be calculated as 1,5% of the average investment divided by the average usage per year. In the case of the plant ripper, the insurance and licence cost is 1,5% of R60 000 divided by 240 hours. This means the hourly insurance and licence cost is R2,06 per hour. Lastly the interest cost is needed to calculate the total fixed cost. Interest cost per hour is calculated as 10,5% of the average investment divided by the yearly usage. Therefore, 10,5% of R60 000 divided by 240 hours is equal to R14,44 per hour. Fixed cost is the sum of the depreciation, insurance and licence and interest costs; thus, the fixed cost per hour is R27,75 for the plant ripper.

The only variable cost applicable to the daily implements is repair and maintenance costs. Due to the variety of implements, the producer can use a percentage for the repair costs which is then expressed as a percentage of the purchase price. It is assumed that the plant ripper does not have a lot of moving parts which means the repair and maintenance percentage of five percent would cover the yearly maintenance cost. This means the repair and maintenance cost per hour is R0,63. The variable cost for the plant ripper is estimated as R0,63 per hour and so the total cost including interest is R28,38 per hour.

4.7 Non-Allocatable Cost

The non-allocatable cost sheet includes the cost calculation of non-allocatable costs, overhead costs and sundry costs.

4.7.1 Non-Allocatable Cost

The non-allocatable cost is all the costs that cannot be allocated to a certain camp. This includes, for example, transport of the labourers to the field, transport of seedlings to the field and more.

In the first column, the activity description is chosen from the drop-down list. The activity taking place is transporting the labourers from the town to the farm. The fuel price for diesel at the time the activity took place is R26,10. The fuel cost will be considered when calculating the variable machinery. The Isuzu 400 is used for this activity. Next the total distance travelled needs to be taken into account. For a total of 245 days, a distance of fifteen kilometres from the town to the farm and fifteen kilometres back is travelled, with the total distance being 7 350 kilometres. It takes approximately twenty minutes to travel fifteen kilometres on the gravel roads. A formula is used to calculate the machinery hours.

Equation 4.1: Machinery Hours Calculation

$$Machinery\ hours = \frac{(\frac{20}{15} \times 7350)}{60}$$

Implementing equation 4.1, gives a total travel time of the 7 350 kilometres and equal to 163.33 hours for the year. This calculation is important for calculating the labour cost of the driver in the labour sheet.

Since no implement is needed to calculate work pace, implement hours can be dismissed, but it is calculated automatically once the machinery hours are filled in. Once all this information is exported in the live cells, with the help of an Excel formula that includes various IF, and Xlookup formulas, the variable machinery, fixed machinery and total cost is calculated for the whole distance travelled. This calculation is done for each activity completed and with the help of a formula to calculate the total cost for the year. This is indicated on the total cost sheet under the heading of non-allocatable cost. In Table 4.19, the total non-allocatable cost is equal to R143 280,25.

4.7.2 Overhead Cost

As discussed in Section 3.3.7.2 in Chapter 3, overhead costs can be defined as the fixed cost paid for the administration of the organisation. The three piecework team leaders, responsible for the pieceworkers, are paid an additional bonus of R70 per day on top of the cash wage they receive. This is seen as an overhead cost. The total cost of the team leaders is R992,27 for the year and is seen as the total overhead cost. This will be incorporated in the total cost sheet and will form part of the total cost calculated.

4.7.3 Sundry Cost

Sundry cost is where all costs that do not fit in other categories are inserted. This producer includes the purchase of new sickles for the harvesting teams at a total cost of R1 500 and the cost of processing the tea. Producers have an option of either processing their own tea by means of a drying court or a tea processor. This producer opted for the latter. The processing cost for the whole season is R148 143 and the total of these two expenses is R149 643,93.

4.8 Certification

This example represents a farm that is UEBT certified, there are various costs linked to being able to pass the certification regulations. Certification costs in this case include the following: audit costs, housing and travelling of the auditor auditing the farm for UEBT certification, the protective clothing that needs to be purchased to comply with regulations and the rehabilitation report. The rehabilitation report is for a piece of land that was illegally enlarged, this means that a professional has to set up a report for the rehabilitation of the piece of land. The rehabilitation report is used as guidance on how to rehabilitate the area. It is not standard practice to illegally enlarge a farm, however, with new certification regulations, this piece of land cannot be under production and needs to be rehabilitated. The sum of all these costs is equal to R84 888. This cost forms part of the total cost of producing Rooibos tea.

4.9 Land (Sheet 11-40)

For this example, nine different lands, better known as camps, are populated with data. Each camp is representative of a camp in a different stage of the nine-year cycle. The layout is as follows:

- Driehoekkamp: Year 1
- Droëkamp: Year 2
- Kakieboskamp: Year 3
- Kamp 22: Year 4
- Kopkamp: Year 5
- Padkamp: Year 6
- Suidweskamp: Year 7
- Syferkamp: Year 8
- Taaiboskamp: Year 9

In the following section the various camps and the activities performed during the cycle year will be discussed.

4.9.1 Driehoekkamp

Driehoekkamp consist of 13,30 hectares and is in year one of the nine-year cycle. In year one soil preparation begins. In a year with a higher Rooibos tea price producers are able to use fertiliser or other types of input, but due to the price this will not be profitable and this producer does not have the luxury to use fertiliser. In year one only old tea bushes and weeds are removed. Due to the location of this farm mechanical weed removal is not enough and manual weed removal is needed. The labour cost is already calculated in sheet 3 and only the mechanical cost has to be calculated.

In column one, Table 4.22, the activity description is chosen from the drop-down menu followed by the fuel price of R26,10. Once the category of four-wheel drive tractors is chosen, the list of tractors on the fixed asset register sheet under the same heading is shown. Next, the producer chooses the tractor used to complete the activity, in this case, the applicable tractor is the New Holland 80-30 which is a 90-kilowatt tractor. Since a two-meter blade is the chosen implement for weed removal, the tractor is working in low gear. This gear uses on average 0,14 litres per hour. The tractor uses 2,67 hours to work on one hectare and the implement will use 2,4 hours per hectare. The total cost per hectare to complete this activity is R1 916,27. The total cost for the Driehoekkamp is R25 486,39.

4.9.2 Droëkamp

Table 4.23 represents Droëkamp which consists of 12,30 hectares. This camp is in year two of the production cycle. In this year final preparations for planting begins followed by the planting of the seedlings. First, the camp is ripped with the New Holland 80-30 and attached plant ripper in low gear. This activity takes two hours per hectare to complete and brings the cost to R1 454,13 per hectare.

Once the camp is ripped, the seed beds need to be prepared for the seedlings. This is called tamping down and is done with the Case JX75T tractor without any implements. The tractor is employed in low gear and uses the weight of the tractor to create the seed beds. The per-hectare cost of the activity is R250,52.

The most important activity of the entire nine-year cycle happens next. The purchased Rooibos seedlings are planted by means of the New Holland 80-30 tractor and the Checchi and Maggli Transplanter which is manned by the tractor driver and four people that feed the seedlings into the moving gear that inserts the seedling into the ground. The cost of the seedlings per hectare is R876,85 as 0,13-kilogram seedlings are planted per hectare. The team is only able to plant a hectare in three hours. The total input and machinery cost per hectare for the planting action is R3 291,94 which makes it is one of the most expensive actions. Due to the cost of the action, it is very important that it be done correctly the first time and does not have to be repeated.

The last activity in this camp is the spraying of pesticides. A mixture of Mulan and Lamda is applied with the combination of the Case JX75T and a boom sprayer. The Case is working in low gear and applies 0,05 units of Mulan and 0,08 units of Lamda per hectare. The product cost per hectare is R22,28. This calculation is done by using a Xlookup formula to look up the price of the product which is then multiplied by the units per hectare, calculating the product cost per hectare. The work pace for machinery during the activity is 0,5 hours per hectare. The total cost of this activity, product cost included, is R388,70 per hectare.

Once the sheet is populated with all the activities done in the cycle year, it calculates the total cost per hectare as R5 385,30 and the total cost per hectare is multiplied by the total hectares of the field to calculate the cost of production for the whole camp. The total cost for Droëkamp that can be allocated is R66 239,15.

4.9.3 Kakieboskamp

Kakieboskamp is a total of 18,10 hectares and is in the third year of its production cycle. Table 4.24 illustrates the activities performed in this camp. First, mechanical weed removal is applied to the field. This is done by using the Case JX75T tractor paired with an offset disc to clear the field of any weeds. In the first four years of production, it is possible to do weed removal using a tractor. After that the tea bushes are too big and manual weed removal needs to be done instead. The total cost for mechanical weed removal is R598,35 per hectare.

Once weed removal is done, harvesting takes place by hand. This first harvest is called top harvest and is done to stimulate the growth of the tea bushes. Some producers do not deem the processing of top harvest profitable and would rather discard the harvested tea. Top harvest tea can be brittle and includes a lot of moisture, bringing the conversion rate of wet to dried tea down to as low as 40%. This means that during the processing cycle, 60% of the weight of the tea is lost due to loss of moisture and other causes.

After harvesting is done, another round of pesticides is applied to the camp. The same mixture as on Droëkamp is applied. The total cost of this camp, excluding the labour cost is R987,05 per hectare. The total cost allocated to the land is R17 865,65.

4.9.4 Kamp 22 and Kopkamp

Table 4.25 is representative of Kamp 22 and Table 4.26 of Kopkamp. Kamp 22 is in its fourth year of the production cycle and Kopkamp is in the fifth year. The activities taking place in these two camps are very similar to the activities done in the Kakieboskamp. The only difference is that Kamp 22 is fully harvested for the first time and Kopkamp for the second time. This tea can be processed by taking it to the processor. The same activities of mechanical weed removal and spray of pesticides is applied.

4.9.5 Padkamp and Suidweskamp

At year six (Padkamp) and seven (Suidweskamp) the tractors are unable to enter the field with a disc without damaging the tea bushes. Table 4.27 shows that Padkamp is a total of twenty hectares and Suidweskamp is 23,40 hectares. The same sequence of activities takes place in these camps. Once harvesting is done, the mixture of Mulan and Lamda is applied to the field by the Case JX75T tractor and boom sprayer. The mixture of pesticides is only applied after harvesting is completed. This ensures that no residue is left on the tea cuttings. Residue can mean that the tea is graded lower or even in more extreme cases that the tea cannot be exported at all.

4.9.6 Syferkamp and Taaiboskamp

Both Syferkamp and Taaiboskamp, in Table 4.29 and Table 4.30, are in the fallow year. To ensure better soil health and a better quality of Rooibos tea, the camp needs to stay fallow for two consecutive years, years eight and nine in the cycle. Therefore, in Table 4.29 and Table 4.30, no activities take place, and the tables are empty.

4.10 Conclusion

The main aim of this research project is to contribute towards a systematic calculation of production cost and expected profits for Rooibos tea producers. Chapter 3 covered the structure of the model and the process followed to establish the trustworthiness of the model itself. This chapter serve to illustrate the procedure that a producer would follow and the sequence of equations to calculate the costs, expected break-even point and expected profitability for individual fields and the farm as a whole. This chapter would thus basically serve as a guideline for producers who wish to use this calculator in practice. After various rounds of inputs from producers the data entry of the farm structure, machinery, labour and production variables are deemed to be user-friendly.

CHAPTER 5: COMPARING DIFFERENT AREAS

5.1 Introduction

The main focus of this research project was to establish a systematic financial support system for the quantification of the expected profitability of Rooibos tea production. Two important considerations were identified namely the break-even point and activity costing. These concepts were integrated into a budget model to assist Rooibos tea producers in the financial planning of both establishment and production decisions. The structure of the model was discussed in Chapter 3 and a hypothetical farm was used to simulate the working of the model in Chapter 4. To test the user-friendliness, responsiveness and accuracy of the model, three different areas were identified to calculate the typical production cost of that area. This calculation also lends itself to comparing the break-even point in terms of tonnage between the areas. The first part of this chapter will introduce the areas within which the model farm is located. The second part of the chapter illustrates the calculations and expected financial performance of each, to demonstrate how the model works. The chapter concludes by identifying key differences between the areas. These differences translate directly to financial differences. Scenario developments are included to illustrate how the model would be able to assist producers of Rooibos tea in planting and production decisions.

5.2 Description of the Different Areas

The areas identified to test the flexibility of the model are Clanwilliam, Sandveld and Tierberg. The location, soil composition, climate, planting density, yield and differences between the production cycle and the total cost per hectare form part of the items used for comparison and the discussion that follows. In each instance the area planted and yields was provided. The producer was kept anonymous and only production related information was made available. The producer could then respond in terms of accuracy. In all cases the response was positive. It was thus an effort to test the model with producers, understand the logic of the model and agree with the calculations. In essence the model is budget orientated. To test the validity, historic information was used so that producers could compare it to actual results. The tables presented in this chapter all form part of the model that was constructed.

Figure 5.1 identifies the locations of the various areas on the map. Point number one is Clanwilliam, which is situated close to the N7, halfway between Citrusdal and Klawer. The farm discussed in Section 5.2.1 is in the Clanwilliam area. The farm in the Sandveld area is located between Elands Bay and Redelinghuys, point number 2 and discussed in Section 5.2.2. The third identified area, Tierberg is situated close to Vanrhynsdorp. In Figure 5.1, Tierberg is numbered 3 and the discussion regarding the farm is in Section 5.2.3. As seen in Figure 5.1, the three areas identified are all situated in the Rooibos farming areas.

Figure 5.1: Rooibos Growing Area
Adapted from: Rooibos Council (2022:4)

5.2.1 Clanwilliam

The Clanwilliam area's climate is dry and very hot in the summer with temperatures rising above 40˚C (Helme, 2007:36). This area experiences typical winter rains with an annual rainfall of 250-350mm. Wind and fog are not a feature in this area (Smith, Botha & Hardie, 2018:252). The farm is 355m above sea level with the annual rainfall around 355mm (Smith, Botha & Hardie, 2018:253). The soil in this area is derived from quarzitic sandstone and is predominantly coarse sands (Smith, Botha & Hardie, 2018:253).

On this specific farm in the Clanwilliam area, the planting density of Rooibos seedlings per hectare is 1,1 and; therefore, 1 100 seedlings are planted on a hectare. Table 5.1 shows the yield per hectare in wet kilogram tea. The top harvest, the first harvest of the plant, yields on average 600 kilograms of wet Rooibos per hectare. The following year, the first year of production yield increases to 2 000 wet kilograms per hectare with the next year achieving the same yield. The first and second harvest is usually the most in terms of yield, but in year three it declines to 1 000 kilogram of wet tea per hectare. The fourth, and last harvest, yields only 400 kilogram of wet tea per hectare. The total yield per hectare on this farm is 6,000 wet kilograms per hectare, which is the highest of the three regions.

Table 5.1: Clanwilliam Rooibos Tea Yields for the 5 Year Cycle

	Wet kg/ha	
Top harvest	600	
1st harvest	2000	
2nd harvest	2000	
3rd harvest	1000	
4th harvest	400	
Total	6000	wet kg/ha
Average	1200	wet kg/ha

The production cycle consists of eight years, which is a year shorter than usual. Table 5.2 illustrates the different fields in production and in what part of the cycle each camp is. This production cycle begins with two years of cover crop followed by the plant year. One to two years of cover crop is recommended to help prevent wind erosion and prevent build-up of plant pathogens (Smith, Botha & Hardie, 2018:252). Once the plant year is completed, the first harvest, the top harvest takes place, followed by four harvests. After the completion of the fourth harvest, the yield is not enough to consider a fifth harvest. The next year, the production cycle starts again.

Table 5.2: Clanwilliam Rooibos Tea Production Cycle

		Geeldam A1	Geeldam A2	Geeldam B1	Geeldam B2	Ew se lyn	Langkamp	Woonstelkamp	Klein Dassiekop
	Hectares	13,5	14,9	16,7	13,9	60,4	5,6	34	27
2021	Year 1	Cover crop 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Cover crop 1
2022	Year 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Cover crop 1	Cover crop 2
2023	Year 3	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Cover crop 1	Cover crop 2	Plant

		Reservoir	Witklip	Gat se land	Driehoek	Sacket	Beeswerfkop	Geeldraai	Waggelklip
	Hectares	32,5	41,7	74	27	45	51,6	36,3	18,8
2021	Year 1	Cover crop 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Cover crop 1
2022	Year 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Cover crop 1	Cover crop 2
2023	Year 3	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Cover crop 1	Cover crop 2	Plant

To illustrate the difference in production cost per hectare, three years of the model are populated, from 2021 to 2023. Table 5.3 shows the total allocated production cost per hectare and the total cost per hectare. The farm in Clanwilliam has a total of 512,9 hectares, in 2021 the total allocated production cost is R107,44, the cost increases in 2022 to R136,39 and in 2023 it increased to R151,74.

The total cost per hectare is exponentially higher due to the non-allocatable cost, overhead costs, labour costs, sundry expenses, certification, and drying court costs being included in the calculation. The total cost per hectare in 2021 is R5 781,23 and increases to R7 170,27 in 2022. This increase is due to an increase in hectares harvested. In 2021, 273,8 hectares were harvested compared to the 294,2 hectares harvested in 2022. Camps in year one and two of harvest also have an expensive spraying program that contributes to the higher total cost per hectare experienced in 2022. The total cost per hectare decreases in 2023 to R6 219,35 with 293,6 hectares being harvested.

Table 5.3: Per Hectare Rooibost Tea Production Cost (Clanwilliam)

	Hectares	2021	2022	2023
Geeldam A1	13,5	R 402,90	R 5 030,07	R 5 759,42
Geeldam A2	14,9	R 3 317,12	R 5 460,55	R 5 759,42
Geeldam B1	16,7	R 4 476,40	R 5 460,55	R 5 759,42
Geeldam B2	13,9	R 4 476,40	R 5 460,55	R 5 759,42
Ew se lyn	60,4	R 4 476,40	R 5 460,55	R 40,25
Langkamp	5,6	R 4 476,40	R 38,64	R 8 793,08
Woonstelkamp	34	R 32,08	R 7 592,27	R 542,73
Klein Dassiekop	27	R 5 892,50	R 483,67	R 6 500,37
Reservoir	32,5	R 402,90	R 5 030,07	R 5 759,42
Witklip	41,7	R 3 317,12	R 5 460,55	R 5 759,42
Gat se land	74	R 4 476,40	R 5 460,55	R 5 759,42
Driehoek	27	R 4 476,40	R 5 460,55	R 5 759,42
Sacket	45	R 4 476,40	R 5 460,55	R 40,25
Beeswerfkop	51,6	R 4 482,09	R 38,64	R 8 793,08
Geeldraai	36,3	R 32,08	R 7 592,27	R 542,73
Waggelklip	18,8	R 5 892,50	R 465,66	R 6 500,37
Total Allocated Production Cost/ha	512,9	R 107,44	R 136,39	R 151,74
Total Cost/ha	512,9	R 5 781,23	R 7 170,27	R 6 219,35

The total cost per dried kilogram is calculated by dividing the total cost by the total kilogram of net dried tea produced to determine the total cost per kilogram of dried tea produced. The total cost of R2 965 190,97 is divided by the kilograms produced of 139 452.48, to equal the per kilogram cost in 2021 to R21,26. In 2022 the total kilogram dried tea increased to 144 456.12. This increase is due to more hectares coming into production. This causes the total cost to increase to R3 677 632,84, and the per kilogram cost increases to R25,46.

In 2023, the total hectares in production decreased leading to a decrease in the net dried kilograms harvested. From 2022 to 2023 it decreased from 144 456,12 to 139 356,54. The total cost decreased to R3 189 904,17 and the total cost per kilogram decreased from R25,46 to R22,89.

Table 5.4: Total Cost of Production for Rooibos Tea Per Kilogram (Clanwilliam)

TOTAL COST OF PRODUCTION FOR ROOIBOS TEA						
	2021		2022		2023	
TOTAL KG NET (DRIED) TEA PRODUCED	139452,48		144456,12		139356,54	
Geeldam A1	R	5 439,08	R	67 905,89	R	77 752,23
Geeldam A2	R	49 425,14	R	81 362,13	R	85 815,43
Geeldam B1	R	74 755,94	R	91 191,12	R	96 182,39
Geeldam B2	R	62 222,01	R	75 901,59	R	80 056,00
Ew se lyn	R	270 374,77	R	329 816,97	R	2 430,86
Langkamp	R	25 067,86	R	216,39	R	49 241,23
Woonstelkamp	R	1 090,60	R	258 137,04	R	18 452,77
Klein Dassiekop	R	159 097,47	R	13 059,03	R	175 509,94
Reservoir	R	13 094,09	R	163 477,15	R	187 181,30
Witklip	R	138 324,05	R	227 704,76	R	240 168,01
Gat se land	R	331 253,86	R	404 080,40	R	426 197,42
Driehoek	R	120 862,89	R	147 434,74	R	155 504,46
Sacket	R	201 438,16	R	245 724,56	R	1 811,07
Beeswerfkop	R	231 275,61	R	1 993,86	R	453 722,74
Geeldraai	R	1 164,38	R	275 599,25	R	19 701,04
Waggelklip	R	110 778,98	R	8 754,37	R	122 206,92
NON-ALLOCATABLE COST	R	27 307,09	R	30 303,26	R	30 918,94
OVERHEAD COSTS	R	253 400,00	R	301 500,00	R	300 600,00
LABOUR COSTS	R	470 056,79	R	500 480,40	R	482 430,69
SUNDRY EXPENSES	R	1 500,00	R	-	R	1 650,00
CERTIFICATION	R	58 880,00	R	63 700,00	R	69 000,00
DRYING COURT	R	358 382,23	R	389 289,93	R	113 370,73
TOTAL COST	R	2 965 190,97	R	3 677 632,84	R	3 189 904,17
TOTAL COST PER KG (DRIED) TEA PRODUCED	R	21,26	R	25,46	R	22,89

5.2.2 Sandveld

The Sandveld receives winter rainfall mainly between April and September in the form of gentle frontal rain (Steyn, 2012:162). The long-term average rainfall is 398mm (Smith & Hardie, 2022:228). Fog is common in the winter, but frost is scarce (Steyn, 2012:162). Hot and dry summers are typical of this area (Steyn, 2012:162). The soil is mostly sandy, which ranges from deep red in the interior to white along the coast (Steyn, 2012:162).

The planting density applied in the Sandveld area is different to that applied in the Clanwilliam area. The planting density in the Sandveld area is 1,28 Rooibos seedlings per hectare. This is equal to 1 280 seedlings planted per hectare, 180 seedlings per hectare more than in the Clanwilliam area.

To illustrate the yield per hectare in the Sandveld, Table 5.5 shows that during the top harvest, the yield is not calculated since the harvest is not being used for processing. This is due to top-harvested tea being brittle. Harvest one, wet tea harvested per hectare is equal to 450 kilograms and this increases in harvest two to 800 kilograms per hectare. Harvest two is the peak year of production. In harvest three the yield decreases to 650 kilograms per hectare, and in the last harvest, harvest four, the yield decreases once again to 300 kilograms per hectare. The total harvest per hectare, is

2 200 wet kilograms, compare this to the yield achieved in the Clanwilliam area, this is significantly lower. The yield achieved in the Clanwilliam area is 6,000 wet kilograms per hectare.

Table 5.5: Sandveld Rooibos Tea Yields for the 5 Year Cycle

	Wet kg/ha	
Top harvest	0	
1st harvest	450	
2nd harvest	800	
3rd harvest	650	
4th harvest	300	
Total	2200	wet kg/ha
Average	440	wet kg/ha

Table 5.6 illustrates the production cycle applied in the Sandveld. This cycle is a year longer than the cycle in the Clanwilliam area. In year one no activity takes place on the camp; this is followed by the removal of the old tea bushes. This is done using a tractor and a brush cutter. Only one year of cover crop is applied, followed by the planting year. In year five of the cycle top harvest is done, with four additional harvests. After the four years in production, the camp either becomes non-productive or die-back (Smith, Botha & Hardie, 2018:252). After nine years of the production cycle, the cycle starts again with year one having no activity.

Table 5.6: Sandveld Rooibos Tea Production Cycle

		U1	M3	U2	M1	M2	M8
	Hectares	22,3	28,4	16,2	5,3	41,2	29,9
2021	Year 1	No activity	Removal of old tea bushes	Cover crop	Plant	Top	Harvest 1
2022	Year 2	Removal of old tea bushes	Cover crop	Plant	Top	Harvest 1	Harvest 2
2023	Year 3	Cover crop	Plant	Top	Harvest 1	Harvest 2	Harvest 3

		M6	M4	M5	M7	KJ1	KJ2
	Hectares	47,9	33,9	32,5	25,1	74	32,6
2021	Year 1	Harvest 2	Harvest 3	Harvest 4	No activity	Removal of old tea bushes	Cover crop
2022	Year 2	Harvest 3	Harvest 4	No activity	Removal of old tea bushes	Cover crop	Plant
2023	Year 3	Harvest 4	No activity	Removal of old tea bushes	Cover crop	Plant	Top

		KTB1	KTB2	KTB3A	KTB5A	KJ4
	Hectares	25,4	23,6	22,4	70,2	26,9
2021	Year 1	Plant	Top	Harvest 1	Harvest 2	Harvest 3
2022	Year 2	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4
2023	Year 3	Harvest 1	Harvest 2	Harvest 3	Harvest 4	No activity

The total area used for production on this farm in the Sandveld area is 557,8 hectares, as shown in Table 5.7. The total allocated production cost, which excludes labour cost, is R36.65 in 2021. For 2021, the total cost per hectare is equal to R2 820,93, which increases to R3 256,33 in 2022. The total allocated production cost increased from R36,65 (2021) to R41,58 (2022) per hectare. In 2023, the total allocated production cost per hectare is similar to 2022. The production cost increased to R42,66 per hectare whilst total cost per hectare, including the cost of labour, non-allocatable etc. increased to R4 108,18.

Table 5.7: Per Hectare Rooibos Tea Production Cost (Sandveld)

	Hectares	2021	2022	2023
U1	22,3	R -	R 644,88	R 568,88
M3	28,4	R 568,02	R 544,17	R 6 815,15
U2	16,2	R 485,11	R 6 427,63	R 1 574,95
M1	5,3	R 5 669,58	R 1 502,35	R 1 303,23
M2	41,2	R 1 317,76	R 1 239,34	R 1 303,23
M8	29,9	R 1 090,33	R 1 239,34	R -
M6	47,9	R 1 090,33	R -	R -
M4	33,9	R -	R -	R -
M5	32,5	R -	R -	R 663,68
M7	25,1	R -	R 644,88	R 568,88
KJ1	74	R 568,02	R 544,17	R 6 815,15
KJ2	32,6	R 485,11	R 6 427,63	R 1 574,95
KTB1	25,4	R 5 669,58	R 1 502,35	R 1 303,23
KTB2	23,6	R 1 317,76	R 1 239,34	R 1 303,23
KTB3A	22,4	R 1 090,33	R 1 239,34	R -
KTB5A	70,2	R 1 090,33	R -	R -
KJ4	26,9	R -	R -	R -
Total Allocated Production Cost/ha	557,8	R 36,65	R 41,58	R 42,66
Total Cost/ha	557,8	R 2 820,93	R 3 256,33	R 4 108,18

Table 5.8 illustrates the same table as in the model, specifically Section 3.3.2. Using Table 5.5 and 5.6, the total kilogram of wet tea harvested is calculated using a formula to convert the wet kilograms to net dried tea produced. The total kilogram of net dried tea produced in Table 5.8 is calculated. In 2021 the total kilogram net dried tea produced is equal to 72 267,12. This weight declines in 2022 to 71 714,16 and in 2023 it declines to 58 354,56. This decline is due to the fields in production in 2021 moving out of peak production from 2022 to 2023. Even though the dried tea produced is on the decline from 2021 to 2023, the total cost however did not decline. It steadily increased from R1 573 514,49 in 2021 to R1 816 379,42 in 2022, and again increased to R2 280 905,95 of total cost in 2023.

The influence of the total cost increase, and total kilogram net dried tea produced on the decline causes the total cost per kilogram dried tea produced to increase from R21,77 in 2021, to R25,33 in 2022 to R39,09 in 2023. Although the hectares in production declined, the cost of non-allocatable costs, overhead costs, labour costs, sundry expenses and certification did not decrease in the same way.

In 2023 there is a significant increase in the total cost per hectare. One cost that stands out is the R504 320,87 in 2023 for the KJ1 camp. KJ1 is 74 hectares, the biggest camp on the farm, and in 2023 the camp is planted with Rooibos seedlings, which is an expensive production year. The interrelationships associated with planting cost per hectare will be discussed in section 5.3.2.

Table 5.8: Total Cost of Production for Rooibos Tea Per Kilogram (Sandveld)

TOTAL COST OF PRODUCTION FOR ROOIBOS TEA						
		2021		2022		2023
TOTAL KG NET (DRIED) TEA PRODUCED		72267,12		71714,16		58354,56
U1	R	-	R	14 380,92	R	12 686,05
M3	R	16 131,69	R	15 454,48	R	193 550,17
U2	R	7 858,75	R	104 127,68	R	25 514,15
M1	R	30 048,76	R	7 962,44	R	6 907,13
M2	R	54 291,67	R	51 060,62	R	53 693,19
M8	R	32 600,97	R	37 056,13	R	-
M6	R	52 226,97	R	-	R	-
M4	R	-	R	-	R	-
M5	R	-	R	-	R	21 569,65
M7	R	-	R	16 186,60	R	3 644,52
KJ1	R	42 033,28	R	40 268,73	R	504 320,87
KJ2	R	15 814,52	R	209 540,90	R	51 343,28
KTB1	R	144 007,25	R	38 159,63	R	33 102,11
KTB2	R	31 099,11	R	29 248,31	R	30 756,29
KTB3A	R	24 423,47	R	27 761,11	R	-
KTB5A	R	76 541,40	R	-	R	-
KJ4	R	-	R	-	R	-
NON-ALLOCATABLE COST	R	31 617,47	R	36 088,67	R	32 418,00
OVERHEAD COSTS	R	300 663,01	R	330 657,94	R	360 535,37
LABOUR COSTS	R	209 055,68	R	223 532,21	R	305 830,69
SUNDRY EXPENSES	R	420 212,50	R	541 516,25	R	542 320,00
CERTIFICATION	R	84 888,00	R	93 376,80	R	102 714,48
TOTAL COST	R	1 573 514,49	R	1 816 379,42	R	2 280 905,95
TOTAL COST PER KG (DRIED) TEA PRODUCED	R	21,77	R	25,33	R	39,09

5.2.3 Tierberg

The summers in this area is hot and dry, with moderate rainfall and the mild winters (Helme, 2007:52). A feature of this area is the occasional summer thunderstorms, the wind tends to be low, and mid-morning mist can be common as it rises from the plains (Helme, 2007:36). The long term average rainfall for the Tierberg/Gifberg/Vanrhynsdorp area is 224 mm (Smith & Hardie, 2022:228). The soil composition varies from deep, neutral to acid sands, with the occasional loamy sands or sandstones (rocky outcrops) (Helme, 2007:54). In Table 5.9, the yield on this Rooibos farm in the Tierberg area is as follows:

Table 5.9: Tierberg Rooibos Tea Yields for the 5 Year Cycle

	Wet kg/ha	
Top harvest	1000	
1st harvest	1200	
2nd harvest	1300	
3rd harvest	700	
4th harvest	400	
Total	4600	wet kg/ha
Average	920	wet kg/ha

The total harvest per hectare is 4,600 wet kilograms, which includes a top harvest and the following four harvests. Once the fourth harvest is completed, the bushes die back to a point where the yield is not significant enough to validate the fifth harvest. The 4 600 wet kilogram per hectare can be broken down to 1,000 wet kilograms during the top harvest and it increases to 1,200 wet kilograms during the first harvest, reaching a peak of 1,300 wet kilograms per hectare in the second harvest. The third harvest has a lower yield per-hectare, 700 wet kilograms, and the fourth harvest has the lowest yield of 400 wet kilograms.

The production cycle followed in the Tierberg area consists of nine years, as illustrated in Table 5.10. The production cycle starts with two years of cover crops to prevent plant pathogens' build-up and restore the soil's biomaterial before the planting year. Year four is the first year of harvest, also the best harvest, with a yield of a 1,000 wet kilograms per hectare as illustrated in Table 5.9. The harvest is followed by four full production harvests thereafter the tea bushes are removed before the production cycle starts once again.

Table 5.10: Tierberg Rooibos Tea Production Cycle

		Kamp 1	Kamp 2B	Kamp 3	Kamp 4	Kamp 5	Kamp 6	Kamp 7
	Hectares	13,5	4,6	22,2	12,1	8,7	6	19,7
2021	Year 1	Cover crop 1	Cover crop 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3
2022	Year 2	Cover crop 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4
2023	Year 3	Plant	Top	Harvest 1	Harvest 2	Harvest 3	Harvest 4	Removal of old tea bushes

		Kamp 8	Kamp 9	Kamp 10	Kamp 11	Kamp 12	Kamp 13	Kamp 2A
	Hectares	52,1	6,2	18,2	20,5	26,1	14,2	5,3
2021	Year 1	Harvest 4	Removal of old tea bushes	Cover crop 1	Cover crop 2	Plant	Top	Harvest 1
2022	Year 2	Removal of old tea bushes	Cover crop 1	Cover crop 2	Plant	Top	Harvest 1	Harvest 2
2023	Year 3	Cover crop 1	Cover crop 2	Plant	Top	Harvest 1	Harvest 2	Harvest 3

The total area used for Rooibos tea production is 229,4 hectares, as shown in Table 5.11. Compared to the other two farms, it is the smallest of the three farms. The total allocated cost in 2021 is R126,62 per hectare, this cost increases to R135,12 per hectare. In 2023 the total allocated cost is R137,45 per hectare. However, the total cost per hectare is significantly higher. In 2021 the total cost per hectare is equal to R5 672,19. The total cost increased to R6 486,55 per hectare in 2022 and increased again in 2023 to R8 275,29 per hectare.

Table 5.11: Per Hectare Rooibos Tea Production Cost (Tierberg)

	Hectares	2021	2022	2023
Kamp 1	13,5	R 2 250,99	R 2 502,16	R 5 626,12
Kamp 2B	4,6	R 2 250,99	R 5 348,10	R 2 179,24
Kamp 3	22,2	R 4 788,07	R 2 109,17	R 1 562,66
Kamp 4	12,1	R 2 102,27	R 1 483,63	R 1 562,66
Kamp 5	8,7	R 1 305,79	R 1 483,63	R 1 562,66
Kamp 6	6	R 1 305,79	R 1 483,63	R -
Kamp 7	19,7	R 1 305,79	R -	R 1 184,67
Kamp 8	52,1	R -	R 1 156,20	R 2 680,35
Kamp 9	6,2	R 1 039,77	R 2 502,16	R 2 680,35
Kamp 10	18,2	R 2 250,99	R 2 502,16	R 5 626,12
Kamp 11	20,5	R 2 250,99	R 5 348,10	R 2 179,24
Kamp 12	26,1	R 4 788,07	R 2 109,17	R 1 562,66
Kamp 13	14,2	R 2 102,27	R 1 483,63	R 1 562,66
Kamp 2A	5,3	R 1 305,79	R 1 483,63	R 1 562,66
Total Allocated Production Cost/ha	229,4	R 126,62	R 135,12	R 137,45
Total Cost/ha	229,4	R 5 672,19	R 6 486,55	R 8 275,29

Table 5.12 calculates the total cost per kilogram of dried tea produced. The total cost per kilogram of dried tea is equal to R35,22 in 2021, which decreased to R31,27 in 2022. The decrease in cost can be attributed to the increase in the total net kilogram of dry tea produced. It increased from 36 948,96 kilograms in 2021 to 47 580,48 kilograms in 2022. The significant increase in the total kilograms harvested is due to the production cycle and rotating a camp that had limited yield out of the cycle, and a larger camp with higher yield is brought into production. The increase in kilogram dried tea harvested is higher than the increase in total cost. This means the total cost of production per kilogram decreased. The reason for the increase in total cost per kilogram of dried Rooibos tea produced is that the total cost increased in ratio more than the kilograms increased. The total cost per kilogram increased from R31,27 in 2022 to R33,95 in 2023.

Table 5.12: Total Cost of Production for Rooibos Tea per Kilogram (Tierberg)

TOTAL COST OF PRODUCTION FOR ROOIBOS TEA						
	2021		2022		2023	
TOTAL KG NET (DRIED) TEA PRODUCED		36948,96		47580,48		55922,40
Kamp 1	R	30 388,43	R	33 779,17	R	75 952,64
Kamp 2B	R	10 354,58	R	24 601,28	R	10 024,52
Kamp 3	R	106 295,05	R	46 823,67	R	34 691,13
Kamp 4	R	25 437,52	R	17 951,92	R	18 908,23
Kamp 5	R	11 360,37	R	12 907,58	R	13 595,17
Kamp 6	R	7 834,74	R	8 901,78	R	-
Kamp 7	R	25 724,07	R	-	R	23 337,94
Kamp 8	R	-	R	60 237,82	R	139 646,29
Kamp 9	R	6 446,58	R	15 513,39	R	16 618,18
Kamp 10	R	40 968,10	R	45 539,32	R	102 395,41
Kamp 11	R	46 145,39	R	109 636,14	R	44 674,50
Kamp 12	R	124 968,50	R	55 049,45	R	40 785,52
Kamp 13	R	29 852,29	R	21 067,54	R	22 189,82
Kamp 2A	R	6 920,69	R	7 863,24	R	8 282,12
NON-ALLOCATABLE COST	R	30 870,87	R	38 809,10	R	45 143,13
OVERHEAD COSTS	R	1 500,00	R	2 100,00	R	2 400,00
LABOUR COSTS	R	269 153,56	R	318 510,68	R	517 862,62
SUNDRY EXPENSES	R	472 125,60	R	607 972,80	R	714 564,00
CERTIFICATION	R	54 855,00	R	60 750,00	R	67 280,00
TOTAL COST	R	1 301 201,32	R	1 488 014,89	R	1 898 351,20
TOTAL COST PER KG (DRIED) TEA PRODUCED	R	35,22	R	31,27	R	33,95

5.3 Comparison of Different Years in the Production Cycle Between Areas

To compare the production cost of the three areas without being influenced by the different sizes, the cost per hectare is used. The following section will compare the different sections of the production cycle between the areas.

5.3.1 Cover Crop

Table 5.13 illustrates the average cover crop cost per hectare. Since the production cycle of Clanwilliam and Tierberg includes two years of cover crop, and that of the Sandveld only consists of one year, the average cost of cover crops for the whole year is calculated. The cost for cover crops is least expensive in the Sandveld area and the Clanwilliam cover crop cycle is the most expensive.

The reason for the difference in cover crop cost is the fact that a different sequence of actions is followed during the cover crop year(s). In Clanwilliam the cover crop sequence includes ploughing, ripping, various types of fertiliser, discing and planting two rounds of small grains, oats, in this case. However, in the Sandveld no fertiliser is added to the soil, no ploughing or ripping occurs, and only rye is sowed followed by the discing of the field. In the middle, the Tierberg sequence, in 2021, is equal to R2 250,99 per hectare. Two types of fertiliser are spread before oats are planted, using a disc. As a result, it is obvious from the difference in the cost per hectare of a cover crop sequence what impact adding fertiliser and other soil preparation techniques has on the per hectare cost, and how much it varies between places.

Table 5.13: Cover Crop Cost Per Hectare

Cover Crop/ha			
	2021	2022	2023
Clanwilliam	R 3 147,70	R 4 033,46	R 4 667,90
Sandveld	R 485,11	R 544,17	R 568,88
Tierberg	R 2 250,99	R 2 502,16	R 2 680,35

5.3.2 Planting

The same planting method for Rooibos seedlings were used in all the areas. A Checchi and Maggli transplanter and a tractor are used to plant the Rooibos seedlings. The difference in cost can be attributed to planting density, the activities and the inputs fertiliser or pesticides.

In 2021, Clanwilliam experienced the lowest planting cost per hectare with an average of R3 317,12 the Sandveld was the most expensive with R5 669,58 per hectare. The planting sequence in Clanwilliam includes using a disc to loosen the soil, planting small grains, specifically oats, using a ripper and applying fertiliser to the camp planting the seedlings, applying mechanical weed removal and the lastly spraying pesticides. The sequence followed in the Sandveld only consisted of using a plough to loosen the soil and apply fertiliser, preparing the planting beds by using a tractor to tamp down, planting the Rooibos seedlings and applying mechanical weed removal with a tractor and a field cultivator. One of the main contributors to the difference in production cost is the planting density and the cost of Rooibos seedlings. As discussed in Section 5.2.2, 180 seedlings are planted per hectare in the Sandveld compared to Clanwilliam.

From 2021 to 2023, the situation changed. As illustrated in Table 5.14, the highest planting cost is still experienced in the Sandveld area, but the lowest planting cost changed to the Tierberg area. Clanwilliam and Tierberg use the same inputs for the planting year, the only difference is the dosage applied. For example, double the dosage of Cypermethrin, a pesticide is applied in Clanwilliam.

Table 5.14: Planting Cost Per Hectare

Planting/ha			
	2021	2022	2023
Clanwilliam	R 3 317,12	R 5 030,07	R 6 500,37
Sandveld	R 5 669,58	R 6 427,63	R 6 815,15
Tierberg	R 4 788,07	R 5 348,10	R 5 626,12

5.3.3 Top Harvest

Comparing the cost per hectare of the top harvest, excluding the piecework used for harvesting the tea, there is a large difference between Clanwilliam, the Sandveld and Tierberg. The main difference is the fact that an intense spray program is followed in Clanwilliam and not in the Sandveld or Tierberg. This causes a more expensive top harvest per hectare. Table 5.15 is a summary of the top harvest cost per hectare for the years 2021 to 2023 for the three different areas. In 2023, the top harvest cost per hectare in Clanwilliam were R5 759,42, the per hectare cost in Tierberg is R2 179,24 and in the Sandveld the cost per hectare is the least, R1 574,95 per hectare.

Table 5.15: Top Harvest Cost Per Hectare

Top Harvest/ha			
	2021	2022	2023
Clanwilliam	R 4 476,40	R 5 030,07	R 5 759,42
Sandveld	R 1 317,76	R 1 502,35	R 1 574,95
Tierberg	R 2 102,27	R 2 109,17	R 2 179,24

5.3.4 Harvest

Since the three areas all have four harvests but a different sequence applied in the four years, an average harvest cost per hectare is calculated. This average cost calculation excludes the cost of piece work. The average harvest cost per hectare during 2023 in the Sandveld is R651,62, in the Tierberg area it is R1 339,43 per hectare, and in the Clanwilliam area, it is R4 329,63. An intensive spray program is followed in the Clanwilliam area to ensure the best yield can be achieved, the other two areas only apply a pesticide mixture once, not multiple times as in the Clanwilliam area.

Table 5.16: Harvest Cost Per Hectare

Harvest/ha			
	2021	2022	2023
Clanwilliam	R 3 366,03	R 4 105,07	R 4 329,63
Sandveld	R 623,05	R 619,67	R 651,62
Tierberg	R 1 044,63	R 1 236,36	R 1 339,43

5.3.5 Removal of Depleted Rooibos Tea Bushes

Table 5.17 is a summary of the cost per hectare to remove the old tea bushes in the three areas. There is no dedicated year for removing the old tea bushes in the Clanwilliam area and therefore, a cost cannot be linked per hectare to this year of activity. However, in the Sandveld and Tierberg areas, there is a year dedicated to removing the old tea bushes.

In the Sandveld area a tractor and an implement called a brush cutter is used to remove the old tea bushes and weeds that have grown since the last harvest took place. In 2023, the per hectare cost for this activity is R663,68. The Tierberg area follows a similar sequence of using a tractor and a brush cutter to remove the old bushes and weeds, but they also use a one-way disc to disc the field in preparation for the cover crop year that follows. The additional activity causes an increase in the per hectare cost in the Tierberg area and is therefore equal to R1 184,67.

Table 5.17: Removal of Old Tea Bushes Per Hectare

Removal of Old Tea Bushes/ha			
	2021	2022	2023
Clanwilliam	R -	R -	R -
Sandveld	R 568,02	R 644,88	R 663,68
Tierberg	R 1 039,77	R 1 156,20	R 1 184,67

5.4 Results and Discussion by Illustration of Whole Farm Production Cost

Although the Clanwilliam area had the highest production cost per hectare in the case of cover crops, top harvest and harvest cost, the average cost per kilogram of dried tea produced is still the lowest. The cost per kilogram in the Tierberg area is on average the highest, R33,48, as illustrated in Table 5.18. In contrast, the total cost per kilogram of net dried tea produced is R23,20 in Clanwilliam. Due to the higher yield achieved in the Clanwilliam area, they can introduce a higher per-hectare production cost cycle, but the higher yield causes a lower average cost.

The total cost per kg net of dried tea is calculated by dividing the total cost accumulated during the year by the net kilogram of dried tea produced during the same year. This means that the higher the yield, the lower the cost per kilogram, but the opposite is also true, if the yield is lower, the cost per kilogram will be higher.

Table 5.18: Total Cost Per Kg of Dried Tea Produced

Total Cost/kg Dried Tea Produced				
	2021	2022	2023	Average Cost/kg
Clanwilliam	R 21,26	R 25,46	R 22,89	R 23,20
Sandveld	R 21,77	R 25,33	R 39,27	R 28,79
Tierberg	R 35,22	R 31,27	R 33,95	R 33,48

5.5 Break-even Analysis

Using the formula discussed in Section 2.2 and Equation 2.4, the break-even point can be calculated by dividing the fixed cost by the difference between the selling price and variable cost per unit. Using prices paid by processors to producers for their Rooibos tea, first, the kilogram of dried tea is determined by dividing the total cost by the price received. Using the variable of 48%, which is the conversion of wet to dry tea, the total tonnage of wet tea that needs to be harvested to break even is calculated.

Comparing the break-even point calculated in Table 5.19 with the total kilogram net of dried tea produced (Table 5.4), there is a difference of 72,35 tons of dried tea between the amount of tea produced and the break-even point. Another way of looking at it, is the differential cost per kilogram of dried tea at R21,26, and the price received in 2021, R14 per kilogram.

In 2023 with the price received at R30, the Clanwilliam producer is producing beyond the break-even point (Pretorius, 2023). To break even, the producer should at least produce 106 330 kilograms, but in 2023 they can produce 139 356 kilograms.

Table 5.19: Clanwilliam Break-even Analysis

Conversion of wet to dried tea (%)	48%		
	2021	2022	2023
Price/kg received	R 14,00	R 21,00	R 30,00
Total Cost	R 2 965 190,97	R 3 677 632,84	R 3 189 904,17
Break-even Point: kg (dried) tea	211 799,36	175125,3734	106330,1391
Break-even Point: ton (dried) tea	211,80	175,1253734	106,3301391
Break-even Point: ton (wet) tea	441,25	364,84	221,52

The results in Table 5.20 compared to the total cost per kilogram of dried tea produced show that between 2021 and 2023 the producer is unable to break even. In 2021, according to Table 5.20, the producer should produce 112 393 dried kilograms of Rooibos tea but is only able to produce 72 267,12 kilograms of dried Rooibos tea. The same type of scenario is applicable to 2023. At least 76 384,67 kilograms of dried Rooibos tea needs to be produced at the point of price received per kilogram of R30 (Pretorius, 2023). In the Sandveld, only 58 354,56 kilograms, of dried tea is produced. This is a shortage of 18 030,12 kilograms of dried Rooibos tea.

Table 5.20: Sandveld Break-even Analysis

Conversion of wet to dried tea (%)	48%		
	2021	2022	2023
Price/kg received	R 14,00	R 21,00	R 30,00
Total Cost	R 1 573 514,49	R 1 816 379,42	R 2 291 540,34
Break-even Point: kg (dried) tea	112 393,89	86494,25806	76384,67815
Break-even Point: ton (dried) tea	112,39	86,49425806	76,38467815
Break-even Point: ton (wet) tea	234,15	180,20	159,13

The scenario experienced at the Sandveld is very similar to the scenario in the Tierberg area, between 2021 and 2023, no break-even point is reached. In 2023, according to Table 5.12 the total cost per kilogram of dried tea produced is equal to R33,95, but the price received per kilogram is only R30 (Pretorius, 2023). The break-even point is 63 278,37 kilograms of dried Rooibos tea, but only 55 922,40 kilograms is produced; therefore, the producer is unable to produce a profit by only producing Rooibos tea.

Table 5.21: Tierberg Break-even Analysis

Conversion of wet to dried tea (%)	48%		
	2021	2022	2023
Price/kg received	R 14,00	R 21,00	R 30,00
Break-even Point: kg (dried) tea	92 942,95	70857,85188	63278,37346
Break-even Point: ton (dried) tea	92,94	70,85785188	63,27837346
Break-even Point: ton (wet) tea	193,63	147,62	131,83

In conclusion, out of the three areas, only one of the areas can break even in the three years of calculation.

5.6 Sensitivity Analysis

The sensitivity analysis tests the reaction of the total income if for example the price per kilogram and yield increase or decrease in increments of ten percent. To test the functionality of this tool, the total kilogram of dried tea is used as the starting point in terms of yield, and the price received by producers is also used. The cell in the model is programmed with conditional formatting to indicate if total revenue is greater than total cost. If so the cells will turn green. If total cost is greater than total revenue, the cells will turn red. If no profit is made, total revenue equal total cost, the colour of the cell will not change.

Table 5.22 illustrate that in 2021, at no given point, hypothetically even if the price and yield increase by twenty percent, the producer is still unable to earn a profit as the total cost is greater than total income. In 2022, the only point where it is profitable to produce is if the both the price and yield increase by twenty percent or the yield increase by ten percent and the price by twenty percent.

For the 2023 season, the producer is profitable at the current price point and yield of R30 per kilogram of dry Rooibos. Therefore, if the price and yield decrease by ten percent, the total revenue is still greater than the total cost. If there is any increase in the yield or price, a profit is shown.

Table 5.22: Clanwilliam Sensitivity Analysis

2021						
Total Cost:	**Yield**					
R 2 965 190,97		-20%	-10%	139452,48	10%	20%
	-20%	R 1 249 494,22	R 1 405 681,00	R 1 561 867,78	R 1 718 054,55	R 1 874 241,33
	-10%	R 1 405 681,00	R 1 581 391,12	R 1 757 101,25	R 1 932 811,37	R 2 108 521,50
Price	R 14,00	R 1 561 867,78	R 1 757 101,25	R 1 952 334,72	R 2 147 568,19	R 2 342 801,66
	10%	R 1 718 054,55	R 1 932 811,37	R 2 147 568,19	R 2 362 325,01	R 2 577 081,83
	20%	R 1 874 241,33	R 2 108 521,50	R 2 342 801,66	R 2 577 081,83	R 2 811 362,00
2022						
Total Cost:	**Yield**					
R 3 677 632,84		-20%	-10%	144456,12	10%	20%
	-20%	R 1 874 241,33	R 2 184 176,53	R 2 426 862,82	R 2 669 549,10	R 2 912 235,38
	-10%	R 2 108 521,50	R 2 457 198,60	R 2 730 220,67	R 3 003 242,73	R 3 276 264,80
Price	R 21,00	R 2 426 862,82	R 2 730 220,67	R 3 033 578,52	R 3 336 936,37	R 3 640 294,22
	10%	R 2 669 549,10	R 3 003 242,73	R 3 336 936,37	R 3 670 630,01	R 4 004 323,65
	20%	R 2 912 235,38	R 3 276 264,80	R 3 640 294,22	R 4 004 323,65	R 4 368 353,07
2023						
Total Cost:	**Yield**					
R 3 189 904,17		-20%	-10%	139356,54	10%	20%
	-20%	R 2 675 645,57	R 3 010 101,26	R 3 344 556,96	R 3 679 012,66	R 4 013 468,35
	-10%	R 3 010 101,26	R 3 386 363,92	R 3 762 626,58	R 4 138 889,24	R 4 515 151,90
Price	R 30,00	R 3 344 556,96	R 3 762 626,58	R 4 180 696,20	R 4 598 765,82	R 5 016 835,44
	10%	R 3 679 012,66	R 4 138 889,24	R 4 598 765,82	R 5 058 642,40	R 5 518 518,98
	20%	R 4 013 468,35	R 4 515 151,90	R 5 016 835,44	R 5 518 518,98	R 6 020 202,53

Table 5.23 is a summary of the results of the sensitivity analysis in the Sandveld area. For 2021, at no point is the producer able to produce at a profitable point given the original yield of 72 267,12 kilograms and R14 per kilogram price (Pretorius, 2023). In 2022, a profitable outcome is possible if the both the price and yield increase by ten percent. If the price and yield stay constant or even decrease, the total cost is greater than the total revenue.

If the price of R30, received in 2023, increase by ten percent and the yield increase by twenty percent, the total revenue is greater than the total cost, thus profit is made. If the yield of 58 354,56 kilograms increases by ten percent, the price at least has to increase by twenty percent to ensure a profitable outcome.

Table 5.23: Sandveld Sensitivity Analysis

				2021		
Total Cost:				Yield		
R 1 573 514,49		-20%	-10%	72267,12	10%	20%
	-20%	R 647 513,40	R 728 452,57	R 809 391,74	R 890 330,92	R 971 270,09
	-10%	R 728 452,57	R 819 509,14	R 910 565,71	R 1 001 622,28	R 1 092 678,85
Price	R 14,00	R 809 391,74	R 910 565,71	R 1 011 739,68	R 1 112 913,65	R 1 214 087,62
	10%	R 890 330,92	R 1 001 622,28	R 1 112 913,65	R 1 224 205,01	R 1 335 496,38
	20%	R 971 270,09	R 1 092 678,85	R 1 214 087,62	R 1 335 496,38	R 1 456 905,14
				2022		
Total Cost:				Yield		
R 1 816 379,42		-20%	-10%	71714,16	10%	20%
	-20%	R 971 270,09	R 1 084 318,10	R 1 204 797,89	R 1 325 277,68	R 1 445 757,47
	-10%	R 1 092 678,85	R 1 219 857,86	R 1 355 397,62	R 1 490 937,39	R 1 626 477,15
Price	R 21,00	R 1 204 797,89	R 1 355 397,62	R 1 505 997,36	R 1 656 597,10	R 1 807 196,83
	10%	R 1 325 277,68	R 1 490 937,39	R 1 656 597,10	R 1 822 256,81	R 1 987 916,52
	20%	R 1 445 757,47	R 1 626 477,15	R 1 807 196,83	R 1 987 916,52	R 2 168 636,20
				2023		
Total Cost:				Yield		
R 2 291 540,34		-20%	-10%	58354,56	10%	20%
	-20%	R 1 120 407,55	R 1 260 458,50	R 1 400 509,44	R 1 540 560,38	R 1 680 611,33
	-10%	R 1 260 458,50	R 1 418 015,81	R 1 575 573,12	R 1 733 130,43	R 1 890 687,74
Price	R 30,00	R 1 400 509,44	R 1 575 573,12	R 1 750 636,80	R 1 925 700,48	R 2 100 764,16
	10%	R 1 540 560,38	R 1 733 130,43	R 1 925 700,48	R 2 118 270,53	R 2 310 840,58
	20%	R 1 680 611,33	R 1 890 687,74	R 2 100 764,16	R 2 310 840,58	R 2 520 916,99

The sensitivity analysis of the last area, Tierberg is illustrated in Table 5.24. For both 2021 and 2022, the producer is unable to produce at a profitable point, even if the price and yield increase by twenty percent. In 2023; however, if the price increase by twenty percent and the yield stays constant at 55 922,40 kilograms, the total revenue is greater than the total cost. If the price of R30 increase by ten percent, and the yield also increase by ten percent, a profit is made.

Table 5.24: Tierberg Sensitivity Analysis

				2021		
Total Cost:				Yield		
R 1 301 201,32		-20%	-10%	36948,96	10%	20%
	-20%	R 331 062,68	R 372 445,52	R 413 828,35	R 455 211,19	R 496 594,02
	-10%	R 372 445,52	R 419 001,21	R 465 556,90	R 512 112,59	R 558 668,28
Price	R 14,00	R 413 828,35	R 465 556,90	R 517 285,44	R 569 013,98	R 620 742,53
	10%	R 455 211,19	R 512 112,59	R 569 013,98	R 625 915,38	R 682 816,78
	20%	R 496 594,02	R 558 668,28	R 620 742,53	R 682 816,78	R 744 891,03
				2022		
Total Cost:				Yield		
R 1 488 014,89		-20%	-10%	47580,48	10%	20%
	-20%	R 496 594,02	R 719 416,86	R 799 352,06	R 879 287,27	R 959 222,48
	-10%	R 558 668,28	R 809 343,96	R 899 271,07	R 989 198,18	R 1 079 125,29
Price	R 21,00	R 799 352,06	R 899 271,07	R 999 190,08	R 1 099 109,09	R 1 199 028,10
	10%	R 879 287,27	R 989 198,18	R 1 099 109,09	R 1 209 020,00	R 1 318 930,91
	20%	R 959 222,48	R 1 079 125,29	R 1 199 028,10	R 1 318 930,91	R 1 438 833,72
				2023		
Total Cost:				Yield		
R 1 898 351,20		-20%	-10%	55922,40	10%	20%
	-20%	R 1 073 710,08	R 1 207 923,84	R 1 342 137,60	R 1 476 351,36	R 1 610 565,12
	-10%	R 1 207 923,84	R 1 358 914,32	R 1 509 904,80	R 1 660 895,28	R 1 811 885,76
Price	R 30,00	R 1 342 137,60	R 1 509 904,80	R 1 677 672,00	R 1 845 439,20	R 2 013 206,40
	10%	R 1 476 351,36	R 1 660 895,28	R 1 845 439,20	R 2 029 983,12	R 2 214 527,04
	20%	R 1 610 565,12	R 1 811 885,76	R 2 013 206,40	R 2 214 527,04	R 2 415 847,68

5.7 Conclusion

The aim of this research project was to develop a systematic and logical decision support model for Rooibos tea production. The model is designed to consider cost for the whole production cycle as the cost and income parameters vary significantly for the different years. Implementing the model in three different areas with different yields and production processes for three years, shows only one area producing at a profitable point for one year. Several clear considerations were identified by "running' the model for farm specific conditions. Producers need to evaluate what impact a cost saving production process on yield has and if it is a viable solution to increase the profit margin of Rooibos tea farms. Another option is an adjustment of how the price per kilogram of tea produced is calculated. This is a wider industry consideration, as this exercise indicates that the production cost of Rooibos tea is currently very high, compared to the prices received. From both the break-even analysis and the sensitivity analysis a complete reconsideration and possible re-design of the production system is required. Alternatively, the price mechanism for the industry may need to be re-evaluated to support the financial survival of Rooibos Tea producers. The main price drivers in the market of Rooibos tea are supply and demand levels, if there is a shortage in the market, the price of Rooibos tea will increase, if there is a oversupply in the market, there will be a decrease in price.

CHAPTER 6: CONCLUSION, SUMMARY AND RECOMMENDATION

6.1 Conclusion

Over the last few years, the Rooibos industry experienced a time window where there was an oversupply of tea, which led to low prices. These low prices decreased to a point where the producers were struggling to break even. There is a surge in the market for certified tea, in terms of organic or other certifications. The buyer is not always willing to pay a premium price. Some producers in the Rooibos industry are less aware of the per kilogram production cost and don't have the correct tools to calculate the production cost over the full nine-year cycle. The Rooibos producers are under pressure to adapt and seek alternative production techniques or stricter financial control. Essentially, farm system adaptations imply changes to physical biological systems and interrelationships to impact financial outcomes. The aim of the research is to construct a financial decision support tool to assist in quantifying the impact that different production processes and yields have on the production cost. Currently, no standardised model can calculate the production cost of Rooibos tea per kilogram produced or consider the cost of production for the whole nine-year production cycle, and this is part of the uncertainty in the Rooibos industry.

Using the concept of activity-based costing as foundation, an enterprise budget is created to calculate the effect of the production process and yield on production cost. Simulation modelling requires an understanding of the production system as well as the users' needs for using the model. The model thus needed to increase the accuracy of financial planning systems and be simple enough to be user-friendly over a wide range of financial and computer skills. Since there are large variations regarding the production cycle and yield, not only between areas but also between producers in the same area, the model needs to be flexible. For example, some of the machinery and implements used are self-built to be able to complete a specific task.

Constructing the budget model to calculate the production cost per kilogram net of dried tea was first done by applying the technical parameters of the production process discussed in Chapter 2. The result of this discussion in Chapter 4 is that the cost per kilogram is R38,89 if the total kilogram of net dried tea produced is equal to 17 535,05 kilograms.

To determine the impact of the production process and yield on the production cost per kilogram, the model is populated with information gathered from the three areas regarding the production process followed, the fixed asset register, costs linked to these items and prices of inputs. Enough historical information is gathered to populate the model for three years, 2021–2023.

The areas identified are Clanwilliam, Sandveld and Tierberg. During 2023, the total cost per kilogram of dried tea produced in Clanwilliam is R22,89, Sandveld R39,27 and in the Tierberg area, R33,95 per kilogram. This is problematic due to the price the producer receives, which is R30,00 per kilogram; therefore, only the producer in the Clanwilliam area can produce at a profitable level. In the Clanwilliam area the production process is more expensive per hectare, however the expensive inputs results in higher yields for this area, and is therefore able to produce at a profit. In the Sandveld area, which produces at R39,27 per kilogram and Tierberg at R33,95 per kilogram, the production cost is higher than the price the producer receives per kilogram, and so they are not at a profitable point. The yield in the Sandveld area is equal to 440 wet kilogram per hectare over the five-year cycle and the yield in the Tierberg area is equal to 920 wet kilogram per hectare over the five-year cycle. Therefore, on average, the Clanwilliam five-year cycle average is much higher than the other two areas with an average yield of 1200 wet kilogram per hectare over the five-year cycle.

From a model development perspective, the following can be concluded:

- A core component is thorough knowledge of the production system, the production environment, including the limitations of the tea plant itself and the variations in methods and techniques the producers employ. This makes the inclusion of producer knowledge a key activity.
- The sequences of activities necessary for production and fine-tuning the cost build-up does contribute to identifying the key cost drivers and thus areas of management focus.
- Using the model in various conditions adds significantly to robustness and trustworthiness among the producers, including application for typical farm analysis and situation-specific analysis.
- The inclusion of break-even analysis and sensitivity analysis provides a very visible and useful tool to immediately indicate key drivers of profitability.

From a production perspective, the results show:

- Currently it is difficult to produce Rooibos tea at a profitable level, even where the production methods are aimed at cost savings.
- Producers need additional income to support their cash flow until they can produce in a more stable and profitable market.
- There are huge differences between areas in terms of production potential and changes to profitable production.

6.2 Summary

The study aimed to develop a user-friendly financial decision support tool to assist producers in determining the impact of different production processes and yields on the production cost of Rooibos tea. This was done by constructing a whole-farm budget model in Excel. The model is designed to calculate the production cost per kilogram by considering not only the direct production cost but also the indirect production cost.

To construct the model, a deeper understanding of the various existing production processes for Rooibos tea had to be developed. Since no blueprint exists, the model has to be flexible and should be able to adapt to almost any situation or scenario. After various versions, the model is created and consists of 42 sheets and 99,000 formulas. By creating the model, the following goals had to be achieved:

- To determine the activities involved in producing Rooibos tea for each phase of the cycle.
- To determine the cost of each activity involved in the production process.
- To determine the various regions of production.
- To determine the break-even point.

The model determines the cost of each component and activity of production, first as a per-hectare cost, and then as a total cost. This enables the producer to identify the most expensive activity. On the total cost sheet, the model calculates what tonnage needs to be harvested in wet and dried tea to break even.

The literature overview is the basis of the formulas and ensures the necessary understanding to create the Rooibos tea budget model. First, the mechanism to determine the break-even point is discussed by referring to different graphs identifying each type of cost to implement the break-even point equation. Activity-based costing is applied since each activity must be broken down into various segments to calculate the cost. As discussed in Section 2.3, ABC is used as a method to accurately measure the costs of the business and link the calculated costs to the goods and services produced. The steps of ABC are also discussed in Section 2.3 and implemented in Chapter three where the building of the model is discussed. It is also used when populating the model.

The cultivation of Rooibos tea, the overall production process, the various standards and certifications applied in the industry, and the various regions where Rooibos tea is produced are all covered in an overview of Rooibos tea.

Chapter 3 is the implementation of a literature study and various discussions regarding the production process of Rooibos tea to build the enterprise budget. This chapter focused on the inner workings of the Rooibos Production Cost Calculator. The goal of the model is to be able to:

- Calculate the per kilogram production cost of Rooibos tea.
- Calculate the break-even production yield.
- Be user-friendly.

Producing Rooibos tea can be broken down into different divisions, and each of these divisions has an allocated sheet, to in the end, be able to calculate the total cost per kilogram of dried tea produced. The model consists of the following sheets:

- User Guide
- Total Cost
- Labour
- Activity Description
- Inputs
- Fixed Asset Register
- Non-Allocatable Cost
- Certification
- Nursery
- Drying Court
- Land

Chapter 4 is an illustration of the implementation of the Rooibos production cost calculator, calculating the total cost per kilogram of dried tea in a hypothetical situation. The results of this calculation are that the total cost of production is R681 945,57, and if divided by the total kilogram of net dried tea produced, 17 535,05 kilograms, the total cost per dried kilogram of Rooibos tea produced is R38,89. In this case, for this producer to break even, 19 484,16 kilograms of dried tea need to be produced, which converts to 40,59 tons of wet tea.

Different areas are compared in Chapter 5. The areas include Clanwilliam, Sandveld and Tierberg. First, the different locations, soil composition, climate, planting density, yield and production cycle are compared. Secondly, the total allocated production cost per hectare and the total cost per hectare are compared. In the different areas, the total cost per hectare for 2023 is R6 219,35 in Clanwilliam, R4 108,18 in the Sandveld area, and in the Tierberg area, the cost is equal to R8 275,29 per hectare. The average cost per kilogram between 2021 and 2023 is equal to R23,20 in Clanwilliam, R28,79 in the Sandveld, and R33,48 in the Tierberg area. Only in the Sandveld in 2023 was a producer able to break even.

The main conclusions of the research project are that a deeper understanding of the production process is evident in the model construction and that the activity-based costing principle and the inclusion of break-even analysis are useful attributes. It is also evident that with current market prices, producers will continue to struggle to break even.

6.3 Recommendation

The main purpose of this study was to determine the impact of different production processes and yields on production costs. This production cost calculator was tested in three different production areas. Firstly, for future studies, it is recommended that the research area be expanded to the rest of the Rooibos-producing areas and use data for nine years instead of three.

Secondly, the model can be adapted to facilitate another type of crop that also works cyclically. This would also imply that the model could be adapted to include livestock for whole-farm analysis. In many of the production areas sheep or game are alternative enterprises due to the remote locations. The nature of the geographical area also possibly lends itself to tourism development, which would be a whole different dimension. This would possibly not be for inclusion in the model itself.

The last recommendation is to review the structure of the Rooibos industry and how decision-making is facilitated. The calculator could even be useful in discussions within industry. It could facilitate understanding among producers from different areas, between producers and processors, certification agencies, and even downstream role players such as retail.

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Britz, K. (2022a) Plant ripper with a fertiliser tank attached [Photograph]

Britz, K. (2022b) Checchi and Maggli Transplanter [Photograph]

Britz, K. (2022c) Rooibos seedling planted using Checchi and Maggli Transplanter [Photograph]

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Addendum A: User Guide

The Rooibos Production Cost Calculator is used to calculate the per kg net clean tea (as sold to consumer) cost of producing Rooibos tea. The accuracy of the model depends on how much information is fed into the model.

HOW TO GET STARTED

1. Fill out the assumptions page.
2. The activity description page is there to assist the user of the calculator to pick the correct activity description. However, if the desired activity description is not on the list there is space provided to add additional items to the list.
3. The inputs list should be updated regularly to keep prices relevant.
4. The user of the calculator should insert the purchases price of the fixed assets into the list and change the assumptions on the right hand side to their preferences.
5. Pages for Land 1-30 should be filled in yearly with each activity that takes place on that land in that year.
6. The non-allocatable page is for activities that does not fit into the Land 1-0 list and should be seen as a overhead cost.
7. Certification, nursery and drying lane is only applicable to producers that exercise these activities.
8. The total cost table shows the price received per net clean kg, the break-even point in tons and the opportunity to implement different scenarios.

Note: The blue cells is live cells and should be adapted to the producers preferences.

ASSUMPTIONS
ACTIVITY DESCRII
INPUTS
FIXED ASSET REC
LAND 1 LAND 2 LAND 3 LAND 4 LAND 5 LAND 6 LAND 7 LAND 8 LAND 9 LAND 10 LAND 11 LAND 12 LAND 13 LAND 14 LAND 15
NON-ALLOCATABLE COST
CERTIFICATION NURSERY DRYING COURT
TOTAL COST

	Horsepower	Kilowatt
Mechanical horsepower to Kilowatt converter:	1	0.75
Kilowatt to mechanical horsepower converter:	1.341	1

Addendum B: Total Cost

Table 3.1: Total Cost per Kilogram (Dried) of Tea Produced

	TOTAL COST OF PRODUCTION FOR ROOIBOS TEA								
	2023	2024	2025	2026	2027	2028	2029	2030	2031
TOTAL KG NET (DRIED) TEA PRODUCED									
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
NON-ALLOCATABLE COST	R -	R -	R -	R -	R -	R -	R -	R -	R -
OVERHEAD COSTS	R -	R -	R -	R -	R -	R -	R -	R -	R -
LABOUR COSTS	R -	R -	R -	R -	R -	R -	R -	R -	R -
SUNDRY EXPENSES	R -	R -	R -	R -	R -	R -	R -	R -	R -
CERTIFICATION	R -	R -	R -	R -	R -	R -	R -	R -	R -
DRYING COURT	R -	R -	R -	R -	R -	R -	R -	R -	R -
NURSERY	R -	R -	R -	R -	R -	R -	R -	R -	R -
TOTAL COST	R -	R -	R -	R -	R -	R -	R -	R -	R -
TOTAL COST PER KG (DRIED) TEA PRODUCED	R -	R -	R -	R -	R -	R -	R -	R -	R -

Table 3.2: Calculation of Break-even Point

Conversion of wet to dried tea (%)	48%								
	2023	2024	2025	2026	2027	2028	2029	2030	2031
Price/kg received									
Total Cost	R -	R -	R -	R -	R -	R -	R -	R -	R -
Break-even Point: kg (dried) tea	0	0	0	0	0	0	0	0	0
Break-even Point: ton (dried) tea	0	0	0	0	0	0	0	0	0
Break-even Point: ton (wet) tea	0	0	0	0	0	0	0	0	0

Table 3.3: Different Scenarios Calculator

2023						
Total Cost:	**Yield**					
R -		-20%	-10%		10%	20%
	-20%	0	0	0	0	0
	-10%	0	0	0	0	0
Price		0	0	0	0	0
	10%	0	0	0	0	0
	20%	0	0	0	0	0

Addendum C: Labour

Table 3.4: Allocation of Labour Cost To Activity (including piece work)

YEAR 1							
HEAD COUNT	NUMBER OF DAYS	ALLOCATION TO ACTIVITY	TYPE OF LABOUR	TYPE OF WAGE	NAME	R/DAY	TOTAL COST
						R -	R -
						R -	R -
						R -	R -
						R -	R -
						R -	R -
						R -	R -
						R -	R -
						R -	R -
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						R -	R -
						R -	R -
						R -	R -
						R -	R -
						R -	R -

	PIECE WORK	YEAR 1	
TEAM	HEAD COUNT	NUMBER OF DAYS	TOTAL HOUSING AND UNIFORM RECEIVED
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!
			#DIV/0!

TOTAL KG WET TEA HARVESTED	R/KG HARVESTED REMUNERATION	HARVEST COSTS
		R -
		R -
		R -
		R -
		R -
TOTAL AMOUNT PAID		R -

Table 3.5: Calculation of Permanent, Temporary and Piece Work Labour

YEAR 1

Permanent Labour

Name	Number of Hours Per work day	Number of Days Per normal work week	Cash Wage Rand per day	Uniform Received Rand per day	Housing Rand per day	Water & Electricity Rand per day	Labour Efficiency Percentage	Total Compensation With Labour Efficiency	Overtime 1,5 50%	Overtime 2 100%	Cost of building house 70m2	Yearly cost of housing 4%	Repair and Maintenance 3%	Total cost for housing Week	Total cost for housing Day
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!

Temporary Labour

Name	Number of Hours Per work day	Number of Days Per normal work week	Cash Wage Rand per day	Uniform Received Rand per day	Housing Rand per day	Water & Electricity Rand per day	Labour Efficiency Percentage	Total Compensation With Labour Efficiency	Overtime 1,5 50%	Overtime 2 100%	Cost of building house 70m2	Yearly cost of housing 4%	Repair and Maintenance 3%	Total cost for housing Week	Total cost for housing Day
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
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					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
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					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!
					#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!		R -	R -	R -	#DIV/0!

Piece Work

Team	Number of Hours Per work day	Number of Days Per normal work week	Uniform Received Rand per day	Housing Rand per day	Water & Electricity Rand per day	Total Benefits Rand per day	Cost of building house 70m2	Yearly cost of housing 4%	Repair and Maintenance 3%	Total cost for housing Week	Total cost for housing Day
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!
				#DIV/0!		#DIV/0!		R -	R -	R -	#DIV/0!

Addendum D: Activity Description

ACTIVITY DESCRIPTION
Brush cutter work
Cultivator work
Disc
Harvesting grain
Harvesting tea
Irrigation
Manual weeding
Mechanical weed removal
Planting of rye
Planting of triticale
Planting Rooibos seedlings
Planting small grains
Plough (including rip, disc)
Removal of tea bush and weeds
Replanting of Rooibos seedlings
Soil prep
Spray of fertiliser
Spray of pesticides
Spreading fertiliser
Spreading rye
Tamping down
Top harvest
Transport of labour to farm
Transport of labour to field
Transport of seedlings to field
Transport of tea to processor
Transport tea from land to truck
Transport of piece work labourers
Weighting of green tea by labourers

Addendum E: Inputs

Table 3.6: Oil Price

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Oil price	2023	2024	2025	2026	2027	2028	2029	2030	2031
R/litre									

Table 3.7: Fertiliser Inputs

YEAR 1:				
FERTILIZER	Unit	Price per unit	Units per HA	Cost per HA
				R -
				R -
				R -
				R -

Table 3.8: Planting Material Inputs

YEAR 1:				
PLANTING MATERIAL	Unit	Price per unit	Units per HA	Cost per HA
				R -
				R -
				R -
				R -

Table 3.9: Weed and Pesticides Inputs

YEAR 1:				
WEED AND PESTICIDES ETC	Unit	Price per unit	Units per HA	Cost per HA
				R -
				R -
				R -
				R -

Addendum F: Fixed Asset Register

Table 3.10: Tractors (2-wheel normal drive tractors and 4-wheel normal drive tractors)

TRACTORS NAME	TRACTOR (kW)	PURCHASE PRICE	AVERAGE LIFE PERIOD (hr)	AVERAGE USAGE PER ANNUM (hr)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)
2-wheel normal drive tractors							
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
4-wheel drive normal tractor							
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -
			12000.00	1000.00	R -	R -	R -

INSURANCE AND LICENCE COSTS (R/hr)	INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS (R/hr)
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
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R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -

Table 3.11: Assumptions: Tractors (2-wheel normal drive tractors and 4-wheel normal drive tractors)

Notes:			
1) Life period	12,000.00	Hours	
2) Average usage per annum	1,000.00	Hours per annum	
3) Salvage values	10%	of purchase price	
4) Average investment	= (Average purchase price + Salvage value) / 2		
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours		
6) Insurance and license cost per hour	0.75%	of Average investment/Hours per annum	
7) Interest cost per hour	9.75%	of Average investment/Hours per annum	
8) Repair and Maintenance cost per hour	120.00%	of Average purchase price/Life period in hours	
Power demand	Fuel consumption	Litres used per kilowatt hour	Total litres used/hour
Low	35%	0.4	0.14
Medium	45%	0.35	0.1575
High	60%	0.3	0.18

Table 3.12: Combine Harvester

COMBINE HARVESTER NAME	kW	PURCHASE PRICE (R)	AVERAGE LIFE PERIOD (hr)	AVERAGE USAGE PER ANNUM (hr)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -
			4000.00	300.00	R -	R -	R -

INSURANCE AND LICENCE COSTS (R/hr)	INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS (R/hr)	FUEL USAGE (L/hr)
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00
R -	R -	R -	R -	R -	0.00

Table 3.13: Assumptions: Combine Harvester

Notes:		
1) Life period	4,000.00	Hours
2) Average use per annum	300.00	Hours per annum
3) Salvage value	10%	of Average purchase price
4) Average investment	= (Average purchase price + Salvage value) / 2	
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
6) Insurance & licence cost per hour	1.75%	of Average investment / Hours per annum
7) Interest cost per hour	7.00%	of Average investment / Hours per annum
8) Repair & Maintenance costs per hour	40.00%	of Average purchase price / Life period in hours
9) Fuel consumption	60%	of Kilowatts used
10) Litres used per kilowatt hour	0.30	Litres/Kw hour

Table 3.14: Trucks with No Trailers

TRUCKS WITH NO TRAILERS Truck Size (ton)	PURCHASE PRICE (R)	FUEL USAGE (L/100km)	AVERAGE LIFE PERIOD (kms)	AVERAGE USE PER ANNUM (kms)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (c/km)
Single differential: with dropsides							
3.0 ton					R -	R -	#DIV/0!
4.0 ton					R -	R -	#DIV/0!
6.0 ton					R -	R -	#DIV/0!
7.0 ton					R -	R -	#DIV/0!
8.0 ton					R -	R -	#DIV/0!
Double differential: with dropsides							
14.0 ton					R -	R -	#DIV/0!
Double differential: horse only							
22.0 ton					R -	R -	#DIV/0!
25.0 ton					R -	R -	#DIV/0!
29.0 ton					R -	R -	#DIV/0!

INSURANCE COST (c/km)	ANNUAL LICENCE COST (R/year)	ANNUAL LICENCE COSTS (c/km)	INTEREST COSTS (c/km)	TOTAL FIXED COSTS INCL. INTEREST (R/km)	TOTAL FIXED COSTS EXCL. INTEREST (R/km)
#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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REPAIR & MAINTENANCE COSTS (c/km)	NUMBER OF TYRES	TYRE COSTS (c/km)	CONTINGENCY FACTOR COSTS (c/km)	TOTAL VARIABLE COSTS (R/km)
#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!		#DIV/0!	#DIV/0!	#DIV/0!
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Table 3.15: Assumptions: Trucks with No Trailers

Notes:								
1) Salvage values	10%	of purchase price						
2) Average investment	=(Average purchase price + Salvage value)/2							
3) Depreciation cost per kilometre	=(Average purchase price - Salvage value)/Life period in hours							
4) Insurance cost per kilometre	10%	of average investment/kms per annum						
5) Actual licence cost per kilometre	=actual cost per annum/kms per annum							
6) Interest cost per kilometre	10.50%	of average investment/kms per annum						
7) Repair & maintenance cost per kilometre	50%	of average purchase price/life period in kms for 3-5 ton trucks		60%	of average purchase price/life period in kms for 6-14 ton trucks		48%	of average purchase price/life period in kms for mechanical horses with interlinks
8) Price of diesel		Cents/litre						
9) Price of oil		Cents/litre						
10) Oil consumption	1.50%	of fuel consumption for 3-5 ton trucks	2%	of fuel consumption for all other trucks				
11) Tyre assumptions and calculations	Number of sets of tyres:	= (Life period of Truck/Life period of tyres) in kms	Life period of tyres:	50000	kms	Price of new tyre	R 2,000.00	Tyre cost per km =(Average purchase price of New Tyre*No. tyres)/Tyre Life in Kilometres
12) Contingency factor	10%	of total costs of repairs, fuel, oil and tyres						

Table 3.16: LDV (4-wheel drive)

LDV (4-wheel drive) - 1 ton	PURCHASE PRICE (R)	FUEL USAGE (L/100km)	AVERAGE LIFE PERIOD (kms)	AVERAGE USE PER ANNUM (kms)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (c/km)
Name:							
					R -	R -	#DIV/0!
					R -	R -	#DIV/0!
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INSURANCE COST (c/km)	ANNUAL LICENCE COST (R/year)	ANNUAL LICENCE COSTS (c/km)	INTEREST COSTS (c/km)	TOTAL FIXED COSTS INCL. INTEREST (R/km)	TOTAL FIXED COSTS EXCL. INTEREST (R/km)
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REPAIR & MAINTENANCE COSTS (c/km)	NUMBER OF TYRES	TYRE COSTS (c/km)	CONTINGENCY FACTOR COSTS (c/km)	TOTAL VARIABLE COSTS (R/km)
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Table 3.17: Assumptions: LDV (4-wheel drive)

Notes:								
1) Salvage values	10%	of purchase price						
2) Average investment	=(Average purchase price + Salvage value)/2							
3) Depreciation cost per kilometre	=(Average purchase price - Salvage value)/Life period in hours							
4) Insurance cost per kilometre	10%	of average investment/kms per annum						
5) Actual licence cost per kilometre	=actual cost per annum/kms per annum							
6) Interest cost per kilometre	10.50%	of average investment/kms per annum						
7) Repair & maintenance cost per kilometre	50%	of average purchase price/life period in kms						
8) Price of diesel		Cents/litre						
9) Price of petrol		Cents/litre						
10) Price of oil		Cents/litre						
11) Oil consumption	1%	of fuel consumption						
12) Tyre assumptions and calculations	Number of sets of tyres:	= (Life period of LDV/Life period of tyres) in kms	Life period of tyres:	50000	kms	Price of new tyre	R 3,400.00	Tyre cost per km = (Average purchase price of New Tyre * No. tyres) / Tyre Life in Kilometres
13) Contingency faactor	10%	of total costs of repairs, fuel, oil and tyres						

Table 3.18: Electric Motors

ELECTRIC MOTORS	MOTOR SIZE (kW)	KVA REQUIRED	PURCHASE PRICE (R)	AVERAGE LIFE PERIOD (Hr)	AVERAGE USE PER ANNUM (Hr)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COSTS (R/hr)
Name:		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
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		0.00				R -	R -	#DIV/0!
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		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!
		0.00				R -	R -	#DIV/0!

INTEREST COST (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR AND MAINTENANCE COSTS (R/hr)
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -
#DIV/0!	R -	R -	R -

Table 3.19: Assumptions: Electric Motors

Notes:		
1) Life period	20,000.00	Hours
2) Average usage per annum	250.00	Hours per annum
3) Salvage values	10%	of purchase price
4) Average investment	= (Average purchase price + Salvage value) / 2	
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
6) Interest cost per hour	10.50%	of Average investment/Hours per annum
7) Repair and Maintenance cost per hour	10.00%	of Average purchase price/Life period in hours
8) Power factor (KVA needed)	85%	of Motor kW size

Table 3.20: Other Machinery (L/100km or L/hr)

OTHER MACHINERY (L/100km)	PURCHASE PRICE (R)	FUEL USAGE (L/100km)	AVERAGE LIFE PERIOD	AVERAGE USE PER ANNUM (km or hrs)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
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					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
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					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!

INSURANCE AND LICENCE COSTS (R/hr)	INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS AS % OF NEW PRICE	REPAIR & MAINTENANCE COSTS (R/hr)
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!

TOTAL VARIABLE COSTS (R/hr)	TOTAL COSTS INCL. INTEREST (R/hr)	TOTAL COSTS EXCL. INTEREST (R/hr)
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!

OTHER MACHINERY (L/Hr)	PURCHASE PRICE (R)	FUEL USAGE (L/Hr)	AVERAGE LIFE PERIOD	AVERAGE USE PER ANNUM (km or hrs)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!
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					-	-	#DIV/0!
					-	-	#DIV/0!
					-	-	#DIV/0!

INSURANCE AND LICENCE COSTS (R/hr)	INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS AS % OF NEW PRICE	REPAIR & MAINTENANCE COSTS (R/hr)
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		#DIV/0!

TOTAL VARIABLE COSTS (R/hr)	TOTAL COSTS INCL. INTEREST (R/hr)	TOTAL COSTS EXCL. INTEREST (R/hr)
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!

Table 3.21: Assumptions: Other Machinery (L/100km or L/hr)

Notes:		
1) Life period	Hours as per table	
2) Average usage per annum	Hours as per table	
3) Salvage values	10%	of purchase price
4) Average investment	= (Average purchase price + Salvage value) / 2	
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
6) Insurance and license cost per hour	1.50%	of Average investment/Hours per annum
7) Interest cost per hour	10.50%	of Average investment/Hours per annum

Table 3.22: Daily Implements

DAILY IMPLEMENTS	PURCHASE PRICE	AVERAGE LIFE PERIOD (hr)	AVERAGE USAGE PER ANNUM (hr)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)	INSURANCE AND LICENCE COSTS (R/hr)
Plant ripper (Dien hoender pille toe agter ripper tande)				R -	R -	R -	R -
Checchi and Maggli Transplanter				R -	R -	R -	R -
Brush cutter				R -	R -	R -	R -
Spreader				R -	R -	R -	R -
Band blaser				R -	R -	R -	R -
Water Cart				R -	R -	R -	R -
Boom Sprayer				R -	R -	R -	R -
4-wheeled trailers 10 ton - Flatbed				R -	R -	R -	R -
Field Cultivators : Shank Tillers 1.7 M - 5 Tines (C Shank)				R -	R -	R -	R -
Harrows Offset Disc Light 1.6M 14 X 20" Disc				R -	R -	R -	R -
Harrows Hydraulic Offset 24" (85Kg/Disc) : Heavy Duty 3.00M Cutting Width 26 X 24" Disc				R -	R -	R -	R -
Blade - 2m				R -	R -	R -	R -
Rotavator				R -	R -	R -	R -
				R -	R -	R -	R -
				R -	R -	R -	R -
				R -	R -	R -	R -
				R -	R -	R -	R -
				R -	R -	R -	R -
				R -	R -	R -	R -

INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS AS % OF NEW PRICE	REPAIR & MAINTENANCE COSTS (R/hr)	TOTAL VARIABLE COSTS (R/hr)
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -
R -	R -	R -		R -	R -

TOTAL COSTS INCL. INTEREST (R/hr)	TOTAL COSTS EXCL. INTEREST (R/hr)
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -
R -	R -

Table 3.23: Assumptions: Daily Implements

Notes:		
1) Life period	Hours as per table	
2) Average usage per annum	Hours as per table	
3) Salvage values	10%	of purchase price
4) Average investment	= (Average purchase price + Salvage value) / 2	
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
6) Insurance and license cost per hour	1.50%	of Average investment/Hours per annum
7) Interest cost per hour	10.50%	of Average investment/Hours per annum

Table 3.24: Drying Court-Specific Implements

DRYING COURT SPECIFIC IMPLEMENTS	PURCHASE PRICE (R)	LIFESPAN (Years)	USAGE PER YEAR (ASSUMPTION) (Hours)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)	INSURANCE AND LICENCE COSTS (R/hr)
Carve machine				R -	R -	#DIV/0!	#DIV/0!
Brush				R -	R -	#DIV/0!	#DIV/0!
Sieve				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!
				R -	R -	#DIV/0!	#DIV/0!

INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	TYPE OF REPLACEMENT COMPONENT	NUMBER OF COMPONENTS	COST PER COMPONENT	LIFESPAN OF COMPONENT (Hours)	REPAIR AND MAINTENANCE OF COMPONENT (R/Per hour)
#DIV/0!	#DIV/0!	#DIV/0!	Blades				#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	Brushes				#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!	Sieve plate				#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
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#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!
#DIV/0!	#DIV/0!	#DIV/0!					#DIV/0!

REPAIR AND MAINTENANCE OF MACHINE AS % OF PURCHASE PRICE	REPAIR AND MAINTENANCE OF MACHINE (R/Per hour)	TOTAL REPAIR AND MAINTENANCE (R/Per hour)	TOTAL VARIABLE COSTS (R/hr)	TOTAL COSTS INCL. INTEREST (R/hr)	TOTAL COSTS EXCL. INTEREST (R/hr)
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
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	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Table 3.25: Assumptions: Drying Court-Specific Implements

Notes:		
1) Salvage values	10%	of purchase price
2) Average investment	= (Average purchase price + Salvage value) / 2	
3) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
4) Insurance and license cost per hour	1.50%	of Average investment/Hours per annum
5) Interest cost per hour	10.50%	of Average investment/Hours per annum

Addendum G: Non-Allocatable Cost

Table 3.26: Non-Allocatable Cost

NON-ALLOCATABLE COST												
Year:	2023									YEAR 1		
										NON-ALLOCATABLE COST: 2023		
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	POWER DEMAND	DISTANCE (km)	IMPLEMENT	WORK PACE MACHINERY hours	WORK PACE IMPLEMENTS hours	VARIABLE MACHINERY (R)	VARIABLE IMPLEMENTS (R)	FIXED MACHINERY (R)	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
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								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								-	R -	R -	R -	
								TOTAL NON-ALLOCATABLE COST 2023				

FIXED IMPLEMENTS (R)	TOTAL VARIABLE COSTS	TOTAL FIXED COSTS	TOTAL COST
R -	R -	R -	R -
R -	R -	R -	R -
R -	R -	R -	R -
R -	R -	R -	R -
R -	R -	R -	R -
R -	R -	R -	R -
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R -	R -	R -	R -
R -	R -	R -	R -
			R -

Table 3.27: Overhead Costs

YEAR 1	
OVERHEAD COSTS	TOTAL
TOTAL OVERHEAD COSTS	R -

Table 3.28: Sundry Expenses

YEAR 1	
SUNDRY EXPENSES	TOTAL
TOTAL SUNDRY EXPENSES	R -

Addendum H: Certification

YEAR	2023
DESCRIPTION	TOTAL COST

Addendum I: Nursery

Table 3.29: Nursery Labour Cost

LABOUR:

NURSERY 2023					
HEAD COUNT	UMBER OF DAY	LLOCATION TO ACTIVIT	YPE OF LABOU	R/DAY	TOTAL COST
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
				R -	R -
TOTAL LABOUR COST/HA					R -
TOTAL LABOUR COST					R -

Table 3.30: Nursery Spray Program

SPRAY PROGRAM

NURSERY 2023			
INPUT	PRODUCT	UNITS/HA	COST/HA
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
			R -
TOTAL SPRAYING COST/HA			R -
TOTAL SPRAYING COST			R -

Table 3.31: Nursery Activity Description and Total Cost

YEAR:	2023											
LAND:	NURSERY	HA:		TOTAL KG PREPARED SEEDS USED:								
										NURSERY 2023		
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	PRODUCT COST/HA	WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)
									R -		-	R -
		Two_wheel_drive_tractors							R -		-	R -
		Four_wheel_drive_tractors							R -		-	R -
		Trucks							R -		-	R -
		Light_duty_vehicles							R -		-	R -
		Combine_harvester							R -		-	R -
		Other_machinery_L_Hr							R -		-	R -
		Other_machinery_L_100Km							R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
									R -		-	R -
TOTAL COST/HA												
TOTAL COST												
TOTAL COST/KG PREPARED SEEDS USED												

VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
					R -
					R -
					R -

Addendum J: Drying Court

Table 3.32: Drying Court Questions and Cost-Per-Hour Calculation

QUESTIONS		
Size of drying court (m3)		
Life time of drying court (years)		
Usage (days per year)		
Rent received on capital investment (/year on average capital investment)		
Repair and maintenance of drying court per year		

COST/HOUR OF DRYING COURT		
Life time	0	years
Usage (hours/year)	0	hours/year
Rent received	0%	
Opportunity cost per year	R -	
Cost per hour	**#DIV/0!**	
Depreciation (straight line method) over	0	years
Depreciation per year	#DIV/0!	
Depreciation per hour	**#DIV/0!**	

Table 3.33: Drying Court Composition

DRYING COURT COST COMPOSITION			
1:3:4			
Cement: Sand: Stone			
The mixture needs the following elements per m3:			
bags of cement			
ton sand			
ton stone			
Labour: estimated 2 hours/m3 concrete		amount of labourers	
Therefore:		Cost	
	Cement		
	Sand		
	Stone		
	Labour		
		R -	/m3 batch
Total cost for drying court		**R -**	

Table 3.34: Drying Court Labour Cost

LABOUR COST FOR DRYING COURT				
Head count	Number of days	Allocation to activity	Type of labour	Total cost
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
				R -
			Total labour cost	R -

Table 3.35: Drying Court Machinery Using Fuel

MACHINERY USING FUEL								
FUEL PRICE (R)	MACHINERY	TYPE	POWER DEMAND	IMPLEMENT CATEGORY	IMPLEMENT	MACHINERY HOURS USED	IMPLEMENTS HOURS USED	VARIABLE MACHINERY
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -
								R -

VARIABLE IMPLEMENTS	FIXED MACHINERY	FIXED IMPLEMENTS	TOTAL VARIABLE COSTS	TOTAL FIXED COSTS	TOTAL COST
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -

Table 3.36: Drying Court Machinery Using Electricity

MACHINERY USING ELECTRICITY								
ELECTRICITY PRICE (R) PER UNIT	MACHINERY	TYPE	ELECTRICITY USAGE PER HOUR	IMPLEMENT CATEGORY	IMPLEMENT	MACHINERY HOURS USED	IMPLEMENTS HOURS USED	VARIABLE MACHINERY

VARIABLE IMPLEMENTS	FIXED MACHINERY	FIXED IMPLEMENTS	TOTAL VARIABLE COSTS	TOTAL FIXED COSTS	TOTAL COST
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -
R -	0	R -	R -	R -	R -

Table 3.37: Drying Court Total Cost

TOTAL COST YEAR 1	
Total drying court cost	
Total labour cost	R -
Total machinery using fuel cost	R -
Total machinery using electricity cost	R -
TOTAL COST YEAR 1	**R -**

Addendum K: Land 1-30

YEAR: 2023 LAND: HA:

YEAR 1:

ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha	WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENT
Manual weeding										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										R -		
										TOTAL COST/HA		
										TOTAL COST:		

Brush cutter work
Cultivator work
Disc
Harvesting grain
Harvesting tea
Irrigation
Manual weeding
Mechanical weed removal

VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
						R -
						R -

Addendum L: Total Cost

Table 4.1: Total Cost of Production for Rooibos Tea (Hypothetical Farm)

TOTAL COST OF PRODUCTION FOR ROOIBOS TEA									
	2023	2024	2025	2026	2027	2028	2029	2030	2031
TOTAL KG NET (DRIED) TEA PRODUCED	17535,05								
Driehoekkamp	R 25 486,39	R -	R -	R -	R -	R -	R -	R -	R -
Droekamp	R 66 239,15	R -	R -	R -	R -	R -	R -	R -	R -
Kakieboskamp	R 17 865,65	R -	R -	R -	R -	R -	R -	R -	R -
Kamp 22	R 26 847,83	R -	R -	R -	R -	R -	R -	R -	R -
Kopkamp	R 39 185,99	R -	R -	R -	R -	R -	R -	R -	R -
Padkamp	R 7 774,00	R -	R -	R -	R -	R -	R -	R -	R -
Suidweskamp	R 9 095,57	R -	R -	R -	R -	R -	R -	R -	R -
Syferkamp	R -	R -	R -	R -	R -	R -	R -	R -	R -
Taaiboskamp	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
0	R -	R -	R -	R -	R -	R -	R -	R -	R -
NON-ALLOCATABLE COST	R 143 280,25	R -	R -	R -	R -	R -	R -	R -	R -
OVERHEAD COSTS	R 992,27	R -	R -	R -	R -	R -	R -	R -	R -
LABOUR COSTS	R 123 646,53	R -	R -	R -	R -	R -	R -	R -	R -
SUNDRY EXPENSES	R 149 643,93	R -	R -	R -	R -	R -	R -	R -	R -
CERTIFICATION	R 71 888,00	R -	R -	R -	R -	R -	R -	R -	R -
DRYING COURT	R -	R -	R -	R -	R -	R -	R -	R -	R -
NURSERY	R -	R -	R -	R -	R -	R -	R -	R -	R -
TOTAL COST	R 681 945,57	R -	R -	R -	R -	R -	R -	R -	R -
TOTAL COST PER KG (DRIED) TEA PRODUCED	R 38,89	R -	R -	R -	R -	R -	R -	R -	R -

Table 4.2: Break-Even Analysis (Hypothetical Farm)

Conversion of wet to dried tea (%)	48%								
	2023	2024	2025	2026	2027	2028	2029	2030	2031
Price/kg received	R 35,00								
Total Cost	R 681 945,57	R -	R -	R -	R -	R -	R -	R -	R -
Break-even Point: kg (dried) tea	19 484,16	0	0	0	0	0	0	0	0
Break-even Point: ton (dried) tea	19,48	0	0	0	0	0	0	0	0
Break-even Point: ton (wet) tea	40,59	0	0	0	0	0	0	0	0

Table 4.3: Scenario Simulation (Hypothetical Farm)

2023						
Total Cost:		Yield				
R 681 945,57		-20%	-10%	17535	10%	20%
	-20%	R 370 339,20	R 416 631,60	R 462 924,00	R 509 216,40	R 555 508,80
	-10%	R 416 631,60	R 468 710,55	R 520 789,50	R 572 868,45	R 624 947,40
Price	33	R 462 924,00	R 520 789,50	R 578 655,00	R 636 520,50	R 694 386,00
	10%	R 509 216,40	R 572 868,45	R 636 520,50	R 700 172,55	R 763 824,60
	20%	R 555 508,80	R 624 947,40	R 694 386,00	R 763 824,60	R 833 263,20

Addendum M: Labour

Table 4.4: Labour Cost Allocation (Year 1) (Hypothetical Farm)

YEAR 1							
HEAD COUNT	NUMBER OF DAYS	ALLOCATION TO ACTIVITY	TYPE OF LABOUR	TYPE OF WAGE	NAME	R/DAY	TOTAL COST
5	4,43	Removal of tea bush and weeds	Permanent_labour_1	Normal_wage	Chaka Manikwa	R 354,92	R 7 867,43
1	3,95	Removal of tea bush and weeds	Permanent_labour_1	Normal_wage	Willem Jantjies	R 514,92	R 2 031,71
1	2,73	Plough (including rip, disc)	Permanent_labour_1	Normal_wage	Willem Jantjies	R 514,92	R 1 407,45
1	0,60	Tamping down	Permanent_labour_1	Normal_wage	Gert Jantjies	R 514,92	R 309,64
1	4,10	Planting Rooibos seedlings	Permanent_labour_1	Normal_wage	Gert Jantjies	R 514,92	R 2 111,18
4	4,10	Planting Rooibos seedlings	Temporary_labour_1	Normal_wage	Tea planters	R 240,00	R 3 936,00
1	7,82	Spray of pesticides	Permanent_labour_1	Normal_wage	Buks Kwaaiman	R 514,92	R 4 024,97
1	5,03	Mechanical weed removal	Permanent_labour_1	Normal_wage	Buks Kwaaiman	R 514,92	R 2 591,77
5	3,62	Top harvest	Permanent_labour_1	Normal_wage	Top harvesters	R 354,92	R 6 424,08
1	1,00	Transport of piece work labourers	Permanent_labour_1	Normal_wage	Willem Jantjies	R 514,92	R 514,92
1	1,00	Transport of piece work labourers	Permanent_labour_1	Overtime_2	Willem Jantjies	R 914,92	R 914,92
10	4,73	Weighting of green tea by labourers	Temporary_labour_1	Normal_wage	Team A	R 240,00	R 11 340,19
1	2,50	Transport tea from land to truck	Permanent_labour_1	Normal_wage	Willem Jantjies	R 514,92	R 1 287,30
1	0,40	Transport of seedlings to field	Permanent_labour_1	Normal_wage	Willem Jantjies	R 514,92	R 203,43
1	2,72	Transport of tea to processor	Permanent_labour_1	Normal_wage	Gert Jantjies	R 514,92	R 1 398,55
1	18,15	Transport of labour to farm	Permanent_labour_1	Normal_wage	Gert Jantjies	R 514,92	R 9 344,87
1	1,23	Transport of labour to field	Permanent_labour_1	Normal_wage	Willem Jantjies	R 514,92	R 635,71
5	3,89	Manual weeding	Temporary_labour_1	Normal_wage	Team A	R 240,00	R 4 670,40

Table 4.5: Labour Cost Allocation – Piece Work (Year 1) (Hypothetical Farm)

	PIECE WORK	YEAR 1		
TEAM	**HEAD COUNT**	**NUMBER OF DAYS**	**TOTAL HOUSING AND UNIFORM RECEIVED**	
Team 1	5	4,73	R	2 339,19
Team 2	5	4,73	R	2 341,62
Team 3	5	4,73	R	2 341,62
	0	0,00	R	-
	0	0,00	R	-
	0	0,00	R	-
	0	0,00	R	-
	0	0,00	R	-
	0	0,00	R	-
	0	0,00	R	-
	TOTAL KG WET TEA HARVESTED	**R/KG HARVESTED REMUNERATION**	**HARVEST COSTS**	
	92682,64	R 0,60	R	55 609,58
			R	-
			R	-
			R	-
			R	-
	TOTAL AMOUNT PAID		R	62 632,02
TOTAL LABOUR COST R	**123 646,53**			

Table 4.6: Labour Cost Calculation – Permanent Labour (Hypothetical Farm)

									YEAR 1	
Permanent Labour										
Name	Number of Hours Per work day	Number of Days Per normal work week	Cash Wage Rand per day	Uniform Received Rand per day	Housing Rand per day	Water & Electricity Rand per day	Labour Efficiency Percentage	Total Compensation With Labour Efficiency	Overtime 1,5 50%	Overtime 2 100%
Chaka Manikwa	9	5	R 180,00	R 15,91	R 83,46	R 15,55	75%	354,9215385	R 474,92	R 594,92
Willem Jantjies	9	5	R 360,00	R 15,91	R 83,46	R 15,55	90%	R 514,92	R 714,92	R 914,92
Gert Jantjies	9	5	R 360,00	R 15,91	R 83,46	R 15,55	90%	R 514,92	R 714,92	R 914,92
Bonani Angelo	9	5	R 180,00	R 15,91	R 83,46	R 15,55	75%	R 354,92	R 474,92	R 594,92
Buks Kwaaiman	9	5	R 360,00	R 15,91	R 83,46	R 15,55	90%	R 514,92	R 714,92	R 914,92
Top harvesters	9	5	R 180,00	R 15,91	R 83,46	R 15,55	75%	R 354,92	R 474,92	R 594,92

Cost of building house 70m2	Yearly cost of housing 4%	Repair and Maintenance 3%	Total cost for housing Week	Total cost for housing Day
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46

Table 4.7: Labour Cost Calculation – Temporary Labour (Hypothetical Farm)

Temporary Labour										
Name	Number of Hours Per work day	Number of Days Per normal work week	Cash Wage Rand per day	Uniform Received Rand per day	Housing Rand per day	Water & Electricity Rand per day	Labour Efficiency Percentage	Total Compensation With Labour Efficiency	Overtime 1,5 50%	Overtime 2 100%
Team A	9	5	R 180,00	R -	R -	R -	75%	R 240,00	R 360,00	R 480,00
Team B	9	5	R 180,00	R -	R -	R -	75%	R 240,00	R 360,00	R 480,00
Tea planters	9	5	R 180,00	R -	R -	R -	75%	R 240,00	R 360,00	R 480,00

Cost of building house 70m2	Yearly cost of housing 4%	Repair and Maintenance 3%	Total cost for housing Week	Total cost for housing Day
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -
R -	R -	R -	R -	R -

Table 4.8: Labour Cost Calculation – Piece Work (Hypothetical Farm)

Piece Work						
Team	Number of Hours Per work day	Number of Days Per normal work week	Uniform Received Rand per day	Housing Rand per day	Water & Electricity Rand per day	Total Benefits Rand per day
Team 1	9	5	R -	R 83,46	R 15,55	R 99,01
Team 2	9	5	R -	R 83,46	R 15,55	R 99,01
Team 3	9	5	R -	R 83,46	R 15,55	R 99,01
Team 4	9	5	R -	R 83,46	R 15,55	R 99,01

Cost of building house 70m2	Yearly cost of housing 4%	Repair and Maintenance 3%	Total cost for housing Week	Total cost for housing Day
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46
R 310 000,00	R 12 400,00	R 9 300,00	R 417,31	R 83,46

Addendum N: Activity Description

ACTIVITY DESCRIPTION
Brush cutter work
Cultivator work
Disc
Harvesting grain
Harvesting tea
Irrigation
Manual weeding
Mechanical weed removal
Planting of rye
Planting of triticale
Planting Rooibos seedlings
Planting small grains
Plough (including rip, disc)
Removal of tea bush and weeds
Replanting of Rooibos seedlings
Soil prep
Spray of fertiliser
Spray of pesticides
Spreading fertiliser
Spreading rye
Tamping down
Top harvest
Transport of labour to farm
Transport of labour to field
Transport of seedlings to field
Transport of tea to processor
Transport tea from land to truck
Transport of piece work labourers
Weighting of green tea by labourers

Addendum O: Inputs

Table 4.9: Oil Price Input (Hypothetical Farm)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
Oil price	2023	2024	2025	2026	2027	2028	2029	2030	2031
R/litre	R 60,00								

Table 4.10: Fertilizer Input (Year 1) (Hypothetical Farm)

YEAR 1:				
FERTILIZER	Unit	Price per unit	Units per HA	Cost per HA
Dolomitic lime	ton	R 297,00	1	R 297,00
Calcitic lime	ton	R 297,00	1	R 297,00
Phosphate	ton	R 2 805,00	0,9	R 2 524,50
Atlantic: Chicken Manure	ton	R 3 200,00	0,4	R 1 280,00
MAP	ton	R 15 000,00	0,5	R 7 500,00
Plaster	ton	R 789,00	2	R 1 578,00
Dried Chicken Manure	ton	R 460,00	0,3	R 138,00

Table 4.11: Planting Material Input (Year 1) (Hypothetical Farm)

YEAR 1:				
PLANTING MATERIAL	Unit	Price per unit	Units per HA	Cost per HA
Barley	ton	R 4 800,00	0,05	R 240,00
Lupins	ton	R 5 200,00	0,03	R 156,00
Rye	ton	R 4 200,00	0,04	R 168,00
Rooibos seedlings	kg	R 6 745,00	0,13	R 876,85

Table 4.12: Weed and Pesticides Input (Year 1) (Hypothetical Farm)

YEAR 1:				
WEED AND PESTICIDES ETC	Unit	Price per unit	Units per HA	Cost per HA
Fortrol	l	R 188,00	2	R 376,00
HP Rim 25	g	R 3,03	90	R 272,90
Solida	g	R 3,77	90	R 339,30
Series	l	R 326,00	1	R 326,00
Mulan	kg	R 215,00	0,05	R 10,75
Methomal	kg	R 365,00	0,266	R 97,09
Delegate	kg	R 5 920,00	0,032	R 189,44
EM-5	l	R 9,94	3,33	R 33,10
Paraquat	l	R 92,00	3	R 276,00
Lamda	l	R 153,76	0,075	R 11,53

Addendum P: Fixed Asset Register (Hypothetical Farm)

Table 4.13: Tractors

TRACTORS NAME	TRACTOR (kW)	PURCHASE PRICE	AVERAGE LIFE PERIOD (hr)	AVERAGE USAGE PER ANNUM (hr)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)	INSURANCE AND LICENCE COSTS (R/hr)	INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS (R/hr)
2-wheel normal drive tractors												
Orange Tafe 45 DI	35	R 347 500,00	10000,00	750,00	R 34 750,00	R 191 125,00	R 31,28	R 4,46	R 24,85	R 60,58	R 35,73	R 34,75
Landini Solis 90	65	R 748 000,00	10000,00	750,00	R 74 800,00	R 411 400,00	R 67,32	R 9,60	R 53,48	R 130,40	R 76,92	R 74,80
4-wheel drive normal tractor												
Case JX75T	75	R 1 029 000,00	10000,00	750,00	R 102 900,00	R 565 950,00	R 92,61	R 5,66	R 73,57	R 171,84	R 98,27	R 123,48
New Holland 110-90	85	R 1 206 500,00	10000,00	750,00	R 120 650,00	R 663 575,00	R 108,59	R 6,64	R 86,26	R 201,49	R 115,22	R 144,78
New Holland 80-30	90	R 1 298 500,00	10000,00	750,00	R 129 850,00	R 714 175,00	R 116,87	R 7,14	R 92,84	R 216,85	R 124,01	R 155,82

Table 4.14: Tractors (Assumptions)

Notes:		
1) Life period	12 000,00	Hours
2) Average usage per annum	1 000,00	Hours per annum
3) Salvage values	10%	of purchase price
4) Average investment	= (Average purchase price + Salvage value) / 2	
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
6) Insurance and license cost per hour	0,75%	of Average investment/Hours per annum
7) Interest cost per hour	9,75%	of Average investment/Hours per annum
8) Repair and Maintenance cost per hour	120,00%	of Average purchase price/Life period in hours

Power demand	Fuel consumption	Litres used per kilowatt hour	Total litres used/hour
Low	35%	0,4	0,14
Medium	45%	0,35	0,1575
High	60%	0,3	0,18

Table 4.15: Trucks With No Trailers

TRUCKS WITH NO TRAILERS	TRUCK SIZE (ton)	PURCHASE PRICE (R)	FUEL USAGE (L/100km)	AVERAGE LIFE PERIOD (kms)	AVERAGE USE PER ANNUM (kms)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/km)	INSURANCE AND LICENCE COST (R/km)	INTEREST COSTS (R/km)
Name:										
Isuzu 400	4,00	R 915 000,00	15,00	300 000	15 000	R 91 500,00	R 503 250,00	2,75	2,52	3,27

TOTAL FIXED COSTS INCL. INTEREST (R/km)	TOTAL FIXED COSTS EXCL. INTEREST (R/km)	REPAIR & MAINTENANCE COSTS (R/km)	NUMBER OF TYRES	TYRE COSTS (R/km)	CONTINGENCY FACTOR COSTS (R/km)	TOTAL VARIABLE COSTS (R/km)
R 8,53	R 0,05	1,53	6,00	0,31	0,18	R 2,02

Table 4.16: Trucks With No Trailers (Assumptions)

Notes:		
1) Salvage values	10%	of purchase price
2) Average investment	=(Average purchase price + Salvage value)/2	
3) Depreciation cost per kilometre	=(Average purchase price - Salvage value)/Life period in hours	
4) Insurance & licence cost per kilometre	7,5%	of average investment/kms per annum
5) Interest cost per kilometre	9,75%	of average investment/kms per annum
6) Repair & maintenance cost per kilometre	50%	of average purchase price/life period in kms
7) Oil consumption	1,50%	of fuel consumption
8) Tyre assumptions and calculations	Number of sets of tyres:	= (Life period of Truck/Life period of tyres) in kms Life period of tyres: 45000 kms Price of new tyre R 2 000,00 Tyre cost per km =(Average purchase price of New Tyre*No. tyres)/Tyre Life in Kilometres
9) Contingency factor	10%	of total costs of repairs, fuel, oil and tyres

Table 4.17: Light-Duty Vehicles

LDV (4-wheel drive) - 1 ton	PURCHASE PRICE (R)	FUEL USAGE (L/100km)	AVERAGE LIFE PERIOD (kms)	AVERAGE USE PER ANNUM (kms)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/km)	INSURANCE AND LICENCE COST (R/km)	INTEREST COSTS (R/km)
Name:									
Toyota Hilux 2.0 Single Cab (Red)	R 326 300,00	7,00	160 000,00	20 000,00	R 32 630,00	R 179 465,00	R 1,84	R 0,67	R 0,87
Toyota Hilux 2.0 Single Cab (Blue)	R 326 300,00	7,00	160 000,00	20 000,00	R 32 630,00	R 179 465,00	R 1,84	R 0,67	R 0,87

TOTAL FIXED COSTS INCL. INTEREST (R/km)	TOTAL FIXED COSTS EXCL. INTEREST (R/km)	REPAIR & MAINTENANCE COSTS (R/km)	NUMBER OF TYRES	TYRE COSTS (R/km)	CONTINGENCY FACTOR COSTS (R/km)	TOTAL VARIABLE COSTS (R/km)
R 3,38	R 2,51	R 1,02	4,00	R 0,23	R 0,12	R 1,37
R 3,38	R 2,51	R 1,02	4,00	R 0,23	R 0,12	R 1,37

Table 4.18: Light-Duty Vehicles (Assumptions)

Notes:		
1) Salvage values	10%	of purchase price
2) Average investment	=(Average purchase price + Salvage value)/2	
3) Depreciation cost per kilometre	=(Average purchase price - Salvage value)/Life period in kms	
4) Insurance and licence cost per kilometre	7,5%	of average investment/kms per annum
5) Interest cost per kilometre	9,75%	of average investment/kms per annum
6) Repair & maintenance cost per kilometre	50%	of average purchase price/life period in kms
7) Oil consumption	1%	of fuel consumption
8) Tyre assumptions and calculations	Number of sets of tyres:	= (Life period of LDV/Life period of tyres) in kms Life period of tyres: 50 000 kms Price of new tyre R 2 250,00 Tyre cost per km = (Average purchase price of New Tyre * No. tyres) / Tyre Life in Kilometres
9) Contingency faactor	10%	of total costs of repairs, fuel, oil and tyres

Table 4.17: Daily Implements

DAILY IMPLEMENTS	PURCHASE PRICE	AVERAGE LIFE PERIOD (hr)	AVERAGE USAGE PER ANNUM (hr)	SALVAGE VALUES (R)	AVERAGE INVESTMENT (R)	DEPRECIATION COST (R/hr)	INSURANCE AND LICENCE COSTS (R/hr)
Plant ripper (Dien hoender pille toe agter ripper tande)	R 60 000,00	4 800,00	240,00	R 6 000,00	R 33 000,00	R 11,25	R 2,06
Checchi and Maggli Transplanter	R 100 000,00	1 200,00	240,00	R 10 000,00	R 55 000,00	R 75,00	R 3,44
Brush cutter	R 80 000,00	1 200,00	240,00	R 8 000,00	R 44 000,00	R 60,00	R 2,75
Spreader	R 50 000,00	2 880,00	240,00	R 5 000,00	R 27 500,00	R 15,63	R 1,72
Band blaser	R 350 000,00	3 500,00	350,00	R 35 000,00	R 192 500,00	R 90,00	R 8,25
Water Cart	R 100 000,00	960,00	80,00	R 10 000,00	R 55 000,00	R 93,75	R 10,31
Boom Sprayer	R 200 000,00	1 600,00	200,00	R 20 000,00	R 110 000,00	R 112,50	R 8,25
4-wheeled trailers 10 ton - Flatbed	R 100 000,00	4 800,00	240,00	R 10 000,00	R 55 000,00	R 18,75	R 3,44
Field Cultivators : Shank Tillers 1.7 M - 5 Tines (C Shank)	R 60 000,00	3 000,00	250,00	R 6 000,00	R 33 000,00	R 18,00	R 1,98
Harrows Offset Disc Light 1.6M 14 X 20" Disc	R 50 000,00	2 500,00	250,00	R 5 000,00	R 27 500,00	R 18,00	R 1,65
Harrows Hydraulic Offset 24" (85Kg/Disc) : Heavy Duty 3.00M Cutting Width 26 X 24" Disc	R 140 000,00	2 500,00	100,00	R 14 000,00	R 77 000,00	R 50,40	R 11,55
Blade - 2m	R 30 000,00	2 880,00	240,00	R 3 000,00	R 16 500,00	R 9,38	R 1,03

INTEREST COSTS (R/hr)	TOTAL FIXED COSTS INCL. INTEREST (R/hr)	TOTAL FIXED COSTS EXCL. INTEREST (R/hr)	REPAIR & MAINTENANCE COSTS AS % OF NEW PRICE	REPAIR & MAINTENANCE COSTS (R/hr)	TOTAL VARIABLE COSTS (R/hr)	TOTAL COSTS INCL. INTEREST (R/hr)	TOTAL COSTS EXCL. INTEREST (R/hr)
R 14,44	R 27,75	R 13,31	5,00%	R 0,63	R 0,63	R 28,38	R 13,94
R 24,06	R 102,50	R 78,44	15,00%	R 12,50	R 12,50	R 115,00	R 90,94
R 19,25	R 82,00	R 62,75	7,50%	R 5,00	R 5,00	R 87,00	R 67,75
R 12,03	R 29,38	R 17,34	5,00%	R 0,87	R 0,87	R 30,24	R 18,21
R 57,75	R 156,00	R 98,25	2,50%	R 2,50	R 2,50	R 158,50	R 100,75
R 72,19	R 176,25	R 104,06	2,50%	R 2,60	R 2,60	R 178,85	R 106,67
R 57,75	R 178,50	R 120,75	2,50%	R 3,13	R 3,13	R 181,63	R 123,88
R 24,06	R 46,25	R 22,19	2,50%	R 0,52	R 0,52	R 46,77	R 22,71
R 13,86	R 33,84	R 19,98	2,50%	R 0,50	R 0,50	R 34,34	R 20,48
R 11,55	R 31,20	R 19,65	5,00%	R 1,00	R 1,00	R 32,20	R 20,65
R 80,85	R 142,80	R 61,95	2,50%	R 1,40	R 1,40	R 144,20	R 63,35
R 7,22	R 17,63	R 10,41	3,33%	R 0,35	R 0,35	R 17,97	R 10,75

Table 4.18: Daily Implements (Assumptions)

Notes:		
1) Life period	Hours as per table	
2) Average usage per annum	Hours as per table	
3) Salvage values	10%	of purchase price
4) Average investment	= (Average purchase price + Salvage value) / 2	
5) Depreciation cost per hour	= (Average purchase price - Salvage value) / Life period in hours	
6) Insurance and license cost per hour	1,50%	of Average investment/Hours per annum
7) Interest cost per hour	10,50%	of Average investment/Hours per annum

Addendum Q: Non-Allocatable Cost (Hypothetical Farm)

Table 4.19: Non-Allocatable Cost

NON-ALLOCATABLE COST

Year: 2023									YEAR 1
									NON-ALLOCATABLE COST: 2023
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km)	IMPLEMENT	WORK PACE MACHINERY hours	WORK PACE IMPLEMENTS hours
Transport of labour to farm	R 26,10	Trucks	Isuzu 400	0,00		7350		163,33	147,00
Transport of labour to field	R 26,10	Light_duty_vehicles	Toyota Hilux 2.0 Single Cab (Red)	0,00		500		11,11	10,00
Transport of seedlings to field	R 26,10	Light_duty_vehicles	Toyota Hilux 2.0 Single Cab (Blue)	0,00		160		3,56	3,20
Transport tea from land to truck	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		4-wheeled trailers 10 ton - Flatbed	22,50	20,25
Transport of tea to processor	R 26,10	Trucks	Isuzu 400	0,00		1100		24,44	22,00
Transport of piece work labourers	R 26,10	Trucks	Isuzu 400	0,00		200		4,44	4,00
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
				0,00					-
									TOTAL NON-ALLOCATABLE COST 2023

VARIABLE MACHINERY (R)	VARIABLE IMPLEMENTS (R)	FIXED MACHINERY (R)	FIXED IMPLEMENTS (R)	TOTAL VARIABLE COSTS	TOTAL FIXED COSTS	TOTAL COST
R 43 630,13	R -	R 62 712,96	R -	R 43 630,13	R 62 712,96	R 106 343,09
R 1 619,08	R -	R 1 691,66	R -	R 1 619,08	R 1 691,66	R 3 310,74
R 518,11	R -	R 541,33	R -	R 518,11	R 541,33	R 1 059,44
R 8 944,43	R 10,55	R 3 866,47	R 936,56	R 8 954,97	R 4 803,03	R 13 758,00
R 6 529,68	R -	R 9 385,61	R -	R 6 529,68	R 9 385,61	R 15 915,29
R 1 187,21	R -	R 1 706,48	R -	R 1 187,21	R 1 706,48	R 2 893,69
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
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R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
						R 143 280,25

Table 4.20: Overhead Costs

YEAR 1	
OVERHEAD COSTS	**TOTAL**
Team 1 Leader	R 330,76
Team 2 Leader	R 330,76
Team 3 Leader	R 330,76
TOTAL OVERHEAD COSTS	R 992,27

Table 4.21: Sundry Expenses

YEAR 1	
SUNDRY EXPENSES	**TOTAL**
New Sickles	R 1 500,00
Tea processing cost	R 148 143,93
TOTAL SUNDRY EXPENSES	**R 149 643,93**

Addendum R: Certification

YEAR	2023
DESCRIPTION	**TOTAL COST**
Audit-UEBT	R 50 188,00
Housing - auditor	R 7 500,00
Traveling - auditor	R 2 200,00
Training - chemical handling	R 4 000,00
Protective clothing - shoes	R 3 000,00
Protective clothing - raincoats	R 5 000,00
Rehabilitation report	R 13 000,00
TOTAL	**R 84 888,00**

Addendum S: Land 1-9 (Hypothetical Farm)

Table 4.22: Land 1 (Driehoekkamp)

YEAR: 2023	LAND: Driehoekkamp		HA:		13,30							
												YEAR 1:
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha	WORK PACE MACHINERY hours/ha
Removal of tea bush and weeds	R 26,10	Four_wheel_drive_tractors	New Holland 80-30	90,00	Low		Blade - 2m				R -	2,67
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
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				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
												TOTAL COST/HA
												TOTAL COST: Driehoekkamp

WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
2,40	R 1 294,10	R 0,83	R 578,99	R 42,35	R 1 294,93	R 621,34	R 1 916,27
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
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-	R -	R -	R -	R -	R -	R -	R -
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-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
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-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
							R 1 916,27
							R 25 486,39

Table 4.23: Land 2 (Droëkamp)

YEAR:	2023	LAND:	Droekamp	HA:		12,30					
											Y
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha
Plough (including rip, disc)	R 26,10	Four_wheel_drive_tractors	New Holland 80-30	90,00	Low		Plant ripper (Dien hoender pille toe agter ripper tande)				R -
Tamping down	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low						R -
Planting Rooibos seedlings	R 26,10	Four_wheel_drive_tractors	New Holland 80-30	90,00	Low		Checchi and Maggli Transplanter	PLANTING_YR1	Rooibos seedlings	0,13	R 876,85
Spray of pesticides	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Boom Sprayer	PESTICIDES_YR1	Mulan	0,05	R 10,75
				0,00				PESTICIDES_YR1	Lamda	0,08	R 11,53
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
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				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
											TOTAL COST/
											TOTAL COST: Dro

YEAR 1:

WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
2,00	1,80	R 969,36	R 1,13	R 433,70	R 49,95	R 970,49	R 483,65	R 1 454,13
0,44	0,40	R 174,91	R -	R 75,61	R -	R 174,91	R 75,61	R 250,52
3,00	2,70	R 1 454,04	R 33,75	R 650,55	R 276,75	R 2 364,64	R 927,30	R 3 291,94
0,50	0,45	R 198,77	R 1,41	R 85,92	R 80,33	R 210,92	R 166,25	R 377,17
	-	R -	R -	R -	R -	R 11,53	R -	R 11,53
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
/HA								R 5 385,30
ɔekamp								R 66 239,15

Table 4.24: Land 3 (Kakieboskamp)

YEAR:	2023	LAND:	Kakieboskamp	HA:		18,10						
	ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha
	Mechanical weed removal	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Harrows Offset Disc Light 1.6M 14 X 20" Disc				R -
	Spray of pesticides	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Boom Sprayer	PESTICIDES_YR1	Lamda	0,08	R 11,53
					0,00				PESTICIDES_YR1	Mulan	0,05	R 10,75
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
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					0,00							R -
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					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
					0,00							R -
												T
												TOTAL (

YEAR 1:								
WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
1,00	0,90	R 397,53	R 0,90	R 171,84	R 28,08	R 398,43	R 199,92	R 598,35
0,50	0,45	R 198,77	R 1,41	R 85,92	R 80,33	R 211,70	R 166,25	R 377,95
	-	R -	R -	R -	R -	R 10,75	R -	R 10,75
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
OTAL COST/HA								R 987,05
COST: Kakieboskamp								R 17 865,65

Table 4.25: Land 4 (Kamp 22)

YEAR: 2023	LAND:	Kamp 22	HA:		27,20						
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha
Mechanical weed removal	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Harrows Offset Disc Light 1.6M 14 X 20" Disc				R -
Spray of pesticides	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Boom Sprayer	PESTICIDES_YR1	Mulan	0,05	R 10,75
				0,00				PESTICIDES_YR1	Lamda	0,08	R 11,53
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
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				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
											TO
											TOTA

YEAR 1:								
WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
1,00	0,90	R 397,53	R 0,90	R 171,84	R 28,08	R 398,43	R 199,92	R 598,35
0,50	0,45	R 198,77	R 1,41	R 85,92	R 80,33	R 210,92	R 166,25	R 377,17
	-	R -	R -	R -	R -	R 11,53	R -	R 11,53
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
OTAL COST/HA								R 987,05
AL COST: Kamp 22								R 26 847,83

Table 4.26: Land 5 (Kopkamp)

YEAR:	2023	LAND:	Kopkamp	HA:		39,70

ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha
Mechanical weed removal	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Harrows Offset Disc Light 1.6M 14 X 20" Disc				R -
Spray of pesticides	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Boom Sprayer	PESTICIDES_YR1	Mulan	0,05	R 10,75
				0,00				PESTICIDES_YR1	Lamda	0,08	R 11,53
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
				0,00							R -
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				0,00							R -
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				0,00							R -
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				0,00							R -
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											TOTA

YEAR 1:								
WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
1,00	0,90	R 397,53	R 0,90	R 171,84	R 28,08	R 398,43	R 199,92	R 598,35
0,50	0,45	R 198,77	R 1,41	R 85,92	R 80,33	R 210,92	R 166,25	R 377,17
	-	R -	R -	R -	R -	R 11,53	R -	R 11,53
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
	-	R -	R -	R -	R -	R -	R -	R -
OTAL COST/HA								**R 987,05**
AL COST: Kopkamp								**R 39 185,99**

Table 4.27: Land 6 (Padkamp)

YEAR:	2023	LAND:	Padkamp	HA:		20,00						
												YEAR 1:
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha	WORK PACE MACHINERY hours/ha
Spray of pesticides	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Boom Sprayer	PESTICIDES_YR1	Mulan	0,05	R 10,75	0,50
				0,00				PESTICIDES_YR1	Lamda	0,08	R 11,53	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
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				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
												TOTAL COST/HA
												TOTAL COST: Padkamp

WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
0,45	R 198,77	R 1,41	R 85,92	R 80,33	R 210,92	R 166,25	R 377,17
-	R -	R -	R -	R -	R 11,53	R -	R 11,53
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
							R 388,70
							R 7 774,00

Table 4.28: Land 7 (Suidweskamp)

YEAR:	2023	LAND:	Suidweskamp	HA:		23,40						
												YEAR 1:
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha	WORK PACE MACHINERY hours/ha
Spray of pesticides	R 26,10	Four_wheel_drive_tractors	Case JX75T	75,00	Low		Boom Sprayer	PESTICIDES_YR1	Mulan	0,05	R 10,75	0,50
				0,00				PESTICIDES_YR1	Lamda	0,08	R 11,53	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
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				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
				0,00							R -	
												TOTAL COST/HA
												TOTAL COST: Suidweskamp

WORK PACE IMPLEMENTS hours/ha	VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
0,45	R 198,77	R 1,41	R 85,92	R 80,33	R 210,92	R 166,25	R 377,17
-	R -	R -	R -	R -	R 11,53	R -	R 11,53
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
-	R -	R -	R -	R -	R -	R -	R -
							R 388,70
							R 9 095,57

Table 4.29: Land 8 (Syferkamp)

YEAR:	2023	LAND:	Syferkamp	HA:		24,40							
													YEAR 1:
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha	WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
												TOTAL COST/HA	
												TOTAL COST: Syferkamp	

VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
						R -
						R -

Table 4.30: Land 9 (Taaiboskamp)

YEAR:	2023	LAND:	Taaiboskamp	HA:		32,80							
													YEAR 1:
ACTIVITY DESCRIPTION	FUEL PRICE (R)	MACHINERY	TYPE	kW	POWER DEMAND	DISTANCE (km/ha)	IMPLEMENT	INPUT	PRODUCT	DOSAGE (units/ha)	PRODUCT COST /ha	WORK PACE MACHINERY hours/ha	WORK PACE IMPLEMENTS hours/ha
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
				0,00							R -		-
												TOTAL COST/HA	
												TOTAL COST: Taaiboskamp	

VARIABLE MACHINERY (R/ha)	VARIABLE IMPLEMENTS (R/ha)	FIXED MACHINERY (R/ha)	FIXED IMPLEMENTS (R/ha)	TOTAL VARIABLE COSTS/ha	TOTAL FIXED COSTS/ha	TOTAL COST/ha
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
R -	R -	R -	R -	R -	R -	R -
						R -
						R -