UNIVERSITY OF KWAZULU-NATAL

Advancing gross farming income sustainability of smallholder farmers in the Free State Province, South Africa

by

Badiri Moloabi

217079590

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Supervisor: Dr. Bhasela Yalezo

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DECLARATION

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ABSTRACT

The study aimed at advancing the Gross Farming Income (GFI) sustainability of smallholder farmers in Free State province (FS), South Africa (SA).

While the official GFI in SA has experienced substantial growth over a number of years(DAFF, 2019b), its real value was on the decline, as its contribution to the agricultural value-added share of the Gross Domestic Product (GDP) declined from 4,2% in 1994 to 1,9% in 2019 and resulting in a lag of 2.3% compared to the global average (DALRR, 2020a). The current GFI of the smallholder farmers in FS was also, low, and declining, with calculations showing similar trends to the national measurements. As the main source of income for farming households including smallholder farmers, it was on the decline from 2,7% in 2018, to 2,5% in 2019, 2,3% in 2020 and 2% in 2021 (Stats SA, 2019a, 2020c, 2021, 2022a).

The study utilised a mixed methods approach. Data was collected through questionnaires and semi-structured interviews of 385 respondents, identifying detailed research questions, from the main and related objectives, and analysing these using descriptive, univariate, bivariate and multivariate techniques. The quantitative analysis phase indicated significant association of demographic and farming practice determinants, with the GFI of smallholders, while the qualitative analysis phase showed a significant association of the GFI, with strategies to commercialise, skills development support programmes and current sustainability practices linked to GFI models and frameworks.

The study findings and results suggest a GFI Sustainability Framework and Model in FS, with farmers employing different farming practices, primarily growing vegetables for consumption and local sales, by diversifying their products, improving market connections, strengthening community ties, and using better record-keeping practices.

The study recommends: policy-based and farm-level strategies with the positive implications of enhancing the economic well-being of smallholder farmers, creating more job opportunities, enhancing infrastructure, and facilitating market access.

Key words: Gross farming income, smallholder farmers, sustainability, sustainability indicators, sustainability determinants.

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DEDICATION

Mosimane oa Motlhaping, tlhapi ya go tsaleloa kwa leroleng, in the dusty streets of Odendaalsrus, Free State, South Africa. Hano o dirile go tlala seatla jaaka badiri, wa tlhabana jaaka motlhabani, and emerged victorious as a victor.

Motlhaping oa Maidi a kgatsele. Motho o montšho, oa go golela koa Thaba Nchu. *Motho o mphela. O seatla. O tau. O pitse. O kgeledi. O marumo. Mpherephetšhane. Ngoana oa ga malala a sepela. Motho oa go tlhapa ka maši, metsi a ntse a le teng. A iphorogotlha ka tlhoa. Thelela bodiba!*

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To God Almighty. You Are Worthy to be Praised.

LIST OF ACRONYMS AND DESCRIPTIONS

CAADP	Comprehensive African Agricultural Development Programme
DAFF	Department of Fishing and Forestry
DALRRD	Department of Agriculture, Land Reform and Rural Development
FAO	Food and Agricultural Organisation (of the United Nations)
FS	Free State (province)
FSDARD	Free State Department of Agriculture and Rural Development
GDP	Gross Domestic Product
GFI	Gross farming income
GHS	General Housing Survey
HA	Hectares (Land size)
IDH	(Sustainable Trade Initiative)
IFAD	International Fund for Agricultural Development
NDA	National Department of Agriculture
NDP	National Development Plan
NEPAD	The New Partnership for Africa's Development
PMG	Parliamentary Monitoring Group
SA	South Africa
SARD	Sustainable Agriculture and Rural Development
SDG	Sustainable Development Goals
Stats SA	Statistics South Africa (department)
TIFF	Total Income from Farming
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNGC	United Nations Global Compact
USD	United States Dollar
USDA	United States Department of Agriculture
WFP	World Food Programme

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CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Gross farming income (GFI), generated by smallholder farmers in South Africa (SA) is a building block of value-added agriculture and contributes to the country's gross domestic product, its GDP (Gulati et al., 2021; Tempia et al., 2020). While it has the potential to generate high growth and sustainable farming income to the agricultural production activities of smallholder farmers locally, it has not reached such levels yet. Locally, smallholder farmers do not have an opportunity to participate equitably in larger commercial farming production value chains, where the GFI is consistently measured, and its contribution to the GDP is recorded accordingly (Loeper et al., 2018).

For numerous years in evaluating commercial income analysis, it has been prevalent to use Gross Farm Income (DAFF, 2019b; Drake, 1954). The Department of Agriculture uses economic review reports on the GFI to measure the performance of commercial farms for policy direction purposes and to identify significant trends in the industry (DAFF, 2019b). There also needs to be an evaluation for smallholder farmers. However, this practice excludes smallholder farmers, leading V. N. Mathinya et al. (2022), to assert that the inadequate attention authorities give to smallholder farmers hinders their long term agricultural productivity and income advancement. Consequently, these small farms may need to be more economically viable from an agricultural standpoint (Muyanga & Jayne, 2019; Piras et al., 2018; Shackleton et al., 2019).

This lack of attention emanates from market access conditions that are not favourable, access to resources being limited and inadequate levels of support from industry players, such as the government, towards smallholder farmers (Piras et al., 2018). Not being able to access credit and other financing instruments, leads to limited economic prosperity (Shackleton et al., 2019). Mathinya et al. (2022) concurs and refers to the unequal and striking differences of accessing credit between commercial farmers and smallholder farmers. Accordingly, this has led to the contribution by smallholder farmers being insignificant on food production when compared to their larger counterparts, the commercial farmers.

This study therefore identifies GFI as a good concept from which to derive and implement a relevant sustainable income tracking modelling framework for smallholders, as it is currently used for commercial farming income (Stats SA, 2020a). Consequently, it can significantly contribute to the drastic reduction in income inequality, unemployment, and poverty levels, especially in the rural based areas of South Africa, where most smallholders are based.

Smallholder farmers derive most of their income from diverse but common sources of farming production (Piras et al., 2018), albeit on a smaller scale than commercial farmers. Smallholder farming is therefore concentrated around lower production of activities that cover animals (cattle, pigs, poultry, sheep), crops, horticulture, other vegetables as well as other farming commodities such as beekeeping and wool rearing among other things.

Some smallholder farmers do mixed farming, meaning a combination of any of the above (Mizik, 2021). There is however little evidence pointing to consistent farming income generated by these smallholders. Such that Mthembu and Zwane (2017), point out, in fact that these farmers suffer most losses resulting from high livestock mortality and stagnant crop productivity. Muzekenyi et al. (2022), disagrees and argues that mixed farming by smallholder farmers allows them to diversify risk of losses between crop and livestock production.

Short term increases and improvement in farming income do occur intermittently from events such as food price increases and market booms but these are inconsistent and short-lived (SFL, 2017). Although increases in food prices have led to bigger profits for smallholders in the past, volatility of the same prices has resulted in uncertainty about the consistency and sustainability of those price increases into the future (Rao et al., 2018). Authors Czyżewski et al. (2019), ascribe this on a concept known as the market treadmill in agriculture and argues that farming income increase does not necessarily follow the direction of productivity. Therefore, in this study, the sustainability aspect does not imply income increase but income consistency and long term availability for smallholder farmers.

Additionally, there are diversions, such as other varied sources of income, apart from farming income, such as social grants and wages from off-farm employment (Myeni et al., 2019a). These have been associated with reducing smallholder farming, in recent

times. For example, Sinyolo et al. (2017) attributes the lack of adequate market participation by smallholder farmers to the disincentivising caused by the consistent receipt of social grants and other off-farm income.

To improve overall income possibilities, these alternative sources of income should not be discouraged as they provide some form of needed regular income (Leonardo et al., 2018). At a smallholder farming level, these sources reduce reliance on a vulnerable farming income (Suleiman et al., 2017). Rather than viewing these as disincentives to improved farming outcomes, as argued by Sinyolo et al. (2017), farmers can use these off-farm income sources and grants to support efforts at improving necessary farming skills for better income levels.

Despite all these challenges, GFI, which encompasses the aggregate of all agricultural revenues acquired from the sale of production goods, additional income associated with farming, and financial assistance from governmental initiatives (USDA, 2019), continues to be a significant variable in the calculation of Gross Domestic Product (GDP). As the measurement of smallholder farmers' income appear erratic, inconsistent, and complex (Poppe & Vrolijk, 2019), this study aims to introduce a simple framework that can satisfy the gross farming income sustainability determination normative.

From a South African perspective, the make-up of GFI, which contributes to GDP values, is defined as gross income of the producers from crops, livestock, miscellaneous items, and personal consumption when appraised at comparable prices, and do not include other types of income that are generated outside of farming activities (Stats SA, 2020a). It is also the value derived from sales and production, added to the differences in stock or inventory levels at any given time (DAFF, 2019b).

Current GFI levels for commercial farming bears varied benefits for large scale farmers, where it is shown that with the income of farmers being consistent and growing, then GFI follows a similar growth trend (Table 1.1). The GFI for the national and provincial agriculture is tabulated in column 6 and 10, showing a consistent annual increase from 1994 to 2019, with intermittent but small decreases in 1999, 2004 and 2019 nationally and 2000 and 2001 provincially. Equally, these benefits should accrue to smallholder farming, for example, increases relating to cashflows generated as well as import and export opportunities.

Table 1.1: Global, SA and FS GDP, GFI and AVA as % of GDP (1994 to 2019)

Year	Global % GDP	*Global % AVA*	*SA % GDP*	*SA % AVA*	*SA GFI Annual Amount in ZAR (Billion)*	*SA GFI Annual% Change*	FS % GDP	FS % AVA	FS GFI *Annual Amount in ZAR (Billion)*
Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*	*Column 6*	*Column 7*	*Column 8*	*Column 9*	*Column 10*
Weighted Average	**3,0**	**4,4**	**2,7**	**-14,6**	**130,5**	**10,9**	**1,8**	**7,6**	**17,3**
2019	2,5	4,2	*0,2*	*1,9*	*281,2*	*3,4*	-0,4	-5,6	**
2018	3,0	3,3	*0,8*	*-2,2*	*285,5*	*3,4*	-0,2	-0,6	**
2017	3,3	3,4	*1,4*	*2,4*	*277,5*	*3,4*	1,4	30,5	46,9
2016	2,6	3,5	*0,4*	*2,2*	*268,0*	*9,6*	-0,3	-19,3	*43,4
2015	2,9	3,6	*1,2*	*-2,1*	*242,4*	*7,5*	-0,3	-24,3	*39,8
2014	2,9	3,6	*1,9*	*2,2*	*225,5*	*11,7*	2,0	6,9	*36,3
2013	2,7	3,7	*2,5*	*-2,1*	*201,9*	*8,7*	1,7	4,3	*32,8
2012	2,5	3,6	*2,2*	*-2,2*	*185,7*	*11,2*	3,0	1,8	*29,3
2011	3,1	3,7	*3,3*	*-2,3*	*167,0*	*22,3*	2,0	-8,6	*25,8
2010	4,3	3,7	*3,0*	*-2,4*	*136,6*	*1,1*	2,5	1,0	*22,3
2009	-1,7	3,7	*-1,5*	*-2,7*	*135,1*	*0,1*	-2,2	-3,5	*18,8
2008	1,9	3,7	*3,2*	*2,9*	*135,0*	*13,6*	2,3	26,4	*15,3
2007	4,3	3,8	*5,4*	*2,6*	*118,8*	*18,7*	3,8	3,1	11,7
2006	4,4	3,8	*5,6*	*-2,3*	*100,1*	*26,9*	5,0	-12,4	*11,2
2005	3,9	4,1	*5,3*	*-2,4*	*78,9*	*20,3*	4,2	3,8	*10,7
2004	4,4	4,4	*4,6*	*-2,8*	*65,6*	*05,2*	4,0	1,0	*10,1
2003	3,0	4,5	*3,0*	*-3,1*	*69,2*	*04,4*	2,3	-9,8	*9,7
2002	2,2	4,7	*3,7*	*3,4*	*72,4*	*13,0*	3,9	-0,4	9,1
2001	2,0	4,8	*2,7*	*3,2*	*64,1*	*25,4*	-1,1	-15,1	*5,1
2000	4,4	4,9	*4,2*	*-3,0*	*51,1*	*20,8*	2,1	23,1	*5,9
1999	3,3	5,2	*2,4*	*-3,2*	*42,3*	*0,2*	4,0	33,8	*6,7
1998	2,6	5,5	*0,5*	*-3,5*	*42,4*	*1,2*	-3,8	-34,8	*5,9
1997	3,5	5,6	*2,6*	*-3,7*	*41,9*	*1,2*	1,9	2,4	*5,1
1996	3,4	7,5	*4,3*	*3,9*	*41,4*	*20,0*	5,3	178,9	4,3
1995	3,0	7,6	*3,1*	*-3,5*	*34,5*	*19,4*	**	**	4,3
1994	3,0	**	*3,2*	*4,2*	*28,9*	**	**	**	4,0

Source: The World Bank. DataBank. World Development Indicators, DALRRD 2020, Stats SA 2020; 2013; 2010; 2002. *Reconstruction of FS GFI into equivalent annual amounts by the Author. ** Current data could not be found. Current data may not be available.

As indicated by the data of censuses and surveys in (AGRISA, 2020; FSStatsSA, 1993; Stats SA, 2005, 2010, 2020a; StatsSA, 2020), as well as in relevant economic

review reports (DALRR, 2020b, 2020a), the GFI shows an increasing trend as summarised in table 1.1 above. Agri SA reports a GFI growth in South Africa, that stretches from 2004, over the subsequent period of about 15 years at 9% year on year, but with a decline of 15% recorded between 2018 and 2019.

The economic review reports on the South African agriculture show a consistent increase in the cashflow of commercial farming sector. For 2020, a significant increase of 37,3% was recorded, followed in 2021, by a comparably good increase of 20,8% (DALRR, 2021; 2022). This is despite the above periods coinciding with the impact of the Covid-19 pandemic, which impacted negatively on the economic performances of many sectors.

A Stats SA (2020a) report, breaks down the GFI by province and commodity type and shows the increasing trend from 2007 to 2017. If basic and relevant indicators can be successfully collected and monitored at farm level (Latruffe et al., 2016), smallholder farming will experience some of the similar benefits derived by commercial farming, in the long term, for example enhanced access to credit. Gradual build of reliable data at farm level can lead to a needed development of more suitable indicators, necessary for measurement of gross farming income for smallholder farmers in Free State province, followed by other provinces.

Smallholder farming is a form of business that has already proven its entrepreneurial capability by producing more than its consumption, and ensuring the selling of its excess products in informal markets (Loeper et al., 2018). As such, Mkuna and Wale (2022) propose a further opening opportunity beyond informal markets, as this is a form of exclusion that impacts negatively on the income of smallholder farmers. These informal markets result in further limitations, as they have been stagnant in the way of distribution and sales, ignoring some of the advancements, such as the use of technology. Therefore, with the introduction of relevant indicators at smallholder farm level, that can enhance both informal and formal market access opportunities, farming income can also be positively affected.

On the contrary to entrepreneurial capabilities, numerous studies posit that there are several activities related to smallholder farming that are decreasing (Rankoana, 2022; Shackleton, 2019); therefore, presenting an argument against smallholder farming being a viable option for farming income opportunities, as pursued by this study.

Whilst this may hold true for activities such as adequate land availability (Lidzhegu & Kabanda, 2022), subsistence farming (Siphesihle & Lelethu, 2020) and crop farming (Shackleton, 2019), allows smallholder farming to reposition itself. Alternatively, it may be a shift that relates to a transformation effort aimed at making smallholder farming more efficient and sustainable, as it is impacted by both controllable and uncontrollable effects. (Wegren, 2018, 2021), highlights that although the production output, such as in crop farming, decline is based on evidence, there are gaps enforced by systematic circumstances, which the smallholder farmer can do little about, such as skewed access to technological progress and revolution in some of the European and Soviet based countries.

There are also many other challenges that faces smallholder farming, such as the lasting negative impact of Covid-19 pandemic, climate change and intermittent diseases (Mthembu et al., 2022). Despite these, smallholder farming has proven its resilience by mostly complementing large scale farming during tough circumstances which has at times led to food shortages, food inflation and exacerbated levels of food insecurity. As such, it is still considered one of the most important agricultural fronts that exist to advance necessary food security, nutrition, poverty alleviation and rural development interventions globally (y Paloma et al., 2020).

There are varied and diverse definitions of a smallholder farmer in literature, depending on geography, typologies, and farming characteristics (Olofsson, 2020; Pienaar & Traub, 2015; Sutherland et al., 2019). Mostly, the characteristics are similar and overlap in these typologies (Carelsen et al., 2021), hence the concept of smallholder farmer is accepted, and the term is widely used in various academic research studies.

Common characteristics include among other things, ownership of land that is less than 2HA in size, with other countries using 5HA as a threshold, farming that is small but labour intensive, and farming with intention to consume part of the production and sell the balance for livelihood (Okunlola et al., 2016; Rapsomanikis, 2015; World Bank, 2015).

The term smallholder farmer also encompasses many names such as emergent, family, poor, and small producer (FAO & IFAD, 2019; Loeper et al., 2018; Rapsomanikis, 2015). For this research, a smallholder farmer is an individual who has

not achieved the status of a large-scale commercial farmer, therefore does not carry out large scale commercial farming activities. Statistics South Africa defines commercial farming as a farming activity by a farming unit or enterprise involved in commercial agriculture (Stats SA, 2020b). However, excluding smallholder farming (Stats SA, 2020a).

Some studies have started to query this line of definition, instead, preferring to call this type of farming, large-scale commercial farming or agriculture (Muzekenyi et al., 2022). For example, they argue that small-scale farmers do get involved in farming activities of a commercial nature. Of material note, is that in SA, most smallholder farmers are black, living in poverty and are mostly based in former Bantustan homelands (Chirau et al., 2020). It is important to note that Kirsten and van Zyl (1998), raised concerns, more than 20 years ago, about the regressive challenges smallholder farmers faced including being confined to rural areas with little or no economic development opportunities, yet little has changed. The context in which the author raises the concern, is supported by a Food and Organization (2015) data analysis finding, that transformation expected to affect smallholder farming business positively takes long.

In fostering a sustainable GFI for smallholder farmers, this study proposes the implementation of a basic modeling framework, customised from antecedent agricultural indicators that are derived from the variables, commonly used by farmers, in their day-to-day farming activities. This approach seeks to empower the smallholder farmers to become change agents in their effort to improve their farming income sustainability, to minimise the failure of support programmes that are driven by the SA government in various types of farming endeavours (Bisaga et al., 2019). As stated by OECD (2019), the needs of emerging farmers suffer challenges of implementation and correct targeted support by the officials tasked with the relevant responsibilities.

This study was approached from a global perspective, that recognises the substantial contribution of smallholder farmers worldwide relating to food production, supply, and consumption, which highlights a chance to impact overall food security and other economic growth opportunities positively (Giller et al., 2021; Lowder et al., 2019). In establishing and promoting family farming, which according to this study forms part of smallholder farming, (FAO & IFAD, 2019), posit that it invests majorly in agriculture, is a major food production and food security contributor worldwide and that it is a recognised foundation of rural economies.

This recognition is further enhanced by the regional position in South Africa's National Development Plan (NPC - National Planning Commission, 2012), which positions smallholder farming in South Africa, at the centre of rural development opportunities. Thus PMG - Parliamentary Monitoring Group (2020), calls for improvement in the business sustainability of black smallholder farmers.

1.1.1 GFI for smallholders in a global context

Smallholder farming requires integration into markets, support to getting increased market access (Ngqangweni et al., 2016), and more favourable policy decisions to ensure the accelerated achievement of rural development, economic growth, and food security solutions that the most vulnerable seek (Nejadrezaei & Ben-Othmen, 2019; Oluwatayo, 2019). A 2018 parliamentary meeting, exposed the department of agriculture, forestry, and fisheries for failing to address the current market access challenges of smallholder farmers, whilst commending the same department for its efforts in pursuing commercialisation of black smallholder farmers (PMG - Parliamentary Monitoring Group, 2018).

Within agriculture, smallholder farming is expected to be one of the drivers towards the achievement of the 17 sustainable development goals (FAO, 2018b; Stats SA, 2019b), more especially the following economic growth linked sustainable development goals, SDG1 (no poverty), SDG2 (zero hunger), SDG8 (decent work and economic growth) and SDG10 (reduced inequalities). This is the reason, (FAO, 2018b) further recognises smallholder farmers as important agents of change in rural areas, towards the achievement of these goals.

In its macroeconomics statistics publication, (FAO, 2019, 2022), presents its regional Gross Domestic Product (GDP) outcomes by reporting on the following regional groupings, separately: Africa, Asia & Pacific, Europe, Latin America & Caribbean, Northern America, and Other Developed Regions (ODR). ODR consist of Australia, Japan, and New Zealand. GDP can be defined as an economic indicator that measures economic growth, health, and size in various parts of the world (FAO et al., 2019). These reports highlight the slower growth of agriculture than other sectors, and its shrinking share value of GDP.

The agriculture industry or sector uses agriculture value added, as an economic indicator that measures its contribution to GDP (FAO, 2022). For example, from the

gross value added (GVA), "the contribution to the economy of individual producers, industries or sectors," (O'Connor, 2018 p4), has been measured to estimate GDP in Scotland. Accordingly, the relationship between agriculture value added and its flow from GFI (referred to as TIFF in the Welsh document) determines the margin of growth or decline in GDP estimates.

Although many statistical surveys and censuses show the outcomes of this direct relationship (Stats SA, 2005, 2010, 2020a; Welsh Government, 2020), many current studies in literature do not highlight this. Instead, these studies focus on the causal relationship between agriculture value added and GDP, ignoring the key input value of GFI thereon.

Table 1.1 further highlights the importance of the above-mentioned relationship, in that, just before the Asian economic crisis of 1997, the global GDP growth in 1994 was 3,0%. It has been stable since then, increasing to 3,3% in 2017. The latest reporting in 2019 shows a slight decrease to 2,4%. Over this period of 25 years from 1994 to 2019, the average GDP growth rate was 3,0% which indicated that worldwide, there was a stable economic growth of around 3%. During these years, the global agriculture value added share of the GDP showed a decline in contribution to GDP from 7,6% in 1995 to 3,3% in 2018 and an increase to above 4,2% in 2019 (Table 1.1). It was stabilised at around 4,0% in 2020 (FAO, 2022).

One of the few relevant studies on GFI, was done in 1950, in Michigan (Drake, 1954). This study emphasises the importance of gross farming income and how farmers can benefit from knowing how to utilize gross income charts. The 1950 study shares similarities with the main objective of this study, which on the contrary, focuses more on smallholder farmers and sustainability of their gross farming income, for which little attention has been given in literature. The influence and relevance of this old study is of high importance.

Large investments by various countries still place agriculture as the preferred industry for the revival of their flailing economies (Mengoub, 2018), which have also been exacerbated by the covid-19 pandemic and climate change eruptions lately. Some of these countries assert that this decline may be taking place, due to forward and backward linkages with other sectors (ITA, 2021). When the manufacturing and mining industry experiences volatility, this results in a low demand of raw materials that are

used in agriculture, which negatively affects the turnover of end products. Other studies counter this view and posits that the agricultural sector stimulates other sectors (Barrett et al., 2019).

On the other hand, FAO et al. (2019) argue that the decline should not be regarded as an overall cause for concern, since it is the faster growth in other sectors than agriculture that has resulted in a declining agricultural contribution to the global GDP. This decrease is 3,4 in real value, and has decreased by 44,7% in a period of 24 years. This position by FAO may be wrongly interpreted as saying the importance of agriculture is dwindling, requiring focus to be redirected to other sectors.

1.1.2 South Africa in context

One of the large investments by the South African government in the fiscal year of 2017, was in favour of the Department of Agriculture, Land Reform and Rural Development (DALRRD) which aimed at implementing a programme to transform 450 smallholder farmers into commercial farms (PMG - Parliamentary Monitoring Group, 2020). The department failed to deliver on this mandate, despite funds being disbursed which benefited other stakeholders instead of the targeted smallholder farmers. Many smallholder farmers who had hoped to be assisted through the programme, suffered income losses after submitting qualifying loan applications (Masiwa, 2020), instead of expected income gains through commercialisation.

While Oluwatayo (2019) asserts that food security results from growth in smallholder agriculture, due to associated income growths; data collated from interactions with smallholder farmers is not compiled and handled to impact income benefits on smallholder farming. There appears to be a lack of knowledge acknowledging that sector growth is driven by income (Schnepf, 2019). This lack of relevant knowledge, expertise and support by authorities such as extension officers, which include a lack of advice on how farmers should manage their farming income, bears a negative impact on the agricultural development growth prospects of smallholders.

Other interventions such as those proposed by the Comprehensive African Agricultural Development Programme (CAADP), include intensifying investment in agriculture, reducing poverty levels and fast-tracking of trade among African countries (NEPAD Agency, 2015). These also face the prospect of failure and may even be harder to implement, or this will result in prolonged delays, especially with influences from the

latest impact of the covid-19 pandemic on various industries as well as the negative impact of climate change on production at smallholder farming level (Kom, 2020; Ubisi et al., 2017).

CAADP requires signatory countries to allocate at least 10% of their annual national government budgets to the development of agriculture in order to achieve a minimum of 6% annual growth in the agricultural sector and implement programmes to include 30% of youth in production supply chains (AU, 2018; NEPAD Agency, 2016). Growth trends reported in table 1.1, already indicate that these targets are not being met. This study can contribute to mitigating some of the challenges that led to the missed targets, with the focus on GFI targeting poverty levels, among other things.

Within South Africa, the farming income data for smallholders is scarcely available as shown in figure 1.1.3. Hence, the aforementioned censuses and surveys have focused on commercial farmers' income when compiling important statistical reports. This is why Erasmus (2017), raised a concern that the support to small-scale farmers is hampered by the lack of reliable data on smallholder farming, and that the government is not showing any willingness to improve the situation despite its numerous promises to compile this information. As of 2016, figure 1.1.3 indicates that the income data for smallholder producers in South Africa had not been determined (Our World in Data, 2016).

1.1.3 Average income data (2016)

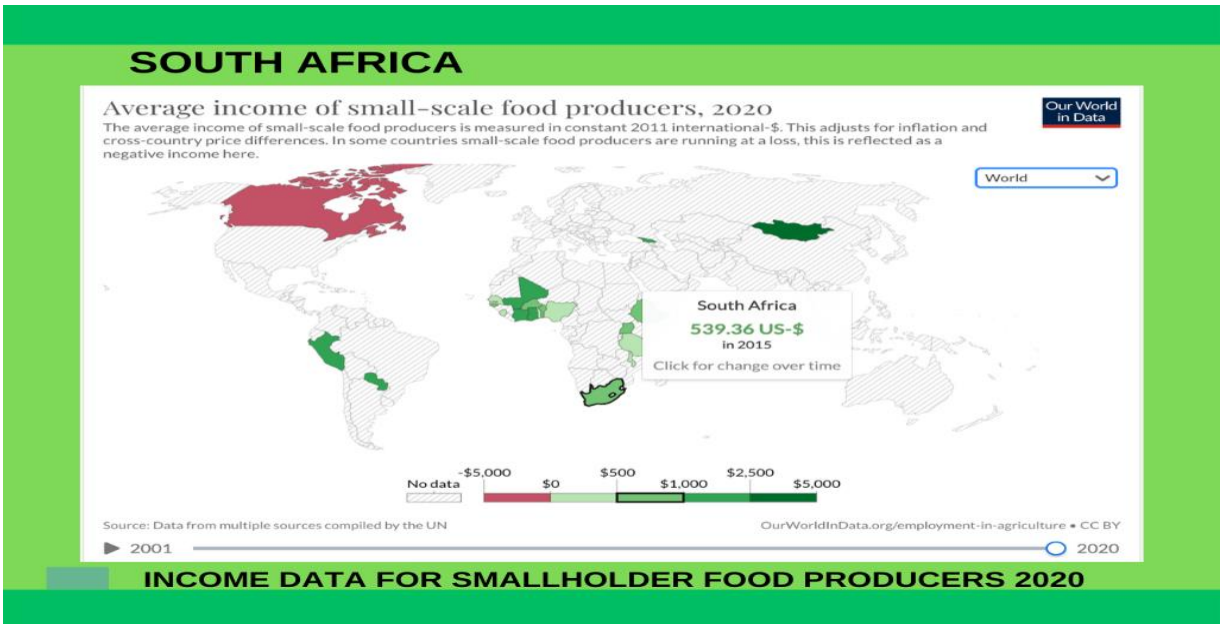
Figure 1.1.3: Average income data of small-scale food producers (2016)



Source: Our World in Data. Creative Commons BY License. Adapted by Author.

1.1.4 Average income data (2020)

Figure 1.1.4: Average income data of small-scale food producers



Source: Our World in Data. Creative Commons BY License. Adapted by Author.

An improvement in the collation of income data of South African small-scale producers is highlighted by figure 1.1.4, with Our World in Data (2020) reporting that as at 2020,

the average income attributable to small-scale producers was calculated at $539.36 per annum (USD).

1.1.5 Free State provincial context

Agriculture is a driver of development for the rural-based areas (Zantsi et al., 2019); with GFI being one of the main determinants of the wellbeing of agriculture in a country (Strauss & Louis, 1940). This means that the income derived from any farming related activities including of smallholder farmers should be easily identified, recorded, and monitored using GFI, to determine income levels. An opportunity therefore exists for this study to influence the status quo, and initiate pursuing the intensive drive to compile and maintain the GFI of smallholders, starting with Free State province.

The base of this research study is the province of Free State, commonly known as the breadbasket and an important food hub in SA (FSDARD, 2019). The province has most of its population residing in rural and agricultural areas. It is home to the country's most significant number of farms, estimated to be around 30,000 (FSDARD, 2018); from which sustainable farming income should be generated. Currently, the farming income reported is based on 7,951 commercial farming entities only (Stats SA, 2020b). Additionally, the province faces a high unemployment rate of 44.5%, surpassing the national rate of 39.7% in the first quarter of 2020 (Stats SA, 2020d), which it desperately needs to turn around. Whilst the latest statistical releases show an improvement of 10,7% on the above, at 33,8% in Free State labour rate, it still lags the national unemployment rate of 32,9% by 0,9% (Stats SA, 2022c).

The Free State province was formerly known as Orange Free State and was renamed after 1994 (South African History Online, 2019). The dawn of democracy brought with it 1994's historical elections and the subsequent discontinuation of the apartheid system in South Africa, which meant that legislative and policy changes would follow. This in turn affected the existing legislative and policy landscape of agriculture.

One of the main policy changes relevant to this pursuance of a sustainable GFI by smallholder farmers, was the requirement to implement government farmer support and extension services, from a merged provincial government competency level, in line with constitutional requirements (Worth, 2012). The implementation effort introduced through these policy changes has failed the previously disadvantaged; where the majority thereof being black smallholder farmers. The mandate given to

those responsible to effect these changes, was to ensure that smallholder farmers are resourced to levels that would facilitate their transformation to profitable commercial farming (Jayne et al., 2019).

There are also, other important and relevant legislative, policy, regulatory provisions, and interventions from programmes (FSDARD, 2019), that require a basic farm-level analysis, for the integration of these interventions in the framework of advancing gross farming income sustainability from the activities of smallholder farmers. This includes interventions from government programme called, Comprehensive Agricultural Support Programme (CASP), a grant for development and extension of support services, Ilima/Letsema Projects, a grant for production outputs, the Agricultural Disaster Management Programme, for cover of climate destructions, and the Blended Finance Scheme (BFS), which has a cheaper funding cost (DALRR, 2022), as it is a combination of a grant portion by government and loan part by funders.

1.2 THE SIGNIFICANCE OF THE RESEARCH

Smallholder farming is on the decline, among other things, because of poor economic policies by the current government, lack of access to sufficient income instruments and credit inputs among other things (Langyintuo, 2020; Ncube et al., 2017). With (Shackleton, 2019), concurring and referring to this decline as the abandonment of farming by smallholder farmers. The reports by (Stats SA, 2016), furthermore, confirms this decline with surveys highlighting the decline of farming households in Free State, from 201,286 in 2011 to 157,510 in 2016. This equates to a 22% decline in a five-year period, which is significant.

This study proposes guidelines to determine how to consistently generate sustainable farming income at smallholder farm level, as these have not been given the prominence they deserve in literature. The advancement of GFI will assist in expanding the pool of income for smallholder farmers, and consequently contribute positively towards a boost in employment opportunities, market access, credit access and technology training requirement of smallholder farmers in Free State and thereafter, in other South African provinces.

It will therefore benefit various stakeholders in the agriculture industry, agricultural departments, agricultural extension officers and other researchers of various agricultural institutions, with its GFI data outcomes, as new knowledge is added to

current knowledge. In most previous and current studies, GFI is secondary to other research interests such as productivity levels and climate change impacts, especially in smallholder farming (Popoola & Yusuf, 2021).

Primarily, it will benefit smallholder farmers in Free State, and consequently in other provinces in South Africa, to consistently generate and maintain sustainable levels of farming income. These are outcomes enhanced by GFI where related contributions to increases such as cashflow of farmers, as well as potential import and export opportunities, have already been highlighted as important in commercial farming (Goedde et al., 2019).

The smallholder GFI sustainability concept introduced in Free State province addresses the lack of existing knowledge gap in smallholder farming literature regarding the absence of GFI exposure. As a result, it brings forth fresh insights and contributes to the expansion of knowledge, new and additional.

1.3 RESEARCH PROBLEM

GFI is an important metric that feeds into agriculture value added and subsequently into GDP (Stats SA, 2005, 2010, 2020a; Welsh Government, 2020). The global agriculture value added share of the GDP, resulting from inputs such as the GFI, has however been in decline from 7,6% in 1995 to 3,3% in 2018. It, therefore, negatively impacted on the global GDP growth, which fell from 3,0% in 1994 to 2,4% in 2019 (The World Bank, 2021), and is expected to decrease further, to 1,7% in 2023 (The World Bank, 2023).

While the official Gross Farm Income (GFI) in South Africa has experienced substantial growth over a number of years(DAFF, 2019b), its real value was on the decline, as its contribution to the agricultural value-added share of the GDP declined from 4,2% in 1994 to 1,9% in 2019 and resulting in a lag of 2.3% compared to the global average (DALRR, 2020a). The GFI plays a significant role in determining the agriculture value-added and subsequently affects the GDP. Consequently, this decline has had a negative impact on GDP growth, with the country falling short of achieving the recommended annual growth of CAADP 6% by 5.8% in 2019, reaching only 0.2% (AU, 2022). Furthermore, the GDP fluctuated in the following years, with a decline of 5.9% (-5,9%) in 2020, an increase of 4.7% in 2021, and a slight increase of 2.1% in 2022(Stats SA, 2022b).

Likewise, in the province of Free State, there has been a decrease in the average growth of the Gross Farming Income (GFI) over a span of 23 years. As a consequence, the contribution of agriculture to the provincial Gross Domestic Product (GDP) has seen a decline from 178.9 in 1996 to a deficit of -5.6% in 2017, as evidenced in table 1.1. Moreover, the GDP has also experienced a drop from 5.3 in 1996 to a deficit of -1.4 in 2019, resulting in a shortfall of -7.4% compared to the CAADP growth mentioned above.

These circumstances pose a significant challenge for the province to recover in the foreseeable future. It is worth noting that over 60% of the population in Free State resides in rural and agricultural areas (FSDARD, 2018). Therefore, the FS has the best opportunity to develop a sustainable smallholder farming income potential. The current GFI of the smallholder farmers in FS is also, low, and declining, as calculations show that it follows similar trends to the national measurements, as shown in table1.1. As the main source of income for farming households including smallholder farmers, was on the decline from 2,7% in 2018, to 2,5% in 2019, 2,3% in 2020 and 2% in 2021 (Stats SA, 2019a, 2020c, 2021, 2022a). This posed a great cause for concern.

Other studies on GFI have focused on advanced standardised methodologies, such as the farm accountancy data network (FADN), income risk management programmes and farming income insurance schemes, used in the developed European Union countries and the United States (Baležentis et al., 2019; Castañeda-Vera & Garrido, 2017; Severini et al., 2019). Although the study by (Baležentis et al., 2019) bears close similarities in that it researches financial performance and sustainability thereof in Lithuanian family farms, it differs from this one in that it looks at more advanced and complex factors, whereas this study focuses initially on the basic factor of sustainable financial performance, specifically, the gross farming income, which has not been adequately researched in FS.

1.4 THE AIM OF THE STUDY

The aim of the study was to advance the GFI sustainability of smallholder farmers in Free State province, South Africa.

1.5 RESEARCH OBJECTIVES

This study focused on the advancement of sustaining the gross farming income by the smallholder farmers in Free State province. Smallholder farming has historically, been associated with producing food for own consumption (Fan & Rue., 2020).

Generating consistent farming income from farming activities of these smallholder farmers, opens opportunities beyond farming for household consumption, with its systematic adoption leading to increased cashflows, potential investments in other growth opportunities such diversification, and paving ways to commercialisation possibilities, which should be the goal of many smallholder farmers (T.S. Jayne et al., 2020).

The advancement of GFI in this study can be presented as five inter-related objectives:

1. To measure the extent of current GFI of smallholder farmers in FS.
2. To propose the determinants of GFI used to derive a sustainable income for smallholder farmers in FS.
3. To evaluate the current strategies of GFI, used to transition smallholder farmers to commercial farmers in FS.
4. To evaluate targeted support programmes that develop the skills of smallholder farmers in FS.
5. To propose a GFI sustainability model for smallholder farmers in FS.

1.6 RESEARCH QUESTIONS

1. How is the current gross farming income of smallholder farmers in FS measured?
2. How can determinants of GFI generate, improve, and sustain the gross farming income of smallholder farmers in FS?
3. What are the currently used strategies of gross farming income, to transition smallholder farmers to commercial farmers in FS?
4. How can smallholder farmers in FS be supported to derive consistent, sustainable gross farming income with their current skills?
5. What is the current gross farming income sustainability model for smallholder farmers in FS.

A general alternative hypothesis relating to the objectives being tested in this study, was to test the advancement of sustainable gross farming income having a positive impact on smallholder farming in Free State province, South Africa. The study therefore, aims to explore and provide evidence on the potential benefits of generating sustainable gross farming income for smallholder farmers.

1.7 DELIMITATIONS OF THE STUDY

Similar to other developing regions, the data associated with smallholder farming entities in South Africa lack reliability or accessibility (Fabregas et al., 2022; Khapayi & Celliers, 2016). If this data is accessible, it may not consistently align with relevant variables, such as the precise timing of occurrences. These limitations in information could impact several outcomes derived from this research study.

1.8 STUDY OUTLINE

The study consists of seven chapters.

Chapter 1: presents the introductory part with sections that include background, study significance, research problem, study aim, objectives and questions of the research.
Chapter 2: presents the literature review on the GFI concept, the concept of gross value added to agriculture, sustainability models, sustainable development models, and indicators of sustainability in agriculture.
Chapter 3: outlines the research methodology which included the data collection and analysis tasks, which was conducted in Free State province, South Africa.
Chapter 4: presents the quantitative findings of the study.
Chapter 5: presents the qualitative findings of the study.
Chapter 6: presents the merged findings of the study.
Chapter 7: contains the summary of the findings, recommendations and presents the conclusions of the study.

CHAPTER 2 LITERATURE REVIEW

The calculation of GFI plays a crucial role in determining the overall economic growth as it represents the gross value added of agriculture that contributes to the GDP (Badiane & Makombe, 2014). Additionally, the profitability and viability of smallholder farming businesses need to consider both fixed and variable costs to maintain a consistent and sustainable farming income (Pham & Smith, 2014), a consistent and sustainable farming income is important.

This section explores various theories, concepts, and models pertinent to the sustainability of gross farming income, explicitly focusing on smallholder farming. By reviewing relevant literature, this section will also analyse the interconnectedness between system, sustainability, and sustainable development and how these factors can positively influence smallholder farmers' income growth and development. The theories and models discussed in this section serve as explanatory tools for understanding the actions taken in response to specific terms or concepts and the relationships that guide individuals and actors in carrying out these actions (Leighninger, 1978). The systematic analyses are of historical importance, as has contributed to the development of many theories over time (Perez, 2020).

2.1 SUSTAINABILITY RELATED THEORIES, CONCEPTS, AND MODELS

Kopfmüller in the study conducted by Enders and Remig (2014) argues for the need to put into operational practice sustainability models. In doing so, Sroufe (2016), suggests that when these sustainability concepts are operationalised, practical actions can be taken to benefit stakeholders. Also, Franks and Frater (2013) propose the implementation of an agricultural sustainability system that incorporates tangible and measurable approaches, particularly at the level of smallholder farmers. This research focuses on the application of sustainability theories, concepts, and models, allowing for the use of quantifiable methods to assess the gross farming income of smallholder farmers (Hedelin, 2019).

Contrary to the perspective of smallholder farming systems, which emphasises the complexity of sustainability, this study applies a simplified approach to operationalise sustainability (Sroufe, 2017), and applies relevant sustainability concepts and models available (Elkington, 2013; Schaltegger et al., 2016; Yao, 2017), to influence the advancement of GFI sustainability.

This model is better suited to the research objectives, which require the measurement of income sustainability among smallholder farmers. The model provides categories of sustainability indicators, which can be utilised in this measurement process (Latawiec & Agol, 2015; Purvis et al., 2018). Moreover, these indicators can be used to assess progress toward sustainable outcomes in terms of economic, environmental, and social aspects. Linked to the concept of sustainability, there are other important inter-connected ideas embedded in various theories of traditional agriculture, learning, system, and sustainable development (Ncube et al., 2017; Patel et al., 2020), which can lead to a good foundation for advancing sustainable gross farming income in farming activities of smallholder farmers in Free State province.

Although (Ncube et al., 2017), do not explicitly mention any of the above theories, there is mention of related aspects that emphasises the significance of indigenous knowledge, change approaches and matters relating to sustainability affecting smallholder farmers.

2.2 THEORY OF TRADITIONAL AGRICULTURE

The investment in education, science and technology by high-income countries has led to a general growth of per capita agricultural output over time (Alston & Pardey, 2017). The above relate to a production output that supports the theory that Schultz referred to as theory of modernisation (Lundahl, 2021), against the original one known as the theory of traditional agriculture.

The latter is a type of agriculture that relies on the tried and tested old ways of doing farming that has been followed by many generations (Lundahl, 1987). Unfortunately, posits Schultz, depending on these old factors of production, the outcome will not be positive but instead result in a low income for farmers. Unless prohibitive costs of production borne by these smallholder farmers are reduced to reasonably low levels, this type of agriculture will not grow (Lundahl, 1987, 2021; Nerlove, 1999). On the one hand, most of the rural areas-based farmers in SA, are still faced with the challenges of depending on their own limited resources, and extraordinarily little effective support if any, from the government (NDA, 2012). This means they are still entrenched in traditional agriculture.

On another hand, Brush (2005), contends that the knowledge inherent in traditional agriculture cannot be ignored and has immense value, which should be conserved for

future generations. Although the need to modernise is important, the foundation of pre-modern knowledge and phenomena will continue to exist into the future (Drosten, 2018). In traditional agriculture, many farming practices and beliefs are informed by local knowledge and cultural experiences passed down through generations. It is a way of life, existence and survival supported by the dependence on land and the use of other natural resources (Zhu et al., 2021).

This local knowledge has also been proven to positively influence agricultural extension farming practice services, which has recently become essential in the progressive development of smallholder farmers (Kirt et al., 2022). The correct application of extension services, coupled with the correct use of local knowledge, has the potential to impact the generation and maintenance of gross farming income by smallholder farmers, positively.

In FAO (2017), however, a concern is raised that the common farming practices in traditional agriculture are causing land fragmentation, which results in the reduction of the availability of arable land and limiting availability of natural resources. An opposing argument by (Patel et al., 2020), is that these practices increase environmental sustainability and food security. When approaches such as agroforestry are used, where tree usage is combined with cropping, it leads to improved soil fertility, conservation of soil and integrated pest control which are positive for smallholder farming and should be advanced as a best practice globally.

Traditional farming continues to be an important part of South Africa's agricultural landscape and a significant contributor to the country's economy, especially at the smallholder farming level. Despite this, the challenges faced by traditional farmers, one of which is the lack of government support for the sector, have resulted in a decline in the overall productivity of the sector and in rural economies, resulting in a drop in living standards for many South African rural populations. However, (Sikora et al., 2019) argue that traditional structures in South Africa are still better developed than in other regional counterparts in Africa.

With the current challenges facing traditional farming in South Africa (V. N. Mathinya et al., 2022), it is imperative for the government to take action to ensure traditional farmers have access to the resources and support they need to thrive in their endeavours to derive sustainable farming income. Matlakala et al. (2021) also,

emphatically state that smallholder farmers are having to contend with climatic change unpredictability, and other natural disaster crises that lead them to become more vulnerable, in their effort to make a decent living from traditional farming endeavours. One of the most important steps governments can take is to create an environment that is conducive to the growth and success of traditional farming by smallholder farmers.

This can be achieved by providing access to resources such as improved agricultural techniques, access to credit and financial services, and access to markets, which Amankwah (2023) argue, provide a leeway towards innovation. The government should furthermore focus on providing technical and financial support to traditional smallholder farmers to help them increase production and improve the overall quality of their produce. This is essentially a competency expected of the extension officers, by providing them with education and training, access to modern farming equipment and technology involvement opportunities, which as Ramukhithi et al. (2023) posits that it is due to a failure by the government extension officers to do so. This negatively affects profitability and productivity levels of these smallholder farmers.

In addition, a report by Fitch Solutions (2023), encourages the South African government to offer incentives to production initiatives by all types of farmers including smallholder farmers, so as to encourage increased investment in their farms. The aforementioned efforts should be supported by the government. This will raise a general awareness of traditional smallholder farming in South Africa to further improve its contribution to the country's economy. This could include public awareness campaigns, educational initiatives, which may lead to increased collaboration between relevant stakeholders.

Based on Robinson-Pant (2016), this would not only help ensure the growth and prosperity of traditional smallholder farmers, but also the development of rural economies and the living standards of rural people. Traditional smallholder farming has been an integral part of the South African economy for many years and has the potential to remain so in the future. However, for the sector to thrive, the government must take steps to ensure that these farmers have access to the resources and support they need in order to thrive.

So, Altieri and Nicholls (2017) highlights global organisations that recognise and support traditionally sustainable agricultural practices by family farms, stating further

that supportive engagements of this nature leads to better outcomes, such as maintenance of global biodiversity, gas emissions mitigation and opportunities to influence political policy changes and the enhancement of food security.

Traditional smallholder farming already provides food security to millions of people around the world, however there is great potential to ensure that this food is produced in a more environmentally responsible manner (Altieri & Nicholls, 2017). Therefore, it is imperative for governments to recognize the importance of traditional agriculture in the provision of food security, as well as food production that follows an environmentally conscious and sustainable manner. Therefore, it is imperative to take steps to ensure its success. One of the interventions government can help improve traditional smallholder farming is through the encouragement and implementation of relevant agroecological policies and programs, with one being appropriate teaching methods (Ncisana et al., 2023).

Agroecology is a branch of ecology that focuses on the application of ecological principles and practices to agricultural systems; this is done by creating an optimal balance between production, food security and how human beings interact with natural resources which inevitably enables environmental wellbeing (Tittonell et al., 2020). Agroecological strategies and programs aim to promote the use of sustainable and locally adapted production methods that are socially and economically just and environmentally justifiable. In their guiding document, agroecological practices were highlighted as a means to increase productivity, reduce environmental impact, and improve resource management whilst reducing costs that are associated with production (FOOD, 2018).

At the same time, strategies and programs based on agroecology are important to support traditional agricultural practices, which Mohammad Mahfuzur Rahman and Keshav Lall (2022), conclude in their study that these were successfully applied within the practice of family farm schools in order to increase access to various resources, technical and financial support, and incentives that encourage greater investment in the farms of smallholder farmers, which in this case is in family farms.

In addition, agroecology-based strategies and programs can be used to promote the preservation and promotion of traditional knowledge and practices (Leonie Guerrero et al., 2019), which also facilitates the development of markets making it more accessible

to traditional farmers. This can include promoting fair trade, establishing local markets, and supporting marketing strategies. By creating more accessible markets, traditional farmers can be more easily integrated into the global food system and therefore, have the potential to increase their income and improve their livelihoods.

2.3 THEORY OF LEARNING

In proposing a learning framework, the study can incorporate the construct of self-efficacy from Bandura's social cognitive learning theory (Bandura & Wessels, 1994), to integrate experiential knowledge and a belief in own abilities and perception of their aspirations (Wuepper & Lybbert, 2017).

These experiences help in the development of increased knowledge, thereby enhancing smallholder farming performance (Kolb & Kolb, 2017). Modern technologies, such as mobile applications, which can further integrate traditional knowledge to optimise production outcomes and achieve sustained incomes, can be used in new knowledge, in endeavours such as smallholder farming (Bhullar et al., 2023). Chilemba and Ragasa (2020) posits, that with age over time, knowledge increases and farmers become more experienced in their field.

2.4 THEORY OF CHANGE

The theory of change explores the changes of agricultural factors at a global level and then cascaded to the local agricultural markets and articulates this meaning, especially for the continued existence and sustainability of smallholder farming. Factors that affect how agriculture evolves, including in crop farming, livestock farming and other forms of farming are categorised under economical, educational, environmental, physical, political, social, and technological categories, with rapid expansion and innovation led by technological advances (Far & Rezaei-Moghaddam, 2020).

There have been technological changes for the better, but a decline in harvested cropland, lower employment numbers of the agricultural labour force, and a sizable difference in agricultural production and patterns that was noted in the last century, and is continuing (Christopher, 2017). This depicts examples of changes that can materially affect the outcomes of carrying out any form or type of farming. Farming may turn out successful results overall or partially, and it can also fail totally or partially because of changes brought about by the factors listed above. It therefore implies that any change can result in types of farming such as smallholder ceasing to exist totally,

ceasing to exist temporarily, continuing production processes or temporarily halting production.

All these would then impact on the income generation and sustainability of the affected farmers. Farmers therefore should have a continued awareness of the factors of change and their overall impact on their business of farming. Change caused by multiple sources, including human activities, can impact the business of farming positively or negatively, or not at all, i.e., where things remain as they were before any of the changes took place (Wuebbles et al., 2017). Changes in yields, food supply for livestock, temperatures affecting fisheries, threat to food safety resulting from climate changes, human health affected by for example pesticides, and many other factors.

The intervention related to the theory of change in this study can be stated as, the impact of deriving sustainable income based on the growth of GFI, for smallholder farmers in the Free State and SA. Change theory is based on the idea that changes in the environment and in farming practices can lead to a more sustainable and productive agricultural system. However, (Christopher, 2017) further argues for a more aggressive approach, that is described as regenerative, where applied practices results in a noticeable restoration and reviving of environmental resources. This theory emphasises the importance of adaptation to better manage resources and to improve productivity. Change theory is important for smallholder farmers, as it provides them with the knowledge and skills necessary to effectively manage their resources and land in the face of changing environmental conditions.

2.4.1 Outputs, outcomes, and impact

In the smallholder farming field, many programmes are already in place, such as extension support by the government (FSDARD, 2019; Yazdan-Bakhsh & Feil, 2021). Typical activities in this type of a programme can be mapped in the logic model diagram. On the other hand, many smallholder farmers find themselves farming because of their inherent goals of food security for their families, poverty alleviation and income generation. These are considered to be their end goals, since the theory of change determines long term outcomes.

2.4.2 Monitoring and evaluation

A hybrid of the above theory of change and logic model in reference, presents a better solution to the challenges facing smallholders (Vogel, 2012) in this study. A typical

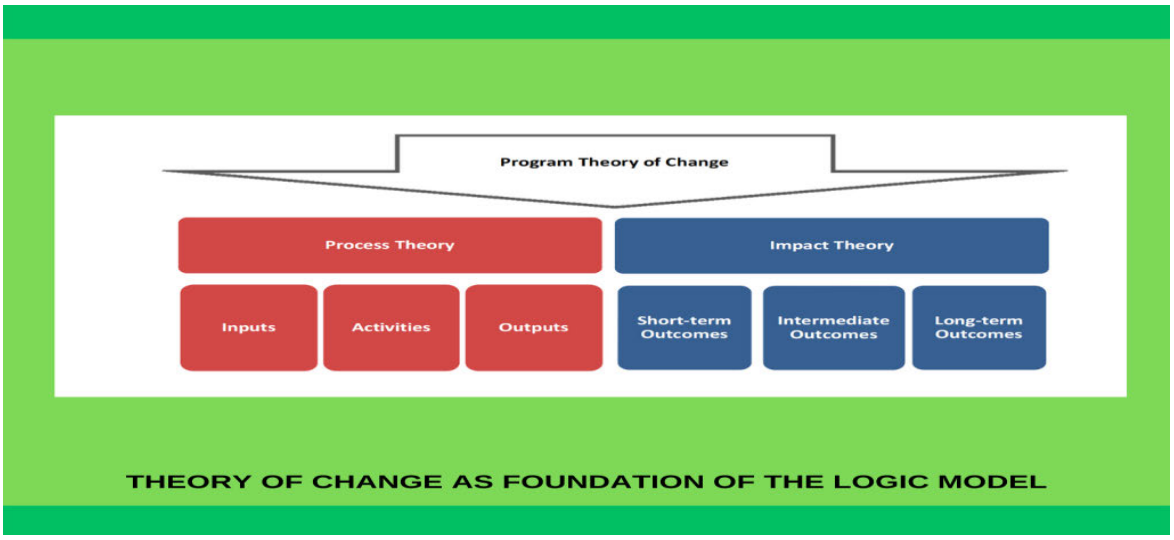
example is where smallholder farmers enrol in existing local municipalities extension support programme in a province, for example in Free State.

The success of the individual short-term outcomes, imply that the logic model of the change programme can be successfully implemented. Even though there are differences between the two, the approaches and activities can be successfully merged (Berra, 2018). In Figure 2.4.3, a framework designed by MPS, as a guideline to create theory of change programmes hinged on logic models is depicted. This is followed by Figure 2.4.4 which then displays an example of the adapted combined theory of change and logic model for the implementation of an extension support programme to integrate mobile digital technology-tracked GFI for smallholders in FS.

The short-term programme outcomes are a simulation to can introduce basic mobile technologies training by repetitive learning methods for smallholder farmers and extension officers in FS. The long term outcome expected is for a smallholder to become a fully-fledged commercial farmer within the next 3 to 5 years, by tracking and recording GFI to ensure adequate annual farming revenue growth.

2.4.3 Guideline to develop a logic model with a theory of change

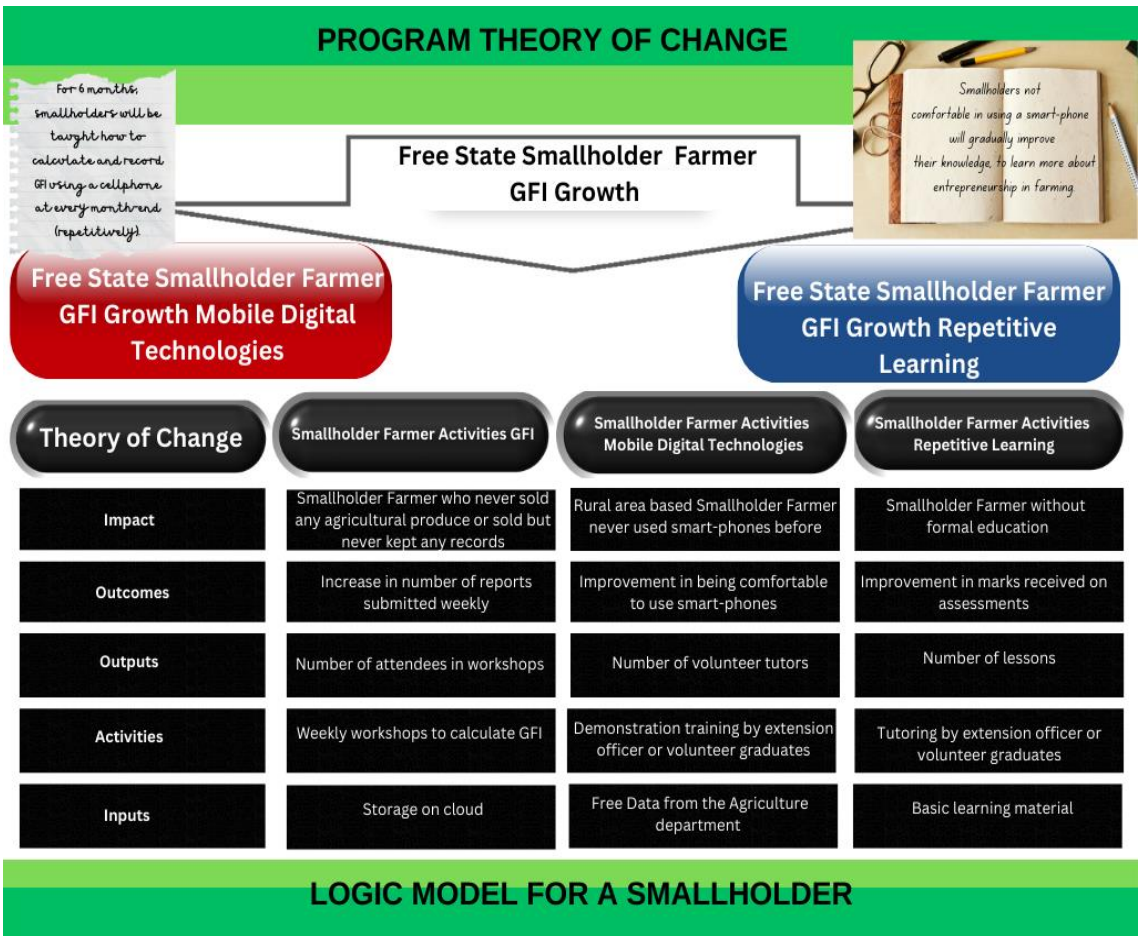
Figure 2.4.3: A logic model with a theory of change framework



Source: MPS, 2014

2.4.4 Adapted MDT-tracked GFI logic model with a theory of change

Figure 2.4.4: Adapted logic model with a theory of change framework



Source: Construction by Author.

2.5 THEORIES OF SYSTEM SUSTAINABILITY

Smallholder farmers are aware that their farming production can bring income benefits, in addition to food security that presupposes own consumption by farming households. These income benefits are, however, mostly inherent and based on experience as there is no existing system to drive its generation. They therefore tend to readily accept this as normal when there are situations where no farming income is derived from their farming activities. This should not be the case. The overall smallholder farming system has enormous opportunities to make farming income become an integral part of its existence, rather than a dependence on guaranteed but insignificant sources such as grants (Jason Stratton, 2022).

Nonkululeko Thandeka Brightness et al. (2022) aver that indigenous crops are an opportunity that has not been exploited by smallholder farmers in South Africa. In this

study, it has already been established that smallholder farming communities participate in agricultural activities of different forms. However, there exists evidence in literature that these activities have not been coordinated optimally, this is with regards to the income that these communities could be deriving on a sustainable basis. For example, economic failure of communal farms points to a myriad of complexities, that mainly result from a lack of addressing entrenched historical structural imbalances (Mamabolo et al., 2021).

It is for this reason that the system theory, is applied as a base to create the linkage to sustainability theories, concepts, models and practices that form the core of this research study. An agricultural or farming system operates using components that interact interdependently within a prescribed boundary and are organised towards achieving production of cropping and livestock produce (Diepart & Allaverdian, 2018; McConnell & Dillon, 1997). These components are brought together to benefit beneficiaries on common objectives necessary to be achieved within the setup of that specific system. A lack of a sustainable GFI in smallholder farming of a province points to a systemic and systematic problem.

System sustainability theory is based on the idea that a sustainable agricultural system must be ecologically, economically, and socially viable (Çakmakçı et al., 2023), and in ensuring a sustainable system, agricultural policies and regulatory actions by the government play a critical role. This theory provides smallholder farmers with systematic knowledge and skills that are necessary to effectively manage their resources and limited land in a sustainable way.

For that reason, Moses Mosonsieyiri et al. (2021) assert that there is a need to prioritise practices that elongate sustainable land management. They further argue for an adoption of the restructuring-based actions, found in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Global Assessment report, which involves changes across technological, economic and social spheres.

At the overarching level, systems theory simplifies the study of different systems (von Braun et al., 2023). In the book by von Braun et al., the system concepts, definitions and dynamics, provides a methodology to argue how issues and problems are understood, and then used to prove the existence of activities that interact and

interrelate in a system. Leighninger 1978's thinking follows a similar direction, where a system is seen as whole, with interdependent parts that form the same whole and function as one (Leighninger Jr, 1978).

The South African smallholder farming system generally has income boundaries that have not been set up for adequate value, and has long neglected to benefit these communities. As Leighninger Jr (1978), further points out, a system requires establishing boundaries that separate parts of it. The system, into those that are part of the environment which the whole finds itself in, and other parts according to their functions, that belong to the whole itself, within the system.

The smallholder farming system in SA, requires that any type of farming project or programme, such as developmental programmes, undertaken to address problems, issues, requirements or needs, clearly defines the scope thereof (McConnell & Dillon, 1997), which allows for the correct boundaries to be classified. The extension and advisory services programme and performance area in the department of agriculture is a typical example where the scope has not been consistent over the years.

The Free State agricultural department annual report for 2018/2019 fiscal year points to factors that have resulted in the failure of the department to deliver the required and expected services to smallholder farmers in the region, where this failure has led to the breakdown of faith between the farmers and departmental officials (FSDARD, 2019).

2.5.1 Definition of system sustainability

System sustainability is an approach to production, consumption, and waste management that is economically viable, socially responsible, and environmentally sound (Yang et al., 2022). It therefore, involves renewable resources' employment, the preservation of natural ecosystems, sustainable production practices' adoption, the implementation of energy efficiency measures, the promotion of sustainable consumption, and the adoption of efficient waste management systems (Marchetti et al., 2020). It also involves developing and implementing policies and regulations to ensure that the system is self-sustaining and that environmental, economic, and social objectives are met, such as ensuring seed production, re-use, breeding, commercialisation, and other forms of seed management (Louwaars & De Jonge, 2021).

System sustainability also entails making sure that a system can remain operational and perform at its intended functions over time. This can be achieved through combined social, environmental, and economic aspects to ensure that this system is economically viable, environmentally sustainable, and socially accepted (Martyniuk, 2021).

Various farming areas in South Africa, and similarly in other countries, the sustainability of animal, crop and horticulture smallholder agricultural systems can be evaluated using indicators like farming productivity as well as farm income (Bathaei & Štreimikienė, 2023). Additionally, this evaluation can be on social sustainability parameters, such as education, conditions of working, farming communities' life quality, farming practices that are acceptable and multi-functional, as well as quality of agricultural produce, which can be measured, ensuring that practices such as land management and conservation of natural resources can sustain the overall system.

2.5.2 General system theory

Boulding's work on general systems theory (Boulding, 1956) is still relevant in today's literature because it provides a framework for understanding how disparate elements within a system interact with each other to create a whole that is greater than the sum of its parts. This understanding is important for many fields, such as economics, computer science, and biology, where complex systems are studied. Additionally, Boulding's work is cited in many contemporary works on systems theory, demonstrating its continued relevance.

Ludwig von Bertalanffy's General System Theory (Bertalanffy, 1968; Gray, 1972), provides a framework for understanding the structure and behaviour of systems. It suggests that there are certain principles that can be applied to all systems, regardless of the individual components, and that these principles can be used to make predictions about the behaviour of a given system. The theory further argues that many distinct types of systems can exhibit similar behaviour, leading to the notion of structural similarity.

In contrast of the two, K E Boulding's system theory is based on the idea that all complex systems are composed of subsystems that interact with each other to maintain their overall stability, whilst Ludwig von Bertalanffy's General System Theory is a conceptual framework that seeks to understand the behaviour of complex systems.

Boulding focused on the dynamics of these interactions, arguing that they could be used to explain how the behaviour of the system changes over time. He also pointed out that the interactions between the subsystems are the key to understanding how the system evolves and adapts. Von Bertalanffy's one is based on the idea that there is a fundamental relationship between the parts of a system and the whole, and that the behaviour of the system as a whole can be understood by analysing the components that make it up.

2.5.3 Grey system theory

In 1982, Julon Deng, a Chinese scholar, started approaches that make it possible for making predictions about systems with incomplete information, small amounts of data and therefore, were not fully understood (Javanmardi et al., 2021). These systems are also referred to as uncertain (Liu, 2019; Liu & Xie, 2020). The approaches, however, are dynamic in that, they continue to be relevant, specifically in areas such as smallholder farming, for understanding the complexity inherent in these related systems. Agriculture consists of multiple data points that can be difficult to measure or are unknown. Soil quality levels is an example, but the grey system concept can only be used to generate an acceptable understanding of those estimate levels (Liu & Xie, 2020).

Hence, grey system theory makes use of the minimum information available to examine the effects of external factors such as climate change on the system, and can also be used to develop sustainable agricultural practices. This allows inferences to be made from the level of any available data at any time.

In Indonesia, the grey system theory was used to determine the contribution of primary producers to what is known as Green GDP (Listra & Prasetyia, 2020). Similarly, this study found many areas that lack development towards building accurate and reliable data. These areas can be classified as grey, requiring researchers to find a feasible way to analyse the inadequate or incomplete data in order to provide best outcomes.

The importance of grey system theory in smallholder farming type of systems, is shown by (Liu, 2019), with arguments that it is useful for averting problems where sample sizes are limited, and where information is insufficient during systems analysis exercises. The author (Liu, 2019) states that it has derivative methods and

applications that have recently been used in numerous studies to address several socio-economic issues, with notable economic and social benefits.

2.5.4 Farm system theory

Farm system theory provides a useful framework and tool for understanding and managing the complexity of farm systems, including smallholder farming systems, with an expected focus on food production, for activities expected to generate farming income (Herrera et al., 2022; Kumara et al., 2017). Hence its application considers the various components of the system in a holistic view and the interactions between them, which emphasises the need to recognise the uniqueness as well as the interdependence of each individual farm system and its associated resources.

That is why (Diepart & Allaverdian, 2018; Herrera et al., 2022) further highlight the importance of a clear understanding of the objectives of the farming system and the need to ensure a balance between the different elements or components of the system. Also, (Kumara et al., 2017)'s emphasis is equally on integrating agricultural activities into what they term subsidiary enterprises.

Additionally, (Adjognon et al., 2017) shows that application of farming systems is equally important when considering the management of external resources, such as credit arrangements, production inputs, and access to farm markets, in relation to income generating activities. Some of the questions they raise relate to the reasons why governments fail dismally to provide adequate credit facilities to smallholder farmers, resulting in arrangements with other credit givers that may be less than affordable or profitable.

Arguably, considering the above paragraphs, farming systems are complex combinations of production factors and farming activities geared towards agricultural production, both for self-consumption and selling; which in this case is mostly associated with smallholder farmers. This position is confirmed by (Ma & Sexton, 2021), suggesting that smallholder farmers may be better off leasing land and labour to larger commercial farmers, and only utilising smaller sizes of own land within allowable scale of use. They use an approach of evaluating advantages and disadvantages of smallholder farming, by comparing these to large-scale commercial farming.

The typology of farming systems is classified as categories, attributes and classes with differences in technical characteristics of ongoing cropping and livestock rearing systems (Nyambo et al., 2019). Therefore, in analysing several types of farming systems, many inherent approaches help in understanding the choices and practices of many farmers and their production activities. These approaches consider the educational, experiential, historical, socio-economic, and other technical contexts in which farmers grow and evolve.

Many developing changes, they being religion-based, cultural, technological and otherwise, are identified and applied through analyses of these farming systems (Omia et al., 2023; Spaling & Kendra Vander, 2019; Zantsi et al., 2020). Contribution to knowledge about agrarian systems of many regions, has been formulated through an understanding of these farming systems and the changes that affect them over time, such as on land usage (Okuhle, 2021), that furthermore help farmers in adapting to these changes accordingly.

Whilst the management principles associated with the farm should be regarded as suitable for a particular farm, their application can lead to different decisions. That is why, (Ma & Sexton, 2021) analyse factors such as labour efficiencies, prices of farming outputs and credit access opportunities to argue that smallholder farming may not be the most effective way out of poverty for most of the poorest households in the world. According to their analysis, it is because smallholder farming may not be as productively beneficial towards the production and security of food, for poor households, as many studies present.

In contrast, (Mujuru & Obi, 2020) argue poverty alleviation by way of smallholder farming is possible, however with appropriate government intervention and transformation of the system. In agreement, (Hlatshwayo et al., 2021) concurs and posits that the government need to increase its support measures towards smallholder farmers, such as by motivating for a more group-based farming practice, which may speed up poverty alleviation programmes.

Relevant farm systems can therefore be used to identify opportunities to continuously improve efficiencies of the farm system which leads to highlight any potential problems and shortcomings highlighted above. Hence, this study advances use of GFI as part of

current systems that smallholder farmers have adopted in order to achieve more buying power, lessen credit constraints and help achieve economies of scale.

Many of the studies above reflect diverse but important findings and outcomes related to farming systems. Strategies to help smallholder farmers, such as forming cooperatives, which is a collaborative tool to mitigate the competitive disadvantages of smallholder farmers in modern day supply chains, and transformation to enable the endogenous consolidation of smallholder farms, have been presented. However, many drawbacks continue to exist, such as capital constraints and heavily discounted prices for the outputs that are relative to large-scale commercial farmers (Kolade et al., 2020; Thibane et al., 2023).

Additionally, contract farming such as off-take agreements (Nwafor, 2020; Reva, 2019), may be a viable alternative strategy to the large-scale commercial farming model. Although, there is an unwillingness on the part of large-scale suppliers to take smallholder farmers under their wing, it should be understood that this will assist in their needed growth both in production and farming income generation.

Understanding the complexity of smallholder farming systems and the economic, social, and cultural context of different farm systems to identify the best strategies for improving smallholder farmer livelihoods, is important (McDonald et al., 2019; Rusere et al., 2019). It should be noted that smallholder farming is a viable option for developing countries, but the drawbacks that have been identified need to be addressed. The application of relevant farming systems in the advancement of GFI, is one of the most important aspect of this study, as there is reciprocity of complementary knowledge contribution with many studies on farming systems.

2.6 ECONOMIC DEVELOPMENT THEORIES

Economic growth theories and concepts are products of sustainable development evolution that can be extended for the application in farming systems such as smallholder farming, and since the system is old and constantly evolving, which allows for varied applications (Courage et al., 2019; Geza et al., 2021; Mpundu & Bopape, 2022; Nomabandla et al., 2023). There are several contrasting economic growth theories and approaches, that impacted on economic and sustainable development initiatives of the periods from the 1950s to the 1970s (Elliott, 2013; Ruttan, 1965).

Many continue to play an important role today, in their native form as well as with their evolved forms.

The advent of sustainable development as a general approach to dealing with aspects of economic progress, poverty alleviation, environmental care and many other developmental factors, is that it is open to manipulation by those with access to sufficient resources (Meyer & Auriacombe, 2019). The government, through its extension services, is expected to play a role in building the capacity of smallholder farmers, removing barriers, as well as ensuring provision of relevant resources such as infrastructure improvements (Myeni et al., 2019a).

Opportunities to highlight instances where barriers can be removed by those with authority to discourage any form of manipulation, need to be supported (Kröbel et al., 2021). Hence the importance of studies such as this one, which focuses on finding ways and means to assist in the development of smallholders aim to provide the necessary guidelines that can impact on the earnings potential by sustaining their gross farming income.

Specifically to agriculture, economists Georg Friedrich List (Kumar, 2020), Irving Fisher (Burnham, 2016), and John Bates Clark (Cherrier & Svorenčík, 2020), as well as Walt Whitman Rostow (Chien-Min et al., 2022), presented important arguments and approaches that sought to define the direction and the growth relationship of economic development, both in the developed and under-developed countries. List is known to favour hard-core industrialisation and has pushed for a transition to industrial based economies, such as in Europe (Tijerina, 2020).

The Fisher-Clark growth strategy is a developmental and structural transformation type which emphasises application of primary and secondary activities to achieve economic progress (Skryl & Gregoric, 2020). It is spread across agrarian, industrial and information sectors. Lastly, Rostow sees economic development being derived from a set of linear stages, with government role players which uses taxes to stimulate investments, demand and savings for the efficient operation of markets (Elliott, 2013).

There are research studies on the economic perspective (Elliott, 2013), suggesting that development was to be driven using financing from available international borrowings. This would ensure rollout of large infrastructure and modernising

agricultural projects through mechanisation, industrialisation and urbanisation. However, there is a concern that this may lead to diminishing local and private investments into the local economies (Manasseh et al., 2022).

Other theories that can be looked into, are the Malthusian, classical (Adam Smith's theory) and Keynesian theories, on how their application can impact the smallholder farming system in Free State (Ditlev-Simonsen, 2022). Malthusian and Adam Smith's theories both focus on factors that impact the sustainability of income, therefore will be juxtaposed where necessary in order to determine the potential influence if applied (Ditlev-Simonsen, 2022).

2.6.1 Malthusian theory

The Malthusian theory posits that resourcefulness and abundance of food in a population, may lead to overconsumption with less care on the consequences of shortage and scarcity over time (Ditlev-Simonsen, 2022). Thomas Robert Malthus (1766-1834) was a British economist who developed a controversial theory related to population growth and its relationship to availability of resources. He proposed that population growth would be exponential and would eventually outpace the growth of resources, leading to poverty and famine (Lee, 2021).

Malthus further argued that extensive population growth would cause a decrease in wages and living standards, and also an increase in poverty. He suggested that various government interventions, such as imposing restrictions on certain demographic enjoyments, was necessary to prevent this from happening (Lee, 2021).

The theory of Adam Smith, commonly referred to as classical theory, is more optimistic and suggests that economic growth can be sustained through the division of labour and relevant investments that emphasises a government-managed market self-regulation that curbs risky business behaviours (Wight, 2019). Smith (1723-1790) was a Scottish economist whose theory resonates with the free market system (Svetličič, 2019).

2.6.2 Shareholder theory (Milton Friedman)

The shareholder theory of Milton Friedman is recognised as one of the important economic theories in literature, because it emphasises the focus on profits that the business should generate for its owners, with that being the primary purpose of its

existence (Ditlev-Simonsen, 2022). Existing research mostly applies this theory to bigger entities that have shareholders with an assigned percentage shareholding, for example registered companies, corporates and corporations, however the research studies differ in the interpretation and way of its application (Elrick & Thies, 2018; Pfleiderer, 2020).

Whilst the initial interpretation highlighted the interest of shareholders as it applies to optimisation of profits being given priority over any other stakeholders, such as employees and communities, latest scrutinies suggest other aspects relating to a responsibility by the entities towards other stakeholders, was deliberately ignored in a myriad of studies, and there have been new efforts to include those (Gelles & Yaffe-Bellany, 2019). Hence, shareholder theory is being compared to stakeholder theory in recent studies (Johnson & Ashar, 2020). In applying the shareholder theory to smallholder farming, a framework can be developed to maximise profitability for owners at farm level, which means their income generation interests are prioritised.

2.6.3 Stakeholder theory (R. Edward Freeman)

In 1984, Freeman introduced stakeholder theory as an idea to afford businesses an opportunity to reassess their societal role in communities and manage their relationships with various stakeholders (Goyal, 2020). Different from the shareholder theory, the stakeholder theory incorporates a diverse selection of stakeholders, such as the suppliers and customers of business, the employees and local communities, ensuring that their varied interests are not ignored (Friedman. et al., 1984), whilst business maximises its profit position in favour of the owners or shareholders.

2.6.4 Economic theory (Keynesian)

Keynesian economic theory, developed by British economist John Maynard Keynes, is an economic approach that proposes that governments should intervene in the economy to maintain economic stability, thereby not allowing markets to self-regulate (Aksakal, 2019). This theory is closely related to the sustainability of farm income as it suggests that governments' intervention will result in increased spending when the demand for farm products falls, thereby stimulating the economy and creating an additional demand.

This approach has been widely accepted and adopted by governments around the world, as the main goal of Keynesian economic theory is to maintain full employment

and price stability (Aleksandar & Ristić, 2019). To achieve this, Keynes suggested that governments should increase spending during economic downturns to stimulate the economy and create additional demand. The increase in demand would lead to increased production, leading to more employment and a rise in the prices of goods and services. This would in turn lead an increase in the income of smallholder farmers, which would help in increasing the sustainability of their income.

Keynesian economic theory also suggests that governments should use fiscal policy to manage economic volatility and stabilise the economy (Eita et al., 2021). Therefore, fiscal policy is the use of government spending, taxes and other regulatory revenues to affect the level of economic activity in the country. Through the use of fiscal policy instruments, governments can increase spending during economic booms in order to maintain economic stability. This can help to reduce price volatilities, thereby leading to increased income stability and sustainability for smallholder farmers.

2.7 THEORIES OF SUSTAINABLE DEVELOPMENT

Sustainable development theories are mainly concepts applicable at a global, regional and local level (Enders & Remig, 2014). As such, this is contained in different domains of importance such as government policies, economics and the environment, among other things. It is also a term used extensively to reference many societal and environment relationships (Elliott, 2013).

These relationships, as posited by Elliot, transcends international organisations and governments and therefore include media, academic, business and many other forms and types of organisations that are large, medium or small in size. The term or the concept of sustainable development was established to try and coordinate the agricultural development and help humans to survive (Elliott, 2013; Shi et al., 2019), in the past. So, there seem to be an agreement between (Enders & Remig, 2014), (Elliott, 2013) and (Shi et al., 2019), that sustainable development has the ability to guide socio-economic strategies and transformation worldwide.

Relevant to this study, small farmers are an important group that must not be overlooked in the commitment to eliminate poverty, hunger and a lack of nutritional availability of food, that is in line with the pledge by 193 signatory countries that are pursuing sustainable development goals (SDGs), (Fan, 2016). Fan reiterates that investment in agricultural programmes and projects for smallholders, can help

smallholders contribute to the achievement of SDGs. With this support, there will be a resultant development in rural areas, as these smallholders are largely based in those areas.

With a focus on the income sustainability linkage of smallholders, to the sustainable development of rural areas, the concept and approaches of sustainable development, and the development of agriculture are considered. As (Fan, 2016), further posits, that the above-mentioned investment in agriculture can enhance the productivity and income of small farms. Fan, however laments that there are many types of constraints confronting diverse smallholder farmers. If these constraints and challenges can be correctly analysed and the support offered to small farmers is coordinated correctly, then almost half of the 17 SDGs can be addressed with the help of small farmers.

Whilst there seems to be a thin line between the concepts of sustainable development and sustainability, one seems to be feeding into the other in a synchronised manner of creating a balance. Sustainability is a thought process concretised by sustainable development activity which is largely a process of carrying out a developmental action (Luks, 2014; Spangenberg, 2014).

The idea of sustainable development appears to be originated and established initially from the Brundtland report in 1987, unveiled during a UN commission which Gro Harlem Brundtland led, a prime minister in the Norwegian Social Democratic Party, and it began to operate as the guiding principle of the UN after that (Elliott, 2013; Enders & Remig, 2014).

Similarly, to how the concept of traditional agriculture is important to the evolution and success of smallholder farming in rural communities, the idea that was conceived in the 1970s, called transdisciplinarity, fuses knowledge gained from theoretical and practical production and application, which can then be used to make appropriate decisions (Rigolot, 2020).

Transdisciplinary studies can therefore be used to promote sustainability and development by exploring and connecting different forms of knowledge and sharing of knowledge, including indigenous knowledge, scientific knowledge, and traditional knowledge, to gain a holistic understanding of the issues. Further importance is highlighted by (Fritz et al., 2021), where opportunities to solve complex problems are

presented by this transdisciplinary approach, in addition to ensuring that specific identified scientific knowledge is utilised to produce practical solutions.

This approach can help to recognise and respect diverse points of view, encourage intercultural dialogue and importantly strengthen efforts on transformation (Ishwari Singh et al., 2020). It also allows for a greater appreciation of the complexities of development, by considering less obvious economic and social variables, such as access to resources and inequality. Additionally, it facilitates the development of a shared understanding of the goals of sustainable development and the need for empowerment of local populations in achieving those goals.

Transdisciplinarity can also be used to foster collaboration among different stakeholders, from scientific communities to local societies (Barth et al., 2019; Kareem et al., 2022), in order to achieve a more global, integrated approach to sustainable development.

However, (Dynan & Sheiner, 2018; Fraumeni, 2022) hold a different view on economic growth as a key indicator of a country's sustainable development, often measured through GDP and income levels. They argue that there are many other important factors that need to be taken into account when assessing the impact of economic growth on particular societies. These include the type of growth, considerations on whether it is capital intensive or import intensive, the job opportunities it creates, the environmental sustainability of the growth, and the income distribution among different sectors of society.

Therefore, when assessing economic growth, it is important to look beyond traditional indicators such as GDP and income levels. Capital intensive growth generally produces fewer job opportunities than import intensive growth, but it may be more beneficial to the environment as fewer resources are consumed in the production process. There is however a debate raised by (Adewuyi & Awodumi, 2021), on the impact levels of net imports such as energy, to economic growth, considering the possible nexus between it and the environmental quality. Equally, strategies such as diversification in exports should be considered (Phiri, 2022). In addition, the income distribution among different sectors of society, such as smallholder farmers, should be taken into account, as this can affect the overall wellbeing of the community.

It therefore means, although traditional indicators of development are important, they should be complemented with a more holistic approach that takes into account the type of growth, job opportunities, environmental sustainability, and income distribution among different sectors of society. It is only by considering the full range of variables that the impact of economic growth on poverty and economic wellbeing can be understood.

Sustainable development is a development that should be done in a manner that is economically, environmentally and socially sustainable, which relates to many sectors of any country's economy (Diale & Shammah, 2020; Timpanaro, 2023). The recent SDGs set out by UN Development Programme are a global requirement to seriously address the challenges of poverty, hunger and undernourishment, and bring peace and prosperity to all, expeditiously (Nel et al., 2023).

Smallholder agriculture has a critical role in the country's communities' developmental requirements, and this needs recognition, as it is directly influenced by technological changes (Okuhle, 2021), markets (Mmbengwa et al., 2019), institutions (Molotsi et al., 2017), and climate change and policies (Matlou et al., 2021).

2.7.1 Definition of sustainable development

Sustainable development is a type of development that ensures the present needs are addressed and adequately met (United Nations, 1992), without future generations being under pressures of compromise, to design ways of meeting their own needs (Elliott, 2013). Although there are many other versions of definitions, this commonly known but slightly adjusted definition, which is widely used, and was penned by the World Commission on Environment and Development (WCED) in their report titled "Our Common Future" in 1987 is comprehensive enough to complement the main objective of this study.

There was an Earth Summit held in Rio de Janeiro in 1992, with a non-binding plan of action on sustainable development agreed upon. This was called "Agenda 21" (Elliott, 2013; United Nations, 1992). The document presents proposals that sets up a delivery of action plans by the year 2025, with an expected creation of conditions to ensure sustainable agriculture and rural development (SARD), driven by both developed and developing countries. This 1992 summit was to ensure continuity and implementation of the 1987 proposals.

Many studies have jumped onto the bandwagon of questioning what sustainable development entails, its meaning and definition among other things (Mensah, 2019b). This study argues that there is a lot of ground that has been covered regarding the understanding and use of the sustainable development concept, and that as this concept evolves, there is sufficient context matter to work with and refer to. Hence, the study presents a wide selection of potential application of theories, concepts and models related to sustainable development and sustainability.

The main objective of SARD, according to the Agenda 21 presentation, is sustainable and increased food production and the enhancement of food security (United Nations, 1992). If this objective is met, it will among other things result in a generation of sufficient income to alleviate poverty. The document does not detail how this generation of income will be tracked and monitored for progress. However, this study will include that aspect of how farming income is derived and monitored for sustenance in its focus, as it is of important interest.

The approach regarding meeting of needs currently and in the future is based on the principles of environmental protection, economic growth and social inclusion (Agbedahin, 2019; Mensah, 2019a). Therefore, it also considers the influence of present actions on the natural environment and the utilisation of resources to fulfil the demands of both the current and forthcoming populations. It is furthermore achieved through the use of resources that are socially acceptable, allowing for a more equitable distribution of resources.

Sustainable development is a holistic approach and vision to development that combines economic, social and environmental models to ensure the protection of natural resources and ecosystems, promote human dignity and wellbeing, and achieve long term progress for future generations (Diemer, 2019; Dufva, 2020). It is an approach that seeks to bring about a balance between continuously improving the quality of life of the present generation without compromising the prospects of the future generations.

Sustainable development is a process of change, progress, and a multi-dimensional development paradigm that balances the current needs with future needs, thereby integrating economic, social and environmental objectives (Doumbia & Lauridsen, 2019).

The concept is, however, anchored on the three separate yet interconnected pillars, specifically the economic system, environmental system and the society, requiring decisionmakers to consistently consider the interrelationship between these goals, complement and the extent of each in ensuring responsible human behaviour and actions at the international, national, community and individual levels that allow resources to continue existing in order to promote the tenets of sustainable development in the interest of human development (UN, 1992).

Sustainable development furthermore seeks to create a balance between economic growth and environmental protection, while promoting social equity and a sense of shared responsibility (Kansanga et al., 2020; Marchetti et al., 2020). This approach is underpinned by the principles of reusing of resources, circularity, collaboration, and participatory planning. It emphasises the importance of integrating ecological and social considerations into community analysis and policymaking, in order to achieve a balance between economic growth and environmental protection. Resource circularity is one of the key components of this approach (Grobler et al., 2022), as it seeks to use waste resourcefully and close production and consumption technical cycles (Okafor et al., 2021).

Sustainable development also requires a shift in mindset, from an individualistic model that extract resources of business to a systemic model that regenerates productive and sustainable resources (Sachs et al., 2019). The process of transitioning community development from an individualistic mindset, which leads to limited effects, to a systemic approach that fosters regeneration within interconnected systems (Tanzer et al., 2022), could significantly contribute to the attainment of various sustainability objectives.

Embracing regenerative development principles represents a contemporary and comprehensive perspective that harmonises with the natural environment and its resources (KOPRIVA et al.). This approach strives to incorporate diverse viewpoints, including those of the environment and its inherent worth, to ensure the utmost benefit for all stakeholders. Central to how the concept of sustainable development has evolved over the years, is its positioning globally, in terms of political, environmental, scientific, business and social circles (Enders et al., 2014). This means that it is a type of practice that has been applied in many spheres over the years, despite its lack of uniformity in the meaning of its application.

From a historical perspective, (Shi et al., 2019), argue that sustainable development grew through a consistent practice of policies and events over the years. There are features identified by these authors, in order to determine what shapes its growth. The Embryonic period, before 1972, is the sustainable use of natural resources which became highly important, as this was carried out in a systematically managed manner. From the embryonic period before 1972, there was the molding period (between 1972 and 1987), where the concept of sustainable development began taking shape albeit vaguely defined (Shi et al., 2019). There was little coherence in the agreement on whether development needs to address economic advancement, which should take priority whilst being careful of the impact on the environment, or whether the elimination of poverty in less developed countries was more important (Shi et al., 2019).

The historical and economic lessons of evolution that can be drawn from the above is that sustainable development has grown through a consistent practice of policies and events over the years (March & Failler, 2022; Tikly, 2019). The developing period after 1987, was when the concept of sustainable development started taking shape and become more clearly defined.

In terms of economics, the various theories and approaches proposed by economists such as List, Fisher and Clark, as well as Rostow, which have sought to define the direction and growth relationship of economic development in both developed and underdeveloped countries, have emphasised the importance of industrialisation, structural transformation, and linear stages of economic development, and have advocated for the use of taxes to stimulate investments, demand and savings (Singh et al., 2023).

There are many reasons why evolutionary sustainable development is important (Hajian & Kashani, 2021). One reason is that it is a holistic approach to development that takes into account the many different aspects that impact on economic progress or non-progress, poverty issues, environmental issues, and more. This approach is important because it helps to ensure that all of these aspects of development are taken into account and that they work together to create a positive overall impact.

Lastly, with the developing period that took place after 1987, a systematic defining concept of sustainable development was further entrenched. The conferences held

during this period were tasked with ensuring underdeveloped countries are supported by developed countries to address the general and overall lack of their development, according to (Shi et al., 2019). It is during this phase, that programmes such as the SDGs were established and continue to take centre stage (FAO 2018, NDP, Fan 2016).

2.7.2 Principles of sustainable development

The key factors of sustainable economic growth, poverty reduction, and environmental conservation are based on three fundamental principles that are crucial in the agricultural sector, as they contribute to its sustainable development (Harris, 2000). He presents these principles as an economically viable system, an ecologically sound system, and a socially inclusive system, each with its distinct rationale. Furthermore, (Khan et al., 2021), underscores these principles by emphasising the importance of preserving natural resources, promoting the use of renewable resources, and ensuring that economic projects do not compromise the environment's quality.

In accordance with the aforementioned logical presentations, the definition of the 1987 Brundtland Report (Elliot, 2013), aligns the economic aspect with the requirement for continuous production of goods and services. This entails ensuring food security and effective governance. Thus, it is crucial to establish minimum guidelines for measuring income sustainability and eliminating agricultural and industrial practices that harm smallholder farming, which often operates in a precarious state of survival.

2.7.3 Sustainable development action on smallholder agriculture

For any type of development to be termed successful, it must be put into action or implemented (Kopfmüller in Enders et al., 2014). This he argues, after decades of debates and discussions about the concept of sustainable development. Also, (FAO, 2018), is in agreement and places measures that are critical for the operation of the SDGs at the centre of the sustainable development challenge. These include the collection and reporting of data, the monitoring of targets and the measuring of progress. International agreements, also coerce governments into action, for example, the Kyoto protocol (Elliot, 2013). This study on smallholders may identify a lack of proactive support by government, which could propel smallholder farmers to take the lead in income and data collation programmes of interest.

Smallholder farming remains an important source of income for many rural households and a vital component of local economies (Bhatti et al., 2021). The majority of these smallholder farmers are based in rural areas, where they rely heavily on subsistence agriculture to make a living. In recent years, the income of smallholder farmers have been declining due to a number of factors, such as the effects of climate change and the decrease in global commodity prices. This has made it difficult for smallholder farmers to remain economically sustainable and has resulted in a decrease in their livelihoods. The proposed action to advance the gross income sustainability of smallholder farmers in Free State province, South Africa is also important for the promotion of sustainable agricultural practices, as there is the existence of identifiable disposable farming income. Sustainable development relative to agriculture, is a system of farming that focuses on the conservation and enhancement of environmental and natural resources (Adolph et al., 2021), while also taking into account economic and social considerations.

This type of farming is beneficial for smallholder farmers, as it can help to increase production yields, reduce input costs, and enhance the quality of their produce. Furthermore, sustainable development farming practices can also help to protect the environment, as they reduce the use of harmful pesticides and other chemicals. The government could introduce incentives and subsidies to encourage smallholder farmers to adopt sustainable agricultural practices. This could be done by providing financial assistance and support to farmers to purchase sustainable inputs, such as organic fertilisers and seeds. In addition, the government should aim to provide technical assistance to farmers, such as training in sustainable farming techniques. Furthermore, the government could also invest in awareness campaigns to educate smallholder farmers about the benefits of sustainable farming income.

2.8 THEORIES OF SUSTAINABILITY

The theories surrounding sustainability necessitate forward looking perspectives in order to maintain their own sustainability (Luks in Enders et al., 2014). This means that there is a continued emergence of new and innovative theories and concepts to support this sustainability phenomena (Chang et al., 2017).

Luks further posits that these theories are about life's good things today, and how these good things can be maintained in the future and further iterates that, for that to happen, economic, environmental and social factors play a relevant role. Hence, from

the three-pillar model, processes to incorporate the derivation of a sustainable income for the successful operations of smallholder farmers in Free State province was initiated and facilitated through this study, in order to enable their economic and social advancement.

Theories of sustainability emphasise the importance of taking into account the environmental, economic, and social aspects of farming in order to ensure a sustainable system, within which a sustainable GFI for smallholder farmers can be derived, which has not as yet been fully exploited (Zwane & Montmasson-Clair, 2016). The farming income of smallholder farmers can then be stabilised, steadily generated and economically beneficial.

There are numerous sustainability theories available, and many others are constantly developing (Chang et al., 2017). The chosen model selected for application in this research is interlinked to one or more of these theories, but has lesser complexities in the application at farm level. These theories which are listed below, complement the selected model, and are examined to determine their immediate effectiveness in addressing the farming income sustainability of smallholder farmers.

Sustainability is an increasingly relevant concept in the world today, and the idea of generating sustainable income for smallholder farmers is particularly pertinent. Smallholder farmers are often vulnerable to market fluctuations, climate changes and other external pressures (Ives et al., 2020).
Therefore, it is important to understand the theories of sustainability that can support the generation and maintenance of smallholder farmers' income to ensure its long term sustainability.

In this research study, theories of sustainability with a focus on the generation and sustainability of the gross income of smallholder farmers, were discussed as key approaches to sustainable gross income, along with the potential benefits of its sustainability for smallholder farmers. The term sustainability is often used to describe the capacity of organisations, businesses, or societies in order to continue their existence and success over a time period (Brundtland, 1987).

For this reason, many theories of sustainability have emerged, each with their own focus and approach (Scipioni et al., 2021). The most prominent theories of

sustainability include the triple bottom line, circular economy corporate social responsibility, corporate sustainability and the green economics.

The triple bottom line incorporates economic, social, and environmental aspects and impacts organisational operations (Daniele Eckert & Fábio Bittencourt, 2019). This encourages a balance on the focus of the three dimensions. Thus, it can be used to assess the impact of smallholder farmers' income sources on the environment, or to assess the social implications of farm labour practices (Ghisellini et al., 2016).

The circular economy concept, on the other hand, focuses on the reuse and remanufacture of materials and products to reduce waste and environmental impact (Ghisellini, 2016). It can also be used to identify new opportunities for smallholder farmers to reduce waste and maximise their profits. Smallholder farmers can use agricultural waste to create compost, which can then be used to fertilise their crops. When applied to smallholder farmers' income sustainability, theories can help to identify the key approaches to sustainable income.

The potential benefits of sustainability for smallholder farmers are numerous (Gathala et al., 2020). By applying sustainability principles, smallholder farmers can reduce their environmental footprint and become more resilient to climate change. They can also maximise their profits by reducing costs, such as waste and labour. Additionally, sustainability practices can be used to create a more equitable and just agricultural sector by ensuring that smallholder farmers receive fair margins on their produce and are treated with respect and dignity by all stakeholders.

2.8.1 Sustainability definition

The definition of sustainability in gross farming income looks into the ability of farmers to generate reasonably enough income levels of revenue from their farming activities and diverse farming practices to cover their costs of production while maintaining the long term health of their land, resources, and environment (Virtanen et al., 2020). It is a concept that encompasses the maintenance of economic viability for farmers (Hunold et al., 2017), the equitable distribution of benefits, the conservation of natural resources, and the protection of the environment. It is also the ability to maximise the economic, environmental, and social benefits of agricultural production while ensuring the long term productivity of the land (V. Mathinya et al., 2022).

2.8.2 Triple Bottom Line (TBL)

In considering economic, environmental and social factors to be interconnected, smallholder farmers can adopt a longer term perspective, that encourages business growth but at the same time, continued social benefits, without compromising the well-being of the environment and society (Ditlev-Simonsen, 2022; Elkington, 2018). TBL is one of the concepts that has been depicted positively by many studies (Loviscek, 2021; Taticchi & Demartini, 2021), to have impacted the world of economics positively, by ensuring benefit to both the business and society, rather than focusing only on short term profit making benefits, therefore in pursuing sustainable income growth, smallholder farmers can do the same.

2.8.3 Corporate Social Responsibility (CSR)

Corporate Social Responsibility (CSR) pertains to how corporations, predominantly in the private sector, address matters of societal significance within the course of their regular business activities, all while optimising their financial gains (Chang et al., 2017), whilst maximising their own income. It can support the income sustainability of smallholder farmers whereby these businesses seek to contribute positively to society, the environment and the economy, through a range of activities such as philanthropic donations, support for local communities, and environmental care interventions.

CSR initiatives can include the provision of financial, investment and production support (Grabs & Carodenuto, 2021). These initiatives can be tailored to the particular needs of corporates to leverage established relationships, where smallholder farmers can gain access to varied incentives such as grants, seed and fertiliser inputs, and leased machinery and equipment, to help increase their production yields and farming revenues.

Country level initiatives have also been suggested, where corporates from developed countries are encouraged to assist in the varied development needs of developing or less developed countries (Ditlev-Simonsen, 2022). Furthermore, these funds could also be used to invest in agricultural technology solutions such as climate smart agriculture, which can help farmers to become more resilient to the negative impact of climate change.

CSR type of investments have the ability to provide farmers with the necessary training, education and awareness programmes that help them to become more

productive, efficient, profitable and to promote sustainable farming practices (Kuchimanchi et al., 2021). Corporations could provide incentives for farmers to adopt methods such as crop rotation, organic farming, and water conservation. These practices help to ensure that the environment is not harmed by agricultural activities, which also help to improve soil fertility, that is essential for the long term sustainability of smallholder farming (Maspul, 2023). Furthermore, CSR initiatives can also promote and support equitable trade, where farmers receive fair compensation for their produce. Finally, CSR initiatives can also be used to better the working conditions of smallholder farmers (Maspul, 2023). This could include the provision of better access to healthcare, better safety measures, and better working conditions.

2.8.4 Corporate sustainability (CS)

The measures applied in corporate sustainability (CS) refers to the practices and strategies implemented by corporations to promote environmental responsibility, social wellbeing, and economic prosperity (Chang et al., 2017). These measures align with the concept of corporate social responsibility (CSR), as both aim to integrate sustainability into business operations. However, with capabilities to support the success requirements of smaller businesses, such as in the form of smallholding farms. The definition of corporate sustainability has been modernised by (Taticchi & Demartini, 2020), to encompass a holistic approach to business, focusing on improving competitive positioning, profitability, and the creation of sustained shared value, development and monitoring of agreed practices by co-stakeholders and lastly integrating environmental, social and governance (ESG), in decisions by businesses.

Whilst the CS strategy by (Taticchi & Demartini, 2020), seems focused on creating synergies with external players, (Ditlev-Simonsen, 2022) has an inward looking focus, emphasising a complete buy in of sustainability plans by internal stakeholders, especially top structures of the organisation. The evolution of CS has seen an enhancement from programmes such as CSR, which mainly focus uplifting communities, to ones which create shared value and use management practices to introduce business models that cater for both the business and societies (Taticchi & Demartini, 2020).

Both CSR and CS programmes can benefit smallholder farmers when applied by corporates as forms of investments, in order to improve local business infrastructure, offer technology and training opportunities, help open access to local markets and

distribution networks, and assist in building capacity for businesses to form well managed cooperatives or business types that can also gain access to capital and credit markets.

Investments by corporates can furthermore be in shared renewable energy sources to reduce reliance on fossil fuels (Pradas Bort, 2023), thereby helping smallholder farmers in reducing their energy costs and increase their profits, whilst minimising the amount of carbon emissions discharged into the atmosphere. This will thus contribute to the sustainability of the environment. Additionally, investments in research and development of new farming methods and related technologies, can help ensure that these investments are socially and environmentally responsible.

2.8.5 Green economics and economy

According to (Chang et al., 2017), green economics advocates for the long term viability of society. They argue that this approach shifts the focus from corporations to policy makers. Research on Asian studies reveals that local economies in these countries prioritize implementing innovative strategies and financial interventions to promote sustainable economic growth (Tolliver et al., 2020). Recent studies have praised the application of the green economy for significantly reducing hunger and poverty in Asian nation (Badiane et al., 2014).

The concept of the green economy is relatively new, and it is expected that agriculture will be the driving force behind its expansion in South Africa (Musvoto et al., 2015). As a result, smallholder farmers in South Africa have a promising opportunity to participate in this phenomenon. However, they may face challenges such as limited access to information, inadequate policies, and insufficient implementation guidelines, which could delay their adoption of this opportunity.

Looking ahead, the progression towards embracing the green economy is expected to occur in the near future. Green economics is a theoretical framework that emphasises the principles of ecological sustainability and social justice (Denona Bogovic & Grdic, 2020). The primary objective of green economics is to establish an economic system that maintains a balance between economic activities and the preservation of natural resources, the promotion of environmental sustainability, and the reduction of inequality.

The implementation of green economics principles is essential for relatively rural and agricultural regions, with large populations of smallholder farmers, who are reliant on agricultural production to meet their basic needs. Agricultural production in these areas is often subject to environmental challenges such as drought and climate change, making it difficult for farmers to maintain their income and livelihoods. Smallholder farmers need to put pressure on local government authorities to start prioritising green economy principles.

2.8.6 Sustainability concepts

Multiple interpretations of sustainable development exist in literature, with definitions and uses or applications of sustainability concepts. However, while they are mostly aligned to environmental, economic and social objectives, their approaches differ. As (Lampridi et al., 2019) posits, these concepts should be embraced because they address the appraisal of any issues related to the above objectives and other agricultural practices. Many models of sustainability have since evolved from those presented as weak, which focused on individual strands, to more integrated and systemic approaches, which are more inclusive and therefore address concerns of the environment, the economy and society from an interlinked perspective (Spiliotopoulou & Roseland, 2020).

2.8.7 Sustainability practices

There is a negligible difference between the concepts of sustainability, practices of sustainability and concepts of sustainable development, as these are all focused on advancing the economy, advancing development of populations and protecting the environment. Practices in agriculture are however more practical, with these being guidelines initiated from existing experiences that are deemed to be successful in agricultural production, which are then adopted over a time period to form additional strategies, concepts and theories (Haidar, 2021; Makate et al., 2017; Mohamad & Gombe, 2017). These guidelines are amongst others, best farming practices (BFP), good agricultural practices (GAP), sustainable agricultural practices (SAP), and many others from which applied strategies are derived.

To ensure that the income of smallholder farmers is sustainable, it is necessary to implement strategies that promote the application of any of the above practices, which include education, financial support, market access, technology and training (Ripley, 2017), as these are mostly sustainable. This study outlines some of the important

specific strategies in literature, that can be implemented and applied to support the income sustainability of smallholder farmers.

1. Education and training

Education in agriculture will provide smallholder farmers with the knowledge, skills, practical experience and resources necessary to adopt sustainable agricultural practices relevant to their farming activity, which may lead to increased crop yields, improved product quality, and higher income from agricultural production (Amadi & Adejoh, 2020).

2. Financial support

Financial support to smallholder farmers does not need to be direct only, in the form of grants, loans, and other financial instruments (Ripley, 2017). It can also be administered as forms of interventions, by other stakeholders with financial expertise, to handle such on behalf of farmers whilst ensuring their successful outcomes on among other things of such as food production and profitability, aver (Ripley, 2017).

3. Market access

Market access involves connecting smallholder farmers to buyers and diverse markets that can provide them with fair prices for their agricultural products. This can be achieved through the development of market linkages, which are networks that facilitate the exchange of information between buyer and seller value chains (Liverpool-Tasie et al., 2020). Market access should become the buzz word that irks smallholder farmers, as many of the enablers thereof are barriers to their market participation (Lantz, 2019). (Mburu, 2021), therefore, suggests the alternative use of market agents and brokers, who have influence in value chain and network access to markets.

4. Technology

The use of digital tools and technology can help smallholder farmers gain knowledge and information as well as adopt many beneficial technological advances and outcomes on many aspects of agriculture including smart-agriculture, conservation agriculture, capacity to adapt to climate change and other technology developments (Abdul-Razak & Kruse, 2017; Ngoma et al., 2021; Ntshangase et al., 2018).

The successful application of the above strategies can lead to successful implementation of many sustainable farming practices that can also help to improve

the efficiency, productivity and consequently income generation of smallholder farms, as well as preserving the environment and natural resources. The reverse is also true in that diverse and sustainable practices can result from improved farming income generation levels, and include the use of organic fertilizers and pesticides, cover crops, crop rotation, soil and water conservation and improved seed (Setsoafia et al., 2022).

2.8.8 Sustainable development or sustainability

The primary inference from the interrelatedness and connection between sustainability and sustainable development is that there exists a demand for all entities, including international governments, corporations, non-governmental organisations, and other interested parties, regardless of their size or location, to assume accountability for working together with the United Nations (McDonald et al., 2019). This collaboration aims to achieve economic success and provide solutions for food security that align with the objectives of sustainable development (Dörgő et al., 2018; Orzes et al., 2020).

Sustainable development and sustainability are two interrelated concepts that often get used interchangeably (Zeng et al., 2022). However, there are important differences between the two, especially when it comes to the potential income of smallholder farmers. This study touches on the difference of application between farming income of smallholder farmers under sustainable development and sustainability. Sustainable development is driven through a process that utilises agricultural assets as an investment income in the same process, further resulting in the continuity of farming operations (Grzelak, 2022).

This concept emphasises economic growth, technological progress and improved living standards, as well as environmental protection and social equity. It is typically associated with the idea of progress and can involve both human-centred and ecological approaches. As an economic concept, sustainable development typically focuses on maximising the benefits of work opportunities that are deemed decent as well as economic growth, while minimising the environmental and social costs, and is often used to refer to the development of renewable energy, clean technology and other green initiatives (Fonseca et al., 2020).

Sustainability, on the other hand, is defined as the ability to maintain a certain level of functioning with a continual process over time; with this concept typically associated

with environmental protection, as it emphasises the need to maintain or improve existing environmental conditions (Galdeano-Gómez et al., 2017). As a result, it also encourages the use of renewable resources, that conserve existing resources, and promote the efficient use of energy and other resources. When it comes to the potential income of smallholder farmers, sustainable development and sustainability differ in terms of their approach.

Sustainable development, including developments driven by communities, typically encourages the use of modern technologies, modernisation techniques and resource efficiencies to increase the productivity of smallholder farmers and improve their income (Spiliotopoulou & Roseland, 2020). This can include the use of improved seeds, crop and livestock management practices, and the adoption of new technologies. In addition, sustainable development focuses on creating economic incentives for smallholder farmers to adopt sustainable practices, such as subsidies, tax breaks, and other forms of government support.

Sustainability, on the other hand, focuses more on protecting the environment and preserving natural resources. This may include the use of traditional farming techniques and the incorporation of natural resources in production processes (Guth et al., 2020). It also emphasises the importance of diversifying sources of income and reducing reliance on monoculture farming. As a result, smallholder farmers may receive lower income due to the lack of access to modern technologies and techniques, as well as the need to invest in resources for conservation.

Traditional agriculture theory, learning theory, change theory, system sustainability theory, economic development theories and sustainability theories all play an important role in the farming income of smallholder farmers. These theories provide smallholder farmers with the knowledge and skills necessary to effectively manage their resources and land in a way that is both economically beneficial and environmentally sustainable.

2.9 EMPIRICAL LITERATURE ON SUSTAINABILITY OF GFI IN FS

The smallholder farmers in Free State carry out farming activities identified as part of the agricultural households that participated in the agricultural surveys of 2011 (Lehohla, 2013), and 2016 (Lehohla, 2016). These farming activities therefore highlight the fact that the agricultural households have contributed to the provincial

GDP, for example of 5% at R218 billion (2016) in Free State. The GFI is problematic in that it is not known, what value added contribution is made above GDP values, as well as either unknown or estimated on an ad-hoc basis when necessary.

The determinants of GFI are mostly driven by basic types of variables (Diaz et al., 2022; Emran et al., 2021; Noack & Larsen, 2019). Knowledge of these determinants in the field of smallholder farming need to be commonly shared so as to simplify the derivation of GFI. This will lead to benefits that can be experienced by the majority.

One important aspect of the empirical data is the corroboration of information from various sources (Ajayi, 2017; Armstrong, 2021; Babin et al., 2021; Kipping et al., 2014). This study collates information, sometimes referred to as data, or a combination thereof, from publications of government, corporate, regulatory bodies, societal and community organisations, such as annual reports, research articles and journals, magazines, newspapers, broadcasts, releases and other channels that share outcomes of ongoing studies.

2.9.1 Historical overview

Over the years, smallholder farmers in Free State have faced numerous historical challenges and continue to do so, from limited access to credit and capital, to a lack of access to markets and knowledge, to land tenure insecurity. Furthermore, academic literature has largely failed to recognise the gross farming income of smallholder farmers, instead focusing on the income of commercial farmers.

Black culture and traditionalism, backed among other things by an entrenched traditional agriculture (Sosibo & Dube, 2021), is strongly influenced by how different tribes carry out their lifestyles, with the loyalty to chieftainship that continues to be recognised, and the heritage of traditional religion which is still evident despite the influence of Christianity (Buthelezi et al., 2019). This is also due to the freedom in choosing which religious affiliation people belong to, an aspect with inherent influence in the manner of group behaviour, including linked agricultural practices (GCIS, 2002).

The current historical records state that, shortly after 1854, the Republic of the Orange Free State originated, after a range of power struggles and battles, between white settlers believed to be of British origin and the indigenous Black Africans, forced land

removals and invasions, exclusions and displacements of mainly the Basotho tribes, by these white settlers (Puukka et al., 2012).

2.9.2 The economy

By studying the socio-economic factors (Cockburn et al., 2019), that affect the sustainability of smallholder farmers in the Free State province, it is possible to gain a better understanding of the economic challenges they face (Kephe et al., 2022; Myeni & Moeletsi, 2020), and to identify potential solutions that could help to improve their livelihoods. In addition, the Free State province claims a number of government-assisted projects and, research and development initiatives that are focused on improving the livelihoods of smallholder farmers (FSDARD, 2018; Myeni et al., 2019b).

These initiatives include the Comprehensive Agricultural Support Programme (CASP), Ilima-Letsema (DAFF, 2019a) and, Poverty and Livelihoods Analysis System (PLAS) projects, which are projects aimed at providing financial and technical support to smallholder farmers and for the diversification and intensification of agricultural production (FSDALRD, 2021). These initiatives provide valuable opportunities to study the impact of, and also to implement government support on smallholder farmers as well as to identify best practices that could be adopted to improve their farming activities. Free State province is therefore, a vital study area for economic research into why gross farming income sustainability of smallholder farmers is necessary. where an audit raised serious queries against the Free State department of agriculture's assertion on the claimed and recorded number of already assisted small scale farmers (FSDARD, 2022).

An analysis of the current infrastructure and the state thereof can help to describe the underlying reasons for the current economic performance of the Free State as well as the degree of support that it can provide towards agricultural development initiatives (i.e. access to inputs, access to markets, and others).

Many of the Free State smallholder farmers depend on the income they derive from their farming activities for their livelihoods (FSDARD, 2019). Their smallholder farms are typically small in scale, but their impact on the overall economy of the Free State province has been proven to be significant. This study examines further how smallholder farm income can contribute to the overall economy of the Free State province, by considering similar studies from both academic and corporate sources.

Smallholder farms in the Free State province are responsible for a significant contribution to the provincial economy, made up of direct agricultural production, as well as indirect contributions such as the provision of jobs, the sale of agricultural inputs, and the generation of taxes. In addition, smallholder farmers are responsible for a significant share of the province's exports.

Smallholder farmers in the Free State also contribute significantly to food security in the province, with a large proportion of all food produced in the province coming from smallholder farms (FSDARD, 2019). Smallholder farms are also an important source of employment in the province. The transport sector plays a crucial support role in the provincial economy mainly due to the province's strategic geographic position. Utilisation of vast resources from the province puts the transport sector in an advantageous position as this will be a contribution from growth in other sectors like agriculture, manufacturing, mining and tourism.

Historically, the railway system was used as the primary means for the transportation of agricultural products. It is currently not managed properly and is ineffective in comparison with the road system, which has resulted in a lot of the focus shifting towards roads as the primary means of transportation; this has again resulted in the rapid deterioration in the condition of the roads in the province. The derelict condition of the roads, especially the secondary roads, prohibits people residing in the rural regions from ensuring easy and frequent access to input and product markets.

2.9.3 Smallholder farming

The process of transforming smallholder farming has been ongoing since its acknowledged existence (IFAD, 2013). Numerous research papers define smallholder farming as the practice that occurs on land measuring 2 hectares or less (WFP, 2019). This is due to the fact that approximately 475 million households worldwide reside and work on plots of land that are equal to or smaller than 2 hectares (Bank, 2016; FAO, 2015). In the South African literature and for the purpose of this investigation, smallholder farmers are classified as emerging, family, small-scale, resource-poor, peasant, and subsistence farmers (DAFF, 2012). These farmers do not belong to large-scale commercial white farms and may not include black-owned capitalist farms that generate substantial annual income for their owners (Okunlola et al., 2016).

However, what remains consistent is that smallholder farming plays a crucial role in achieving several sustainable development goals by 2030, and possibly all of these goals by 2050 (NDP). This study specifically concentrates on the aspect of income sustainability within the entirety of smallholder farming in South Africa, which is driven by GFI, and proposes factors that determine its success. The Free State (FS) Province possesses immense potential for agricultural development. Nevertheless, in order to attain a point of heightened agricultural productivity and economic prosperity for developing farmers, a variety of limitations or challenges must be addressed.

2.9.4 Gross farming income (a form of income)

There are multiple forms of farming income in literature, such as farm-level, gross cash farm, and farm household income (Hoppe, 2014). Although this study does not aim to quantify the exact extent of GFI required to mitigate the social issues mentioned in this investigation, its objective is to emphasise the importance of collating data concerning the income of smallholder farmers in South Africa, as this data is integral to the overall development, progress, and success of their farming operations and income sustainability.

There are strategies that should focus on enhancing access to various resources, including finance, knowledge, markets and promoting sustainable farming practices, which will assist in advance the farming income sustainability of smallholder farmers in the Free State province.

1. Improving access resources

Smallholder farmers often need help accessing essential resources such as water, fertilisers, and equipment. The provincial government can address this issue by facilitating access to irrigation schemes, subsidising the cost of inputs, and providing training on sustainable resource management.

2. Enhancing technical knowledge and skills

Smallholder farmers may need more technical knowledge and skills to optimise their farming practices. The Free State province can establish monitored programs and workshops to improve the capacity of small farmers in areas such as crop production, livestock management, post-harvest handling, and agribusiness management. Partnering with agricultural research institutions and universities can also provide cutting-edge research and technology access.

3. Promoting sustainable farming practices

Smallholder farmers need to adopt sustainable farming techniques in order to enhance productivity, conserve natural resources, and adapt to climate change. The provincial government can introduce incentives and subsidies for adopting conservation agriculture, organic farming, and green agriculture. Technical support and training on sustainable farming techniques, including soil and water conservation methods, should also be improved.

4. Strengthening market linkages

Access to commercial markets is critical for smallholder farmers' income sustainability. The Free State province can support and incentivise the establishment of farmers' cooperatives or associations to facilitate collective marketing and bargaining power. It can also assist in market research and development, value chain analysis, and branding to improve small farmers' market competitiveness. Furthermore, regulated initiatives to promote local procurement by government institutions and private sector companies can create more market opportunities for smallholder farmers.

5. Facilitating access to finance and insurance

Funding access is a significant constraint for smallholder farmers. The provincial government can collaborate with financial institutions to develop tailored financial products for small farmers, such as microcredit, agricultural loans, and crop insurance. Additionally, innovative financial literacy and business management training programs can empower farmers to manage their finances better and make informed investment decisions.

6. Strengthening extension services

Extension services are crucial in disseminating knowledge and providing technical assistance to smallholder farmers. The Free State province can invest in strengthening its agricultural extension services by recruiting and training more extension officers from the groups of smallholder farmers themselves. These officers can provide regular on farm visits, conduct training sessions, and facilitate farmer-to-farmer knowledge exchange networks.

2.9.5 Unemployment

In recent years, there has been a slow and declining economic activity worldwide (Bank, 2020). This has been further exacerbated by the Covid-19 pandemic, which

has negatively impacted the global economic growth, particularly the gross domestic product (GDP). As a result of this, there have been significant job losses, estimated to be around 400 million jobs as of June 2020 (UN, 2020).

In Southern Africa, where approximately 70% of the population depends on the agricultural industry for food and income, the impact has been particularly severe (ECA, 2020). Not only is smallholder farming already facing sustainability challenges and declining (Aaron, 2012; Vink & Van Rooyen, 2009), but the Covid-19 pandemic has further worsened the situation. The employment numbers in the industry have already been declining over the years, and smallholder farming is seen as a potential solution to address high unemployment and poverty levels (DAFF, 2014), smallholder farming is expected to help turn this tide for the better, and to a larger extent help people out of high unemployment and poverty levels.

The challenges faced by the Department of Agriculture and Rural Development (DARD) are further compounded by high rates of unemployment, lack of access to basic amenities, poor infrastructure and services, low literacy and skills levels, and rural to urban migration (among other factors), (DAFF, 2014). To address these challenges, there is a need for a community centred and people focused approach (DAFF, 2014).

2.9.6 Food insecurity

Food insecurity, or the lack of regular access to nutritious and sufficient food, is a major concern for many developing countries (WHO, 2020). Addressing food insecurity, unemployment, income inequality, and poverty requires an integrated approach, as they are interlinked and have a mutual impact (Hoffmann, 2011). Countries, including South Africa, have already committed to the Sustainable Development Goals (SDGs) of the United Nations (Resolution, 2015), and it is essential for the authorities at the country level to adopt solutions aligned with the SDGs (Hoffmann, 2011; Vink et al., 2009).

Although the South African government faces challenges in implementing targeted developmental programs, the National Development Plan (NDP) remains crucial in achieving important developmental goals (Ndokweni et al., 2017). South Africa currently ranks 110 out of 193 countries in terms of SDG progress (Sachs et al.). In Free State, South Africa's "bread basket" province, around 53% of the population

experiences food insecurity (World Data Lab, 2021). This is higher than the global average rate of 32.62% for a population of 7.8 billion people (World Data Lab, 2021).

Addressing food insecurity and poverty requires leveraging the potential of the agricultural sector, particularly smallholder farming, despite its recent decline (Shackleton, 2019). The South African government aims to eliminate poverty by 2030 and sees the increase in the number of smallholder farmers as a strategy to achieve this goal (NDP, DAFF 2013). Farming is seen as a means of generating revenue and alleviating poverty, with 6% of South Africans engaging in agricultural activities to earn extra income (Vink et al., 2009). However, for smallholder farming to be successful in poverty reduction, the government needs to prioritize revenue generation alongside food security and introduce interventions to increase the participation of households in agricultural activities (GHS, 2019).

2.9.7 Poverty

The SA national and provincial branches of government, including Free State, have in their list to address the SDGs, an aim to eliminate poverty by the year 2030 (NDP). One of the strategies the SA government intend to use is to increase the number of smallholder farmers (NDP, DAFF 2013). It is because farming is generally associated with revenue generation, which can alleviate some forms of poverty. This is part of the reason that 6% of South Africans engaging in some form of agricultural activity do so in order to earn extra income (Vink et al., 2009). For smallholder farming to be successful, the government has to recognise that revenue generation is as important as food security. It should introduce interventions that grow participation of SA households in agricultural activities from 15.3% (Stats SA, 2020c), to a higher value that can impact on poverty levels, among other economic challenges.

2.9.8 Education

The University of the Free State, established in 1904, is located in Bloemfontein (Puukka et al., 2012). There are also a number of secondary level schools dedicated to agricultural teaching, in the province. Agricultural education is crucial in providing smallholder farmers with the necessary knowledge and skills to improve their farming practices (Tamako et al., 2022) and increase their income sustainability. In the Free State province context, where agriculture is a critical economic sector, implementing appropriate agricultural education strategies is essential to support the development of smallholder farmers.

According to the South African Yearbook 2021/2022 (Mokoena, 2022), the Free State province is known for its agricultural production, particularly in maize, wheat, sunflower, and livestock. However, smallholder farmers in the province face numerous challenges, including limited access to resources, inadequate knowledge and skills, and the impact of climate change. Agricultural education need to be inclusive and prioritised in order to overcome myriad challenges and enhance income sustainability.

One approach to agricultural education is the customised development of training programs that address the specific needs of smallholder farmers. These programs should provide practical knowledge and skills in crop production, livestock management, agribusiness, and sustainable farming practices. Equipping smallholder farmers with these skills can improve their productivity, optimise resource utilisation, and improve their capacity to adjust to unpredictable climatic conditions. Additionally, training programs should incorporate financial literacy and business management to empower farmers to make informed decisions about their farming operations and enhance their income sustainability.

Educational institutions have an essential role in implementing agricultural education strategies. According to Puukka (2012), higher education institutions have a social responsibility to contribute to regional and city development. In the Free State province context, universities and agricultural colleges can collaborate with government departments and agricultural organisations to deliver relevant agricultural education programs. These institutions can provide short courses, certificate programs, and degree programs tailored to the needs of smallholder farmers. Furthermore, they can establish research and extension programs to study and disseminate best agriculture practices, promoting innovation and knowledge transfer in the sector.

It is essential to consider the needs of smallholder farmers in the Free State province, ensuring the effectiveness and inclusivity of agricultural education strategies. Various stakeholders, including government, higher education institutions, agricultural organisations, and smallholder farmers, require collaborative efforts. By implementing appropriate agricultural education strategies, the Free State province can empower smallholder farmers to improve their income sustainability, contribute to agricultural development, and achieve food security and economic growth.

2.9.9 Income sustainability

There is a necessity for enhanced sustainability in the revenue earnings of smallholder farmers, in order to circumvent vulnerability to heightened levels of poverty, which continue to affect an estimated 1.4 billion individuals globally (IFAD, 2013). Income disparity, joblessness, and food insecurity are the additional obstacles identified by the United Nations (UN) member states as immediate dangers to achieving the specified objectives of the 17 Sustainable Development Goals (SDGs), which are geared towards creating a more prosperous and inclusive world (UN 2020, NDP).

The 20 actions outlined by the Food and Agriculture Organisation (FAO) in 2018 emphasize interconnected solutions aimed at expedited progress towards achieving the SDGs, and meeting specified targets with tailored solutions to individual problems, as evidenced by the 8.2% failure measured in 2019, to achieve poverty eradication efforts by 2030 (UN, 2020). Integrated solutions have a favourable likelihood of accelerating the problem-solving process (FAO, 2018a), thereby advancing progress (FAO, 2018a). This investigation follows a similar approach. The five interrelated objectives of this study pursue the continuous productivity goal of many small-scale farmers towards developing sustainable solutions that ensure sustained gross farming income.

Smallholder farming income sources are diverse and include revenue from general farm production, diversified on-farm and off-farm earnings, informal trader sales, asset-based services, and social grants among others (Loeper et al., 2018; Popoola & Yusuf, 2021; Rapsomanikis, 2015). Most of these income sources present various challenges for smallholder farmers and are linked to structural and behavioural factors (Jayne et al., 2010).

These challenges encompass inconsistency in revenue streams, where a smallholder farmer may deliver produce that meets quality standards in one year but fails to replicate the same success in subsequent years, resulting in losses. Moreover, these challenges mean that although smallholder farming income is acknowledged, it is generated and documented in a manner that fails to incentivise the majority of smallholder farmers to comprehend its value, magnitude, and true impact in the agricultural sector. Rectifying this oversight would lead to improved and more sustainable income possibilities for smallholder farmers in South Africa (SA). Erratic income recognition is therefore at the core of what is perceived to be the failure and

income challenges faced by many smallholder farming ventures, particularly in SA, where increased investment in smallholder farming would yield superior and enduring success (von Loeper et al., 2018).

Three crucial factors have been identified in the aforementioned literature. Firstly, 6% of farming income earned by households engaged in agricultural activities is derived from non-farm sources. Secondly, many farmers are unaware of the potential impact gross farming income can have on their entrepreneurial prospects due to inadequate recordkeeping. Often, it is as if this income does not exist at all. Finally, smallholder farming is not recognised as a business.

2.10 CONCEPTUAL FRAMEWORK OF SUSTAINABILITY INDICATORS

FAO (2015) suggests that the economic development process greatly influences the evolution of smallholder farms in terms of production and economics. These aspects also extend to the environmental and social aspects, as economic progress cannot occur at the expense of these interconnected factors. There is a global set of indicators available for measuring industry sustainability (Hurni et al., 2009), although some countries have chosen to customise indicators to suit their specific needs (Elliot, 2013). In South Africa, a country report has been developed that includes relevant indicators for tracking progress towards the 17 SDGs (Stats SA, 2019b). This allows industry players to tailor sustainability frameworks to their specific requirements.

SDG 1 (eradicating poverty), SDG 2 (eliminating hunger), SDG 8 (promoting decent work and economic growth), and SDG 10 (reducing inequalities) are connected to the theory of sustainable development. Various studies have supported the idea that farm income is a key indicator of sustainability in agriculture (Van Pharm et al., 2014). However, at the smallholder farm level, the selection and use of indicators can be less complex and different from higher tiers.

The theoretical framework presented in this study addresses the issue of measuring gross farming income for smallholder farmers in FS. It takes a systemic approach (Harris, 2000) to measure the sustainability of income in smallholder farming, considering economic, environmental, and social indicators. This approach contributes to theoretical knowledge (Grunwald in Enders et al., 2014). The application of these three pillars to smallholder farmers at the income earning level has not been previously explored, making this study a valuable addition to the literature. At a

broader level, this systems approach simplifies the study of different systems or formats (von Braun et al., 2021). Indicators are used to demonstrate measurable changes (Elliot, 2013). In the context of sustainability, indicators align with industry-related metrics, variables, and determinants in agriculture, reflecting its multidimensional nature (Shipman et al., 2016).

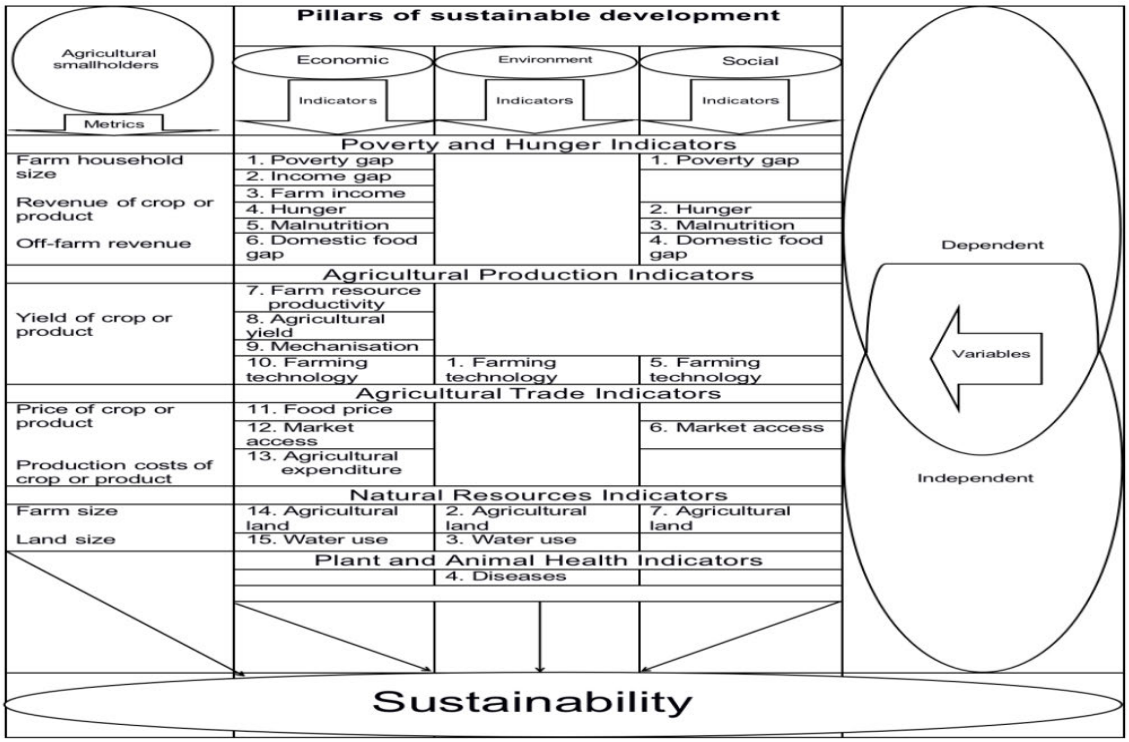
Therefore, this framework highlights the interrelationships between these factors in promoting income sustainability for smallholder farmers. This study utilised a minimum of 26 agricultural sustainability indicators (Olubode-Awosola et al., 2008), incorporating at least 15 economic, 4 environmental, and 7 social indicators, all derived from existing frameworks such as the OECD framework (OECD, 2004). OECD (2004), highlights the important of continuing development around the above linkages, where it proposes the development of further sustainability indicators at an international level, continued use, improvement and adaptation of the PSR model, as well as the need to structure the development of the indicators programmes to align to SD requirements. The framework used in this study to initiate an FS smallholders framework, as shown in figure 2.10.1, follows the above-mentioned proposal.

2.10.1 Conceptual framework smallholder sustainability indicators

The most basic model of gross farming income sustainability indicators framework that smallholder farmers in the Free State Province can implement includes indicators related to financial performance, environmental performance, and social performance. Financial performance indicators measure profitability, liquidity, and solvency. Environmental performance indicators measure environmental protection, stewardship, and resource efficiency. Social performance indicators measure quality of life, health and safety, and community development.

The GFI Sustainability Indicators Framework provides a comprehensive overview of the essential indicators necessary to facilitate the initiation, growth, and maintenance of smallholder farmers in the Free State Province of South Africa. The GFI Sustainability Indicators Framework aims to provide a basis for smallholder farmers to assess the financial viability of their farming operations and to identify potential areas of improvement. This framework is based on the core indicators of GFI and provides guidance on how these indicators can be used to measure and monitor the overall financial sustainability of a smallholder operation.

Figure 2.10.1: FS province conceptual framework for sustainability indicators



Source: Designed by the Author. Constructed with information from literature references: Olubode-Awosola, Chilonda, Minde & Bhatt 2008, Elliot 2013, Shipman, Soto, Mullan, González & Daniels 2016.

CHAPTER 3 RESEARCH METHODOLOGY

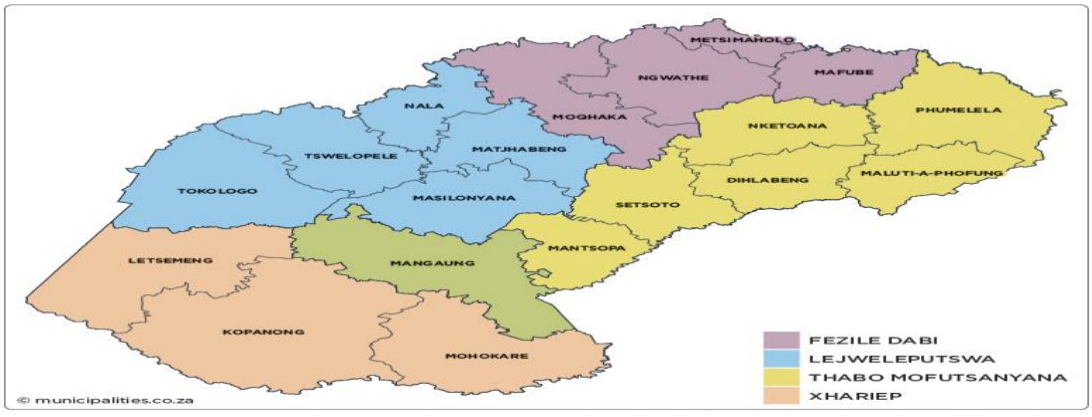
This chapter presented the mixed methods methodology that was used to address the research problem identified in this study, with the purpose of developing an in-depth understanding of the research problem, by using both quantitative and qualitative data outcomes (Creswell & Creswell, 2018; Kumar, 2019; Leavy, 2017). It starts with the study area background, thus setting the scene for the research.

3.1 RESEARCH STUDY AREA BACKGROUND

3.1.1 Free State province the study area

South Africa has nine provinces which were created in 1994 when the apartheid system was discontinued and replaced with a new democratic dispensation (Mokoena, 2022). These provinces followed the establishment of the new provincial legislatures as per the 1993 Interim Constitution of South Africa. They were given administrative powers and exclusive competencies over certain areas of governance. However, they report and are accountable to the national government. Relevant to this study are the legislative and executive powers over agriculture, exercised concurrently with the national government are of particular interest from a provincial context, related to matters of GFI generation for smallholder farmers in the Free State province (Figure 3.1.1).

Figure 3.1.1: Map of Free State Province



Source: https://municipalities.co.za/provinces/view/2/free-state

1. Location

The Free State Province share borders with six other provinces; namely Gauteng, North West, Mpumalanga, Eastern Cape, Northern Cape, and KwaZulu-Natal (Mokoena, 2022). The province covers an area of approximately 129,825 square kilometres. It has a population of about 2.92 million people. Free State has a predominantly rural landscape that consist mainly of agricultural activities, which made it an ideal study area for research on smallholder farming income. Smallholder farming plays a significant role in the province's economy, with many agricultural households relying on it as their main source of income (FSDARD, 2019). The province's agricultural landscape is also diverse. Its farmers cultivate crops such as maize, wheat, sunflowers, and sorghum In addition to livestock farming that include cattle, sheep, pigs, poultry and goats.

As a research study area, it is centrally located when compared to other provinces. A central location has the advantage of easier access to trade places locally and in other provinces, as well as the associated costs of travel, where required. With the primary study related to smallholder farming in the agricultural sector, the province positively meets the general criteria of housing many agricultural households (Stats SA 2016), and being one of the bedrock centres of agriculture in South Africa (FSDARD 2019). Hence, it provides a good opportunity for the application of the research outcomes of this study, implying that this research carries both aspects of theory and actual application.

The inhabitants of the province, in the different municipal areas, have shown a clear interest in agricultural research and its outcomes. For instance, the level of cooperation by the sampled respondents, who are classified as smallholder farmers, with the selected gatekeepers in this study was remarkable. The province offers great potential to support similar future types of research study undertaken, with the enviable number of schools, colleges and universities found in the province, especially those that have agriculture as part of their syllabi. As an area of research, this has the ability to elevate the province as the preferred research destination in the field of agriculture.

The Free State province of South Africa is an important study area for research into why GFI sustainability of smallholder farmers is necessary. The province is home to a large number of smallholder farmers who are essential to the economy, and provides

the majority of agricultural production in South Africa. The sustainability of their farming activities is of paramount importance to the country's food security and rural livelihoods.

This study has looked at the importance of the Free State province by researching the gross farming income sustainability of smallholder farmers, by considering the socio-economic and environmental factors that have a direct impact on their livelihoods. The province is home to arguably the majority of South Africa's smallholder farmers, who are also responsible for a major part of agricultural production in the country. They are engaged in a wide range of activities, including crop and livestock production, and the sale of products such as maize, groundnuts, sorghum, and wool.

These activities are essential for providing food and income for their families and for contributing to the country's economy. As (Sihlobo & Qobo, 2021) strongly argues, there is a clear failure by the democratic government to uplift smallholder farmers, who are mainly Black, despite the legislative powers it enjoys at national, provincial and local government levels. This study implores the government, to use its legislative authority, to recognise the need to support necessary models and frameworks such as the advancement of gross farming income for smallholder farmers, to ensure achievement of relevant sustainable development goals.

3.1.2 Geography, climate and the environment

The Free State province is an essential area geographically as it has a wide range of environmental conditions that are agro-ecological (Adisa et al., 2018). There are also semi-arid and arid areas; which means that some areas have slight rain and those without any significant amounts of rain (DAFF, 2018). There are also areas of high-rainfall and those with unfavourable temperate and climate conditions. This diversity of conditions provide researchers with a unique opportunity to study the impact of climate change and how smallholder farmers can play a varied role in farming activities related to these environmental factors, in the following district municipal areas of Free State:

1. Fezile Dabi

The Fezile Dabi District Municipality is in the southern part of the Free State province, covers an area of approximately 16,468 square kilometres and has borders with the Northern Cape province to the west, the Lejweleputswa District Municipality to the

north, the Mangaung Metropolitan Municipality to the east, and the Thabo Mofutsanyana District Municipality to the south (FSDARD, 2019; Puukka et al., 2012).

Figure 3.1.2 (1): Map Fezile Dabi District Municipality



Source: https://municipalities.co.za/provinces/view/2/free-state

Geographically, the authors highlighted that Fezile Dabi district has diverse landscapes, agroecological conditions, and a mix of flatlands, rolling hills, and river valleys. The district's western part falls within the arid and semi-arid areas of the Free State province. This region also has low rainfall, sparse vegetation, and dry riverbeds. Agriculture in these areas is primarily limited to livestock farming, as the arid conditions are not conducive to crop cultivation. The Fezile Dabi district has several major rivers, including the Vaal River and its tributaries. These rivers provide essential water resources for both agriculture and human consumption. The Vaal Dam, located within the district, is one of South Africa's largest dams and is crucial in supplying water to the Gauteng province.

Furthermore, the district has several towns and rural settlements, including Sasolburg, Parys, and Viljoenskroon. These towns have served as commercial and administrative centres for the surrounding agricultural communities. In recent years, there has been a growing focus on tourism in the district, with attractions such as the Vredefort Dome, a UNESCO World Heritage Site, which draws visitors from far and wide. In contrast, in the eastern part of the district, the area experiences a higher annual rainfall. This region has a more favourable temperate climate and fertile soils, thus making it

suitable for various agricultural activities. Crop farming, mainly maize and wheat, is common in these areas, and the district is known for its grain production. Agriculture in Fezile Dabi is diverse and has a main focus on crop production, livestock farming, and irrigation farming along the river valleys.

Maize, sunflower, wheat, and soybeans are the main crops grown in this district. Livestock farming include cattle, sheep, goats, and poultry. The district is also known for its intensive irrigation farming along the Vaal and Orange River systems, producing citrus fruits, vegetables, and lucerne. Empirically, agriculture can play a major role in the economic development of this district municipality, and can grow its contribution higher than the current 12% (Municipality & District, 2022), if the advancement of smallholder farmers' programmes are supported.

2. Lejweleputswa

As (FSDARD, 2019) reports, the Lejweleputswa District Municipality is in the north-western part of the Free State province and covers an area of approximately 29,582 square kilometres and shares borders with four other districts, the Fezile Dabi District Municipality, the Thabo Mofutsanyana District Municipality, the Dr Ruth Segomotsi Mompati District Municipality in the North West province, and the Northern Cape province to the southwest (StatsSA, 2021). Geographically, the Lejweleputswa district also has a mix of semi-arid and arid environments.

Figure 3.1.2 (2): Map Lejweleputswa District Municipality



Source: https://municipalities.co.za/provinces/view/2/free-state

Furthermore, the district's western part falls within the Kalahari Desert, a vast, sandy desert region known for its dry and hot conditions (Nicholson, 2005). The presence of the Kalahari Desert in this district limits agricultural activities to livestock farming, as

the dry conditions are not suitable for crop cultivation. Towards the eastern part of the district, the terrain is diverse, and is hilly and has mountainous areas. These areas receive slightly higher rainfall and have more fertile soils, making them suitable for limited crop farming and horticulture. However, water is scarce and remains a challenge in some parts of the district, with these rivers and dams being the primary water sources for agricultural and domestic use.

The Lejweleputswa district has several towns and smaller settlements, including Welkom, Odendaalsrus, and Virginia. These towns are known for their mining activities, particularly gold mining, which has been a significant economic driver in the region for many years. In recent years, the district municipality has tried diversifying the economy by promoting tourism, agriculture, and manufacturing. The district's name follows the predominant languages spoken in the area; namely Sesotho and Setswana. Geographically, Lejweleputswa is characterized by flat to undulating plains, with scattered hills and koppies (small hills), in certain areas.

The Vaal River, one of the major rivers in South Africa and forms the district's southern border which provides a vital water supply for both agricultural and domestic use. The district has three local municipalities, Matjhabeng, Masilonyana, and Nala. Matjhabeng is the largest municipality houses the city of Welkom, which is a major economic centre in the Free State province. Since the gold rush in the 1940s, Welkom has existed and is still a gold mining area with related industries. Agriculture in Lejweleputswa focuses predominantly on crop production, with maize being the main staple crop. Other crops cultivated in the district include sunflower, wheat, potatoes, and various vegetables. Farmers in the area also practice livestock farming, particularly cattle and goats. The area hosts successful agricultural shows and auctions attracting large number of visitors annually, impacting economic activities positively in the region (Mokoena, 2022).

3. Mangaung Metropolitan

The Mangaung Metropolitan Municipality is located in the eastern part of the Free State province and is the capital of the province (FSDARD, 2019). It covers an area of approximately 6,327 square kilometres and is bordered by the Lejweleputswa District Municipality to the west, the Thabo Mofutsanyana District Municipality to the east and south, and the Northern Cape province to the south.

Figure 3.1.2 (3): Map Mangaung Metropolitan Municipality



Source: https://municipalities.co.za/provinces/view/2/free-state

Geographically, the Mangaung Metropolitan Municipality has a diverse range of landscapes and agroecological conditions. The southern part of the municipality falls within the Maluti Mountains, a mountain range that forms part of the eastern escarpment of the country. The mountains are characterized by rugged terrain, deep valleys, and high peaks, providing a picturesque backdrop to the region. This area experiences a cooler climate and higher rainfall than the rest of the municipality, making it suitable for livestock farming and limited crop cultivation. The northern part of the municipality consists of rolling grasslands and savannahs, with a more semi-arid climate.

Agriculture in these areas mainly focuses on livestock farming, particularly cattle and sheep. The municipality has several rivers, including the Modder River and the Caledon River, which provide water resources for agriculture and human consumption. The Mangaung Metropolitan Municipality is home to the city of Bloemfontein, the judicial capital of South Africa, and several smaller towns and settlements. Bloemfontein serves as a significant commercial and administrative centre for the region, with a diverse economy that includes finance, manufacturing, and retail sectors. The city is also known for its educational institutions, including the University of the Free State. Lastly, the Mangaung Metropolitan Municipality, situated in the central part of the Free State province, is unique as it encompasses both urban and rural areas.

It covers an area of approximately 3,347 square kilometres (StatsSA, 2021) and includes the city of Bloemfontein, the provincial capital of the Free State.

Geographically, Mangaung has flat to gently undulating plains, with scattered hills in certain areas. Agricultural land surrounds the municipality, with farming activities extending into the city's outskirts. The Klip River, a tributary of the Modder River, runs through the municipality, providing some water resources for agriculture and recreation.

In terms of agriculture, Mangaung has limited agricultural activities compared to other rural districts in the province. However, there are pockets of agricultural land on the city's outskirts where crop and livestock farming occur. The municipality also promotes urban agriculture initiatives to encourage food production within the city boundaries.

4. Thabo Mofutsanyana

The Thabo Mofutsanyana District Municipality is in the south-eastern part of the Free State province (FSDARD, 2019). It covers an area of approximately 28,470 square kilometres and shares municipal boundaries with four other districts, the Fezile Dabi District Municipality to the north, the Mangaung Metropolitan Municipality to the west, the Eastern Cape Province to the south, and the Kingdom of Lesotho to the east. Geographically, the Thabo Mofutsanyana district has a mix of highland and lowland areas. The district is located in the eastern part of the Free State province and borders Lesotho to the east. It covers an area of approximately 23,315 square kilometres (StatsSA, 2021) and has three local municipalities, Maluti-a-Phofung, Setsoto, and Phumelela.

Figure 3.1.2 (4): Map Thabo Mofutsanyana District Municipality



Source: https://municipalities.co.za/provinces/view/2/free-state

The Maluti Mountains dominate the landscape of Thabo Mofutsanyana, which runs along the district's eastern border. These mountains form part of the Drakensberg mountain range and are known for their dramatic cliffs, deep valleys, and snow-capped peaks in the winter months. The high altitude of the mountains contributes to a cooler climate in this area compared to the rest of the province. The district also includes the eastern parts of the Golden Gate Highlands National Park, which has sandstone cliffs, rolling grasslands, and diverse flora and fauna. It makes it a popular tourist destination for hiking, wildlife viewing, and scenic drives.

In terms of agriculture, Thabo Mofutsanyana is known for its fertile soils and favourable climate for crop production. The district is one of the province's significant producers of maize, wheat, and sunflower. Livestock farming, notably sheep and cattle, is also prevalent. The abundance of natural resources, such as water from the Lesotho Highlands Water Project, further supports agricultural activities in the district.

5. Xhariep

The Xhariep District is in the Free State province, encompassing an extensive area with diverse agroecological conditions. According to the SA Yearbook 2021/2022, the Xhariep District is an important geographical region within the province. The district covers a large area within the province, with various agroecological conditions. It means that the district experiences different environments and climates. These environmental patterns does greatly affect the agricultural activities that take place in the area.

Figure 3.1.2 (5): Map Xhariep District Municipality



Source: https://municipalities.co.za/provinces/view/2/free-state

One of the critical features of the Xhariep District is its agricultural potential. The district has a significant amount of arable land, which makes it favourable for farming activities. The agricultural sector plays a crucial role in the district's economy, contributing significantly to the province. In terms of livestock farming, the Xhariep District is known for its extensive sheep farming and game farming enterprises. These industries take advantage of the district's vast open spaces and natural resources. Livestock farming is a vital part of the district's agricultural sector, providing employment opportunities for local communities.

Apart from agriculture, the Xhariep District is known for its natural beauty and recreational activities. The district has several nature reserves, attracting tourists and nature enthusiasts. These reserves offer opportunities for outdoor activities such as hiking, camping, and wildlife viewing.

It is the largest district in the province, yet it has the lowest population density. According to the 2011 census, Xhariep has an estimated population of 146,259 people, with the majority falling into the young age category. The district has a relatively small elderly population, constituting of only 5% of the total population. The gender composition has remained constant since 1996, with females making up 50.8% of the total population. There are 45,368 households in the district, with an average household size of 3.2 people. Xhariep also faces significant challenges in terms of unemployment, with a high unemployment rate of 26.8%.

The region around Koffiefontein is well-suited for the production of various crops such as cotton, pomegranates, olives, persimmons, watermelons, cantaloupes, cactus pears, lucerne, pistachios, almonds, squash, pumpkins, and potatoes. Zastron and Dewetsdorp are suitable for the production of Cenchrus Cilliaris. Smallstock farming, the rearing of small livestock, is also prevalent in Xhariep due to its arid conditions.

Despite its agricultural potential, Xhariep is one of the poorest municipalities in the Free State Province. The district struggles with high levels of unemployment and poverty. There are currently efforts to address these issues. The Department of Water Affairs has initiated a project to expand the Jagersfontein/Fauresmith area's water supply to promote economic productivity. The Industrial Development Corporation is also exploring the possibility of utilising the Xhariep area for sustainable energy production, particularly in biogas or "green energy."

There are ongoing efforts to promote cash crop cultivation in Xhariep, with maize, beans, and potatoes. AGRI-SA, an agricultural organisation, actively encourages small maize growers in black areas to increase production. The district has good transportation infrastructure, with excellent road connectivity (N1), and railway connections. Land reform acquisition projects are also taking place to the south of the area. Xhariep has a reliable water supply from the Xhariep Dam. There is also an enterprise area designated for wooled sheep production. However, the area is not suitable for cultivation but is well-suited for abattoir operation.

3.2 RESEARCH PARADIGM

There is a choice of philosophies a research study can follow, namely; constructivism, positivism and pragmatism. Although constructivism and positivism are regarded as the main philosophies, this study applied the pragmatist philosophy. Philosophies are also known as paradigms, i.e. methods and techniques of better understanding social phenomena (Kumar, 2019).

3.2.1 Positivism

Positivism as a form of philosophy mostly in research studies, focuses on factors that can easily be explained and are also predictable (Park et al., 2020). It originated **in** the natural sciences, and researchers use it to focus on empirical data and measurable facts. Many researchers assert that positivism can objectively study the world's reality outside the researcher in the same way as natural science, and on the premise that the method observes the exact natural science. It stipulates that reality and truth are verifiable through scientific protocols and methods, meaning that knowledge uses observation in external reality rather than conjecture.

3.2.2 Constructivism

Constructivism is another philosophy that presents knowledge that is socially constructed, resulting from the interaction of various actors (Lyons & Bandura, 2019). It therefore assumes the use of metaphors and abstractions to understand the world's way and that knowledge and reality only make sense when interpreted in a social context. Constructivism emphasises qualitative methods such as questionnaires, interviews, and observations, which can detail the beliefs, values, and norms that form part of investigations.

3.2.3 Pragmatism and its application

Pragmatism embraces various research approaches that focus on the practical implications of results rather than simply providing explanations (Kaushik & Walsh, 2019). Its main principle is that knowledge results from purposeful interactions with our environment, and studying the consequences of these interactions yields the most helpful information. Rather than sticking to one method, pragmatic research uses a wide range of methods (Hodeib, 2021), including case studies, participant observations, and surveys, to find viable solutions to research questions. Pragmatism also encourages researchers to assess their ethical and moral implications of their research projects (Barlow, 2022) and therefore recognise the potential impact of the results on public policy and social structure.

The three approaches outlined, positivism, constructivism, and pragmatism, provide a distinctive lens through which to interpret data and reach conclusions (Creswell & Creswell, 2018). While positivism and constructivism are theoretically at odds, the fact remains that the combination of the two can yield more significant insights than either approach would individually. The holistic approach that pragmatism provides strives to offer solutions to the research question and to understand the implications of the conclusions reached. Ultimately, choosing the appropriate philosophy or paradigm to carry out a research study which depends on the research objectives and the type of data collected.

This study applied a theory of sustainability to propose how farming income of smallholders can become more sustainable. A pragmatist paradigm, which is aligned to the mixed methods approach of research was utilised, as it does not align fully with either of the two other philosophies. It stands in the middle of and allows pluralism of both the quantitative (positivism) and the qualitative (constructivism) frameworks to be tested in a social research (Magalhães et al., 2022).

A pragmatist paradigm is an approach to research that focuses on understanding the practical consequences of a particular phenomenon or behaviour and social norms (Pouryousefi & Freeman, 2021). This paradigm is often used in studies that involve the understanding of real-world application of theory or research. In the context of a research study of smallholder farmers, income sustainability efforts in the Free State Province of South Africa, a pragmatist paradigm was applied to explore the practical

effects of initiatives and interventions that are being implemented to improve the income of smallholder farmers.

Pragmatism philosophy encourages a holistic understanding of smallholder farmers' needs and constraints. It, therefore, recognises that various social, economic, and environmental factors influence farming income generation. By adopting a mixed methods approach, researchers can gather quantitative data (e.g., income levels, household expenditure patterns) and qualitative data (e.g., interviews, focus group discussions) to understand the farmers' context. This comprehensive understanding enables the development of targeted and effective interventions to address smallholder farmers' specific challenges.

Secondly, pragmatism philosophy emphasises the importance of action and experimentation. This philosophy encourages researchers to go beyond theoretical analysis and engage with farmers to co-develop and test potential income-generation strategies in smallholder farming.

The use of pragmatism philosophy in mixed methods research allowed the researcher freedom to simplify the process of advancing a GFI sustainability indicators framework, as it provided a comprehensive and practical approach to address the complexities and challenges the smallholder farmers face (Creswell & Creswell, 2018). Many stakeholders that aim to provide various solutions, including income generation, to smallholder farmers in FS and other parts of Africa must engage with farmers comprehensively (Ehui, 2016). Conversely, pragmatists can carry out more in-depth and essential farm-level engagements, eliminating the complexities created by inflexible philosophical approaches in other studies (Simpson, 2018).

3.3 RESEARCH APPROACH

Deductive and inductive approaches to research are commonly used, depending on whether an existing theory is being tested (deductive), or a new theory is being developed (inductive). This study followed a deductive approach, in that, from the general sustainability theory as applied, it compared and analysed the understanding of the respondents, through questionnaires and then related the empirical data, to deduce whether the farming income of smallholders in the Free State is measured and sustainable. The deductive approach is normally used with the positivist philosophy, but can also be applied where qualitative research techniques are used, as in this

study (Kumar, 2019). The deductive approach followed determined smallholder farmers' different realities of generating gross farming income through objectively sought evidence (Creswell & Poth, 2016).

The researcher used existing knowledge from similar studies by identifying the main variables influencing smallholder farmers' ability to generate farming income. However, many need to focus on the sustainability aspect. These variables included factors such as access to land, access to financial facilities, level of education, availability of market opportunities, and the adoption of modern agricultural techniques. Based on these antecedent factors, the researcher developed a set of detailed questions that were further customised to objectively predict the relationships between these variables and the gross farming income of FS smallholder farmers.

Next, the researcher designed a research framework and planned to collect data that allowed further analysis, further using this research design on its appropriateness to engage the farmers within a short period spanning four months. It was generally conducive seasonally, shortly after the winter months.

3.4 RESEARCH DESIGN

Every scholarly investigation necessitates a plan and a structure known as a research framework (Leavy, 2017). It encompasses formulating a tactical approach to explore a research inquiry or tackle a research problem in order to derive valid and satisfactory solutions (Kumar, 2019), as is the case in the current study where the focus is on a lack of sustainable farming income of smallholder farmers. In mixed research methods, the research designs prioritise either sequence, nesting or integration of the data collected in a research study (Leavy, 2017).

3.4.1 Convergent design

This study selected the convergent design as it was the most appropriate in formulating the research framework, plan and structure that allows smallholder farmers in the Free State province to query how their farming activities generate the revenues sustainably. It followed design typologies suggested in (Leavy, 2017), which aligned with mixed research methods. In a convergent design, data from qualitative and quantitative sides brought together provides a more holistic view of farm levels of research issues (Leavy, 2017).

The study design strategy aimed to integrate qualitative and quantitative data collection and analysis within a single study to increase the overall understanding of the research topic. This design was instrumental when the researcher identified some complex phenomena that resulted in multiple and diverse perspectives; such as, there were contrasting views on interpreting the POPI act by the Department of Agriculture officials to plan the sample reach of smallholder farmers needed to participate in the research.

The design plan started with the researcher conducting a literature review to gain insights into the existing knowledge and theories of smallholder farming income problems. This step allowed the study to confirm that existing farming income indicators frameworks for smallholder farmers are not readily available in the literature, especially from a FS province perspective. Furthermore, those available focus more on farming production than on income sustainability. The convergent design planned steps, as suggested by (Leavy, 2017), indicated an inclination towards integrating quantitative and qualitative data, in line with typologies highlighted in earlier in this study.

Planning envisaged a representative sample of smallholder farmers that could quantitatively and qualitatively rate and rank any existing farming income generation strategies that had been employed in farming activities and whether these strategies had any economic impact on their living conditions. The convergent design anticipated combining the qualitative and quantitative data for a comprehensive analysis and contrasting this data to identify convergence, discrepancies, or whether it is complementary. For example, quantitative findings on the importance of agricultural qualification could support outcomes in qualitative data showing a higher income among farmers with this form of qualification.

The convergence design in qualitative and quantitative outcomes helps to strengthen the validity and reliability of a study. It enhances the understanding of the research problem, advancing GFI in FS. In line with (Leavy and Creswell et al.), and to effectively employ convergent design, the researcher followed a systematic process that involved several key steps:

Identified the main research question or problem: The researcher started by clearly defining the overall research question or problem to investigate. This guided the entire convergent design process.

Identified detailed research questions: The researcher formulated specific research questions that addressed the study's objectives. In this study, questions focused on understanding the current sources of gross farming income for smallholder farmers, the challenges they face in sustaining income, and the potential strategies they can adopt to improve their income generation.

Conducted initial literature-based research: The researcher gathered background information and conducted preliminary research to understand the current state of knowledge in the field of study. It helps identify existing theories, models, or frameworks to adapt as a reference point.

Selected relevant research methods: The researcher chose appropriate research methods to gather appropriate data based on the main research question and the available resources. This study uses quantitative and qualitative methods, with questionnaires and interview sheets. Collected and analysed data: The researcher collected data using the selected methods. This study involved completing questionnaires and conducting semi-structured interviews that were in line with the approved ethical considerations application. The data is then analysed using appropriate quantitative and qualitative analysis techniques.

Generated research insights: Based on the analysed data, the researcher generated insights that responded to the research problem and coalesce findings which identified patterns, themes, or relationships.

Drew conclusions and made recommendations: The researcher concluded the study and made recommendations based on the coalesced findings. It involved proposing a new framework or model of reference that guides smallholder farmers on essential indicators for a sustainable gross farming income.

Communication and sharing of findings: The study will share the outcomes with relevant stakeholders, including the participant smallholder farmers, the academic community, industry practitioners, policymakers and other relevant players, in line with UKZN's publications policies. Results from the research findings can be used to enhance social transformation in the business of smallholder farming.

3.4.2 Sequential design

Sequential designs, namely, explanatory and exploratory sequential designs, use a time related order, where the data collection from either a qualitative or quantitative method can precede the other (Creswell & Creswell, 2018). The explanatory design explains quantitative data findings using qualitative data outcomes, whilst the

exploratory design uses the qualitative data findings to develop relevant instruments to use in a quantitative method of research (Creswell & Creswell, 2018).

3.4.3 Nested design

The nested design uses one of the two methods, qualitative or quantitative, as the primary method (Leavy, 2017). This design also integrates qualitative and quantitative methods, allowing researchers to complement and triangulate their findings. This integration can occur at different levels. It can use qualitative data to inform the design and interpret quantitative data or to validate and test the findings from qualitative data.

3.4.4 Integration design

Where the two methods of data collection require a form of integration, then these are merged in order to compare or do a cross-validation of the findings. In this case, the design is known as a convergent or concurrent design (Creswell & Creswell, 2018; Leavy, 2017), which, as in this study, merges the quantitative and qualitative data that is collected, to derive final findings.

A comprehensive analysis of the identified research problem can be achieved through the use of a resultant convergent mixed methods design, which combines merged information (Creswell & Creswell, 2018). This design is particularly relevant and important to this study as it incorporates research assumptions and procedures, as well as themes that are applicable to the research population and sampling, specifically focusing on smallholder farmers (Creswell & Creswell, 2018).

The assumptions being challenged in this study include the disorganised regulatory structures at different government levels (local, provincial, and national), such as the inadequately monitored extension support programs for smallholder farmers. The findings from this research can be utilised to promote social transformation within the smallholder farming industry.

3.5 RESEARCH METHOD

The combination of qualitative and quantitative research methods used in this study is commonly referred to as various terms such as designs, advanced designs, strategies, methods, researches, studies, or types of research (Creswell; Hesse-Biber & Johnson, 2015). This approach is employed as a tactic to assess the reliability and validity of a

social research study, encompassing both qualitative and quantitative components (Creswell, 2009).

The utilisation of mixed methods research in this study allows the researcher to identify the strengths and weaknesses of qualitative and quantitative methods while having the freedom to utilise a wide range of methods and approaches without being confined to one (Jason & Glenwick, 2016). Mixed methods research is defined as a research approach where researchers combine qualitative and quantitative elements, including viewpoints, data collection, analysis, and inference techniques, to achieve a comprehensive understanding and verification (Johnson et al., 2007). The research incorporates elements of the qualitative method, which focuses on phenomena related to quality (Kothari, 2004), and allows for the exploration, description, and understanding of the experiences, meanings, processes, and purpose of the phenomena being studied, in this case, smallholder farmers, in a non-numerical manner. The findings derived from qualitative methods are typically diverse, naturally varied, unique, and based on the participants' experiences and the researcher's beliefs (Jason & Glenwick, 2016).

Emphasising quality and contextual significance, this approach places importance on culture and other settings allowing the researched communities the expression of their views (Jason & Glenwick, 2016). The research also incorporates elements of the quantitative method, which aims to generalise data. In this study, generalisation is achieved through the selection of random samples that are sufficiently large to minimise errors and ensure that the selected samples adequately represent the smallholder farmers' population in a statistically meaningful way (Krentel & Ahmad, 2021). The research problem addressed in this study is the lack of sustainable income generation resulting from inadequate knowledge and guidelines for measuring the GFI, a critical factor influencing the recording of smallholder farmers' productive outcomes.

The core of mixed methods research is digging into the qualitative and quantitative databases more to integrate data, thereby providing a deeper understanding of the research problem in a research study (Creswell & Creswell, 2018). Studies use mixed methods research to collect, analyse and integrate data from a study that combines qualitative and quantitative data (Leavy, 2017).

Mixed methods research brings qualitative and quantitative together. Therefore, its implementation requires that the researcher understand how to individually gather and analyse numerical data (quantitative), and narrative data (qualitative). This provides a more comprehensive understanding of the research problem and enables researchers to answer a broader range of research questions.

Creswell & Creswell (2018) provide a practical guide to designing and conducting mixed methods research. They suggest that mixed methods research typically involves collecting and analysing data in two distinct phases, quantitative and qualitative. The quantitative phase focuses on collecting numerical data, employing surveys, measurements, or experiments. In contrast, the qualitative phase collects narrative data through interviews, observations, or document analysis.

In their book, the authors emphasise the importance of carefully considering the research problem and research questions to determine the most appropriate mixed methods design. In this study, the researcher uses the concurrent design, which he has outlined above. On the other hand, Leavy (2017) also offers guidance on mixed methods research, emphasising the interconnectedness of qualitative and quantitative approaches. She suggests that mixed methods can help explore complex research questions, capture nuanced experiences, and uncover the underlying mechanisms and contexts that quantitative data alone cannot reveal.

In her book, Leavy further discusses the different philosophical perspectives, one of which this study has applied, namely pragmatism. This study showed that it informs mixed methods research and proposes specific strategies for designing and conducting mixed methods studies. She further highlighted the importance of reflexivity, ethics, and validity in mixed methods research. She provided real-world examples and case studies to illustrate the implementation of mixed methods in various contexts, like where smallholder farmers obtained relative comfort in the opportunity to participate in this study.

Both Creswell & Creswell (2018) and Leavy (2017) provide comprehensive frameworks for understanding and conducting mixed methods research. They highlight the potential benefits of combining different research approaches and offer practical guidance on the integration of qualitative and quantitative methods, analysis of data, and interpretation of findings, duly incorporated in this study.

3.5.1 Qualitative method

Creswell, 2018, argue that mixed methods qualitative research help study complex social phenomena because it allows researchers to examine subjective experiences, social interactions, and the meanings people give to their behaviour, which play a role in understanding.

They emphasise the importance of qualitative techniques when studying issues that require in-depth research, such as cultural conventions, social inequalities, and personal experience. Leavy, 2017 emphasised that qualitative research in mixed methods research provides a more comprehensive and holistic understanding of research questions. She argued that qualitative methods are particularly effective when studying social processes, subjective experiences, and constructing meaning. She also emphasised the value of qualitative techniques in examining context, culture, and power relations. Leavy, 2017 argued further, that qualitative research helps identify patterns and generate hypotheses for further research.

Kumar, 2019 emphasised the role of qualitative research with mixed methods in providing a more comprehensive understanding of social phenomena. He also stated that qualitative methods allow researchers to capture the complexity and diversity of human experiences and perspectives. According to Kumar, qualitative research helps explore unexpected aspects of a research topic, develop theories, and give context to quantitative results. He argued that qualitative research increases the validity and reliability of mixed methods studies by providing a more nuanced and comprehensive analysis.

3.5.2 Quantitative method

Creswell & Creswell (2018) describe quantitative methods as a component of mixed methods research that involves the collection and analysis of numerical data. This approach uses statistical techniques to examine patterns, trends, and relationships between variables. Quantitative methods provide researchers with precise and objective measurements, allowing for the testing of hypotheses and the generalization of findings to a larger population.

Leavy (2017) agreed that quantitative methods in mixed methods research have a focus on numerical data and statistical analyses. This approach employs surveys,

experiments, or existing datasets to uncover patterns, trends, and associations between variables. Quantitative methods help researchers understand the extent and direction of relationships, as well as explore whether there are statistically significant differences across groups.

Kumar (2019) sees quantitative methods as an essential part of mixed methods research. This provides a systematic and structured approach to collecting and analysing data which involves the use of statistical techniques, measurements, and questionnaires to collect data from large sample sizes. Quantitative methods enable researchers to quantify the impact of variables, examine causal relationships, and make predictions.

3.5.3 Mixed methods

Researchers can interpret mixed methods as a developmental process of combining diverse systems and methods to form an identifiable research strand, ultimately succeeding in bringing together qualitative and quantitative data (Timans et al., 2019). In their second edition of a textbook they produced in 2011, these authors highlight that Creswell and Clark gave a history of how mixed methods evolved. It ultimately emerged as a separate methodology of scientific significance (Timans et al., 2019).

Mixed methods research is a methodology that conceptualises practices and conventions which address complex research issues by integrating qualitative and quantitative perspectives (Toraman, 2021). Mixed methods research allows for an in-depth exploration of research questions and the integration of different data types to understand the research topic better. It can combine the strengths of both quantitative and qualitative research methods. Quantitative data analysis identifies patterns or relationships in the numerical data, while qualitative analysis extracts rich forms of descriptive data that help understand any complex phenomena, perspectives or experiences of people.

Combining qualitative and quantitative data analysis outcomes in one research study minimises identified weaknesses. It enhances strengths by allowing researchers to employ various research methods, data collection techniques, and analytical approaches to address complex research questions and gain a more comprehensive understanding of social phenomena.

The evolution of mixed methods encourages commending the work of researchers such as Creswell and Clark, who recognised the need for a methodology that could address complex research issues by impressing on incorporating both qualitative and quantitative perspectives. This recognition led to mixed methods as a separate and significant scientific methodology. By integrating qualitative and quantitative perspectives, mixed methods research provides a more comprehensive and in-depth exploration of research questions. It allows for the integration of different types of data, which helps researchers gain a better understanding of the research topic.

3.6 RESEARCH STUDY SAMPLING

A sample refers to a component that is representative of an extensively defined population in a research study (Banerjee & Chaudhury, 2010). It constitutes a smaller subset that is chosen to accurately represent the specified population, with the aim of providing reliable, precise, and inclusive data about that population (Pandey & Pandey, 2015).

The research study population encompasses all individuals from whom relevant information is gathered, and it is from this pool that a study sample is extracted (Ranjit, 2019; Leavy, 2017). As per the data presented by Stats SA 2016, Census 2011, Agricultural Households, and Stats SA Community Survey, there were an estimated 201,286 agricultural households in FS, in 2011, which decreased to 157,510 in 2016 (Table 3.5.1). This investigation focuses on documenting the target study population, consisting of 157,510 smallholder farmers.

3.6.1 Sample size

A representative sample size of 385 smallholder farmers from the aforementioned population is determined by utilising the tables derived from the Cochran formula, as shown below. These participants are then randomly selected to take part in the study.

Table 3.5.1: Extract from Statistics Summary of Farming Households in SA

Name of Province	No. Of Agricultural Households 2011	No. Of Agricultural Households 2016
Free State	201,286	157,510

Source: Stats SA, Census 2011, Agricultural households and Stats SA Community Survey, 2016; as well as adaptation by the Author.

The Cochran formula below is statistically generally accepted and preferred for large and infinite populations (Israel, 1992; Sarmah et al., 2013)

$n_0 = Z^2pq/e^2$

Where n_0 is the sample size, Z^2 is the value of the desired confidence level also known as risk level, p is the estimated proportion of an attribute that is present in the population, q is 1 - p, and e^2 is the precision level, commonly known as margin of error, or sampling error desired. The product of p and q (pq), in the formula equals the estimate of variance. Using common and generally accepted rates' mix where confidence level is 95%, standard deviation is a 0.5 and the margin of error is +/- 5%, the derived sample is calculated as follows:

$n_0 = ((1.96)^2 \times .5(.5)) / (.05)^2$
$= (3.8416 \times 0.25) / 0.0025$
$= 0.9604 / 0.0025$
$= 385$

When deciding on a study sample, there are two types sampling methods that are guided by the choice of research paradigms selected (Ranjit 2019, Leavy 2017). The probability sampling type is normally linked to the quantitative method. It is also known as random sampling, where the choice of a sample gives an equal and independent chance to the respondents in a population to be selected without bias. The non-probability type is aligned to the qualitative method of research; therefore, the selection of respondents under this type, can be dependent on the researcher's requirements. With this study using the mixed methods approach, both types of sampling were applied.

3.6.2 Probability sampling

Various probability sampling techniques exist, such as simple random, stratified, systematic, and cluster methods, and these . For the quantitative phase of this research, the researcher used a simple random sampling technique. This allowed statistical application of appropriate analysis techniques (Leavy, 2017), which further enhanced the outcomes of correlation conclusions in the statistical tests carried out (Ranjit, 2019).

From the Cochran formula guideline, the researcher allowed voluntary participation of 370 smallholder farmers, organised randomly from various communities residing in any of the four district municipal areas and one metropolitan municipality shown in

table 3.8 below. Gatekeepers and facilitators assisting the researcher in these communities, were tasked to invite any smallholder farmer to freely participate or not participate, with anonymity guaranteed in that randomly completed registers could contain pseudo names. This participation allowed respondents an equal probability of being part of the sample or, not being part of the sample representing the overall population (Ranjit 2019, Leavy 2017).

Stratified, systematic and cluster random sampling types below, were not suitable for use in determining the research outcomes required, therefore not used.

1. Simple random sampling

Simple random sampling is a form of probability sampling wherein participants are chosen randomly using a computer program or a table of random numbers in a selected sample (Ranjit 2019). It is also the most basic form of probability sampling.

2. Stratified random sampling

Studies use stratified random sampling to divide the population into subgroups, strata or classes. In this method, the researcher randomly selects individuals from each stratum or class in proportion to their representation in the population. It ensures that the sample is representative of the different groups within the population. Researchers use stratified random sampling often when distinct subgroups within the population may have different characteristics or interest outcomes.

3. Systematic random sampling

Systematic sampling involves selecting individuals from a population at regular intervals. For example, researchers could select every nth person on a list for the study, where n represents a number. This method is proper when the population is significant and a list or database is available that selects individuals. Systematic sampling is more effective than simple random sampling in terms of efficiency and convenience.

4. Cluster random sampling

When the population is naturally a division of groups or clusters, researchers use cluster sampling. In this method, a study selects clusters randomly, and then it adds all individuals within each selected cluster in the study. Researchers use cluster sampling when it is impractical or too costly to select individuals from every member type of the

population. For example, in a study on mathematics literacy, clusters could represent public schools or home-based schools, and the sample would include all scholars within each selected cluster.

3.6.3 Non-probability sampling

Non-probability sampling has different probability sampling methods, which include simple, stratified, systematic, and cluster non-probability sampling.

Selecting respondents under the non-probability type, also known as convenience sampling, can depend on the researcher's requirements (Ranjit, 2019). For the qualitative aspect, the researcher used a homogenous purposive sampling technique, which allowed for a small sample based on a non-probability sampling technique (Kothari, 2004). As (Ranjit, 2019) posits, the sample size becomes less important on the qualitative side of the study.

The researcher chose fifteen smallholder farmers to provide various perspectives on conditions related to generating gross farming income when carrying out their farming activities. Research that applies non-probability sampling is commonly in qualitative type studies. Unlike probability sampling, which aims to select a sample representing the overall population, non-probability sampling does not involve random selection. Instead, participants are chosen based on their availability, accessibility, or specific characteristics of interest, need or requirement to the researcher.

1. Purposive non-probability sampling

One of the most applied non-probability sampling methods in qualitative research is purposive sampling. In purposive sampling, participants are selected based on the study's specific purpose and ability to provide relevant and insightful information. This method allows researchers to focus on individuals with the knowledge, experiences, or perspectives most relevant to the research question or problem.

2. Convenience non-probability sampling

Convenience sampling is another commonly used non-probability sampling method. This method involves selecting participants based on their convenience and availability to participate in a study. Researchers often use convenience sampling when time, budget, or logistical constraints make it challenging to recruit a representative sample. Although convenience sampling is not considered as rigorous as probability sampling regarding how researchers generalise, it can still provide

valuable insights and perspectives, mainly when researchers prefer exploratory or carry out pilot studies.

3. Snowball non-probability sampling

Snowball sampling and quota sampling are other types of non-probability sampling techniques. Snowball sampling is recruiting participants through referrals from existing participants, and quota sampling uses specific quotas for different groups, classifications, or categories.

Non-probability sampling methods are advantageous in qualitative research because they allow researchers to target specific populations or individuals who are most likely to provide rich and in-depth information based on their experiences. These, however, also have limitations. Non-probability samples only sometimes represent the overall population, limiting how generalised the findings are. In addition, their outcomes may be less valid because their selection of the participants may have been more subjective and risk more bias of choice.

3.7 RESEARCH STUDY TECHNIQUES

Research study techniques include a wide selection of tools that researchers use to collect data, for analysis purposes, based on the objective of a research study (Pandey & Pandey, 2021). The design framework and plan select questionnaires and semi-structured interviews using interview sheets as appropriate instruments for this study. There is a varied list, including observation techniques, documents (secondary sources), schedules and rating scales and interview guides (Creswell & Creswell, 2018; Kumar, 2019; Leavy, 2017; Pandey & Pandey, 2021).

The nature of this research design was descriptive and therefore it had interview sheets and questionnaires as suitable methods and data measuring instruments to collect and obtain data (Kothari, 2004; Ranjit, 2019). The researcher identified semi-structured interviews as appropriate for the research problem, the research respondents, namely the smallholder farmers, the gatekeepers, and the enumerators. (Creswell & Creswell, 2018), highlighted the appropriateness of correctly identifying the chosen study sites and participants for the proposed study.

The advantage of using this type of interview is that it provides uniform information from the interviewees. The interviewers are therefore not required to have superior

interviewing skills. The researcher utilised appropriately qualified young unemployed individuals to assist in collating data through interviews.

In this study, the researcher provided these individuals to facilitate the completion of questionnaires, as it was deemed inappropriate for the research participants to complete them on their own. This choice reaffirms the commitment to ensuring the utilisation of culturally appropriate tools (Creswell et al., 2018) and data collection methods that are mindful of the cultural intricacies of the community. Previous studies indicate that the majority of smallholder farmers possess limited literacy skills (Zantsi et al., 2021). One crucial distinction between a questionnaire and an interview sheet lies in the fact that the former is typically self-administered and necessitates a comprehensive understanding of the questions (Kumar, 2019).

3.7.1 Rating scales

The research uses rating scales to measure and rate the level or degree of a particular trait. They are often used in research studies and surveys to collect participant data and opinions. Rating scales typically consist of a series of utterances or items that participants must rate on a numeric scale, such as a Likert scale. In this study, the scale ranges from 'strongly disagree' to 'strongly agree' and 'severe' to 'negligible'. The study has used responses for data quantification and analysis.

Questionnaires usually incorporate rating scales to measure different characteristics and phenomena of other questions related to a study topic. The questionnaire in this study has numerous rating scales incorporated to test the scale level of answers to various questions.

3.7.2 Interview Guides/sheets

Research interview guides are documents, tools and techniques that provide a structure or framework to conduct research interviews. They typically include a set of questions or topics that an interview covers and prompts or follow-up questions to elicit more detailed responses from respondents. The interview guides serve as a roadmap for interviewers to cover all relevant areas and gather consistent data from each participant.

The qualitative section of this study consists of an interview guide, which the researcher and trained enumerators followed to probe in detail. These questions relate to the qualitative side of mixed methods research.

3.7.3 Questionnaires

Research questionnaires are structured sets of questions used to collect data for research purposes. Researchers typically use and administer them in surveys and research studies to gather participant information. The questions in a questionnaire follow a carefully designed format. The data collected through questionnaires can then be. Questionnaires are a standard and widely used tool in the field of research.

Research studies structure a set of questions in a questionnaire to collect data for research purposes. These studies and surveys typically use questionnaires to gather information from research participants. Researchers administer questionnaires in various formats, including paper-based forms, online surveys, or face-to-face interviews. They typically design questions carefully in line with the research purpose to obtain specific information relevant to a research topic. The researcher then analyses, draws conclusions, and makes inferences about the research topic. Many studies use questionnaires as a standard tool in the field of research.

The quantitative aspect of this study obtained responses to questions posed in a questionnaire to address relevant research matters about the research problem of gross farming income by smallholder farmers in the Free State province that were not being measured or generated sustainably.

3.8 ETHICAL CONSIDERATIONS

Rogers, 1987, highlighted an essential factor that human interaction between researchers and participants results in the slightest discomfort at a minimum. Hence it is a prerequisite to consider and know that in any research that involves humans, there are ethical considerations to take care of (Leavy, 2017).

It means researchers must adhere to minimum moral principles that guide their values and ethical standards, ensuring participants in their chosen studies are treated fairly in line with the provisions set by the research community. At a minimum, these provisions include social justice, inclusivity, and addressing inequalities which the

social justice movements have influenced, as social and historical events that took place against historical atrocities (Leavy, 2017).

Typically, smallholder farmers usually frequent agricultural department offices in the local government municipality regions to receive extension support services. Free State consists of four district municipalities and one metropolitan municipality, as indicated in Table 3.8. The researcher collaborated with the appropriate authorities to ensure the utmost comfort of the research participants, who were included in the study without feeling obligated to participate or receiving any derived benefits in the future (Creswell et al., 2018).

When conducting a study involving marginalised and disadvantaged participants, such as smallholder farmers, it is crucial to obtain local approvals from individuals of authority in the community, commonly referred to as gatekeepers or leaders at selected research sites, who can facilitate effective communication channels. Furthermore, the research study was conducted in a respectful manner towards all primary participants and any other secondary stakeholders involved in the study, such as the aforementioned gatekeepers and the selected research sites (Creswell & Creswell, 2018; IFAD, 2013). According to Creswell 2009, it is imperative to treat research sites with respect in order to ensure that they remain undisturbed even after the completion of the study.

Importantly, the research study was carried out in a respectful way towards all direct participants and any other indirect stakeholders who formed part of the study. For instance, the gatekeepers mentioned and the sites at which the study is undertaken. According to Creswell 2009, there is a need to respect research sites, such that after a study is completed, those sites remain undisturbed.

Table 3.8: List of District and Metropolitan Municipalities

Name of District/Metro Municipality	Administrative Centre
Fezile Dabi	Sasolburg
Lejweleputswa	Welkom
Thabo Mofutsanyana	Phuthaditjhaba
Xhariep	Tromsburg
Mangaung	Bloemfontein

Source: https://municipalities.co.za/provinces/view/2/free-state: List of Municipalities in the Free State. A reconstructed table by the Author.

3.8.1 Protection of participants

In ensuring that this research is not harmful, and that it presents good character overall, with acceptable levels of morality, integrity, being fair and truthful, this study has incorporated the following three levels of the provisions of an ethical substructure (Leavy, 2017):

1. The philosophical dimension

This refers to the values system applied in the research, influenced by the researcher's experiences and most importantly, the societal values where the research is carried out. This study ensures that no harm is brought to the participants that could be caused by repercussions of historical events This study ensured that use of information gathered, did not bring to the fore fear of victimisation that used to take place during the years of the apartheid system in SA. Anonymity, privacy and confidentiality provisions was applied in the collation of respondents' information This furthermore, was in line with the country's legal frameworks.

2. The praxis dimension

This level requires that all aspects related to the actual research process, from the design of the research topic, to the research methodology and data collection requirements, were planned and carried out in a way did not present harm to the participants, and that all relevant codes of ethics are adhered to, including ensuring all forms of consent are obtained. The study researcher submitted letters requesting approval from all relevant institutions before starting with the actual field research work, and has only carried out the research, where approvals were received.

Interview sheets used, incorporated a section for obtaining informed consent from all the participants in the research.

3. The reflexivity dimension

This level related to the behaviour of researchers towards the research participants, where researchers ensured that discriminatory practices are eliminated and participants are given a similar acceptance and treatment, irrespective of hierarchy or authority levels in the society or research sites.

Whilst the study involved gatekeepers, to ensure maximum acceptable levels of participation, it has ensured that all participants in their individual capacity were treated with the utmost of respect, and were allowed to participate willingly and freely.

The research study adhered to exemplary ethical principles, encompassing all stipulations pertaining to ethical compliance that could affect all players related to the research study, in line with the guidelines from the University of Kwazulu-Natal. Creswell, 2009, avers that researchers must follow all guidelines of their own organisations as well as of other organisations where applicable.

The researcher ensured that all meetings with the participants of the research study, explained and provided informed consent forms, which describe the study purpose, assure confidentiality as names are not required, afford the opportunity to voluntarily participate or not participate in the study and afford additionally an opportunity to withdraw and opt-out at any point during the participation process, individually to all participants, without them experiencing any form of undue influence, adverse impact, bias or harm to their integrity or otherwise.

3.8.2 Nature and limits of benefits as participants

The study aimed to benefit research participants, mainly as smallholder farmers, and only after the completion of the study. The research study expected to provide recommended outcomes and, where possible, guidelines on consistently generating and maintaining sustainable farming income. The advancement of gross farming income will further positively contribute to employment opportunities, market access, credit access and technology training requirement of smallholder farmers in Free State and other South African provinces.

Participating in the research study resulted in no direct monetary or financial rewards or reimbursements. In participating, indirect benefits were possible as farmers started to generate new ideas for dealing with their current farming income. Benefits, compensation, rewards, reimbursements, and any other form of recompense that a researcher may offer research participants, can assume positive or unintended negative interpretations if there is no clear explanation of its intention in the process of research (Persad et al., 2018). In some rural settings, gifts are a default requirement when researchers expect research participants from that area (Appiah, 2020).

In this study, the researcher emphasised that potential benefits would derive as outcomes at the end of the research. The researcher engaged and appraised the community members who also played the role of gatekeepers, facilitating meetings at convenient times and places for access to participants, with information regarding there being no compensation to participate in the research, except a token of appreciation in the form of meals for participants, and stipends for selected field enumerators, as per the ethical clearance approval of UKZN.

In line with the approval, the researcher provided breakfast and lunch vouchers or meals arranged with the municipal areas' community leaders or gatekeepers, which the researcher paid. Participants would voluntarily agree to gather at convenient communal areas close to their residencies to ensure the participation decision does not inconvenience them. Very few participants in one municipal area of Xhariep required assistance with transport to the meeting place. The researcher paid for local transportation of these participants to ensure that they were financially better off after participating in the research.

3.8.3 Inclusion and exclusion participation criteria

The study included all smallholder farmers in the Free State province who agreed to provide informed consent before participating in the study. It, however, excluded farmers willing to participate in the study but not agreeing to give informed consent.

3.8.4 Anonymity of research participants

The research participants provided information that was used for scholarly research and related outcomes only. The researcher will not use participants' information for any other reason, and the identities will remain highly confidential, in line with all the

applicable regulatory provisions, for example, the Protection of Personal Information Act (POPIA).

Participation in the study was entirely voluntary. The researcher gave them a choice to participate, not to participate or stop participating in the research. The study has anonymised participants' views from the interviews and questionnaires. Neither their names nor identities were requested nor disclosed in any form in the study, and the researcher chose to use nicknames, pseudo-names, or no names at all when completing questionnaires and interview sheets.

3.9 DATA COLLECTION

Some authors suggest that it is vital for researchers to appreciate whether or not the research problem they are investigating and collecting data for its research deserves the effort (Kumar, 2019; Creswell, 2018). It must be a void or a form of neglect in literature (Creswell, 2018). This study meets the requirement to pursue data collection and carry out the research to assist smallholder farmers in generating farming income sustainably.

The research problem this study addresses reflects neglect because the information that relates to the GFI generated by the large-scale commercial farming sector has been readily available for a long time (StatsSA 1994, 2022), different from that of smallholder farmers. This results in farmers on this commercial farming level enjoying many benefits. However, the same deprives smallholder farmers who do not have access to funding from diverse financial institutions. The closest this researcher can link to a similar study is Louis Drake's 1954 query of farming income generation and recording methods for all farmers. Since then, smallholder farmers have not received adequate attention regarding how to generate income sustainably.

The research employed a convergent mixed methods design that collected qualitative and quantitative data simultaneously (Creswell et al., 2018). Participants from various groups had the freedom to choose whether they wanted to be part of the qualitative or quantitative aspects of the study, as the aim was to gather similar datasets.

3.9.1 Sources of data collection

Regarding data collection, two main approaches were followed, primary and secondary (Ranjit 2011; Kothari 2004). This study primarily relied on primary data,

which refers to information gathered directly and exclusively for this specific research. Secondary data, on the other hand, was utilised to a lesser extent and was obtained from existing sources such as meeting diaries, at public institutions like the department of agriculture provincial offices and municipal offices.

As a result of the Protection of Personal Information Act (POPIA) of 2013 and the uncertainty of interpretation of its provisions, this study only used secondary data already available in public domains. Therefore, requiring no separate permission to use in its fieldwork. Examples include reports and statistics on agriculture, held by Statistics South Africa, as this data is freely accessible and does not require permission. A directory of Free State Department of Agriculture extension officers is also publicly available online and was used for related enquiries by the researcher and to discuss how these officers would be able to assist the researcher, in line with the gatekeeper letter received.

The Free State Department of Agriculture's gatekeeper letter clearly stated that it would not share access to the existing information about farmers following POPIA. The researcher has adhered to the provision of this restriction by not requesting any details of the smallholder farmers in any of the departmental offices. However, the interpretation by the same department is likely incorrect.

According to the above act, information about smallholder farmers that is on the records of the Department of Agriculture, e.g. in Free State, is on public records, as *provincial departments* are public entities. This information is, therefore, accessible, with good reason, to members of the public (Government Gazette, 26 November 2013, of Act No.4 of 2013, POPI Act of South Africa).

3.9.2 Recruitment of participants to the study (fieldwork)

The Free State Department of Agriculture provided managed access to the researcher through a gatekeeper's letter. This allowed the researcher to attend any gatherings, meetings, and events of (smallholder) farmers in all the municipal districts/metropolitan areas as and when they occurred. These meetings are generally called farmers' days, which usually occur once annually in specific areas of interest, for example at the municipal town level, municipal district level and provincial level. However, these culminate from several preparatory meetings, which the researcher could also attend.

The researcher proactively visited the Free State Department of Agriculture's customer service centres, where they usually hold these meetings and where smallholder farmers frequently visit for various service requirements for introduction purposes. The initial intention was to recruit potential participants from these customer service centres, utilising the following recruitment materials and approaches:

1. Flyers

Generic flyers posted or distributed at customer service centres and similar business centres.

2. Other personal introduction approaches

Self-introduction of the researcher, personal conversations, request for referrals and announcements to the smallholder farmers as potential participants in the study, as per the gatekeeper letter of the Free State Department of Agriculture, introduced and approved his request to cite the Department of Agriculture in Free State, as per the reference to proceed with the research study in the province.

The researcher, being an outsider that currently resides in Gauteng province, identified the presence of a gatekeeper as essential and therefore formally requested a gatekeeper's letter from the Department of Agriculture in the Free State province to create comfort and trust in the provinces' rural communities (Masambuka et al., 2020).In this research study, the researcher was currently not a resident of the Free State province nor a farmer in the same province. However, he is originally from the same province.

The researcher used a gatekeeper's letter of support issued by the Free State Department of Agriculture to raise the comfort levels of the smallholder farmers and other community leaders who consented to participate in this study in interacting with the researcher. The gatekeeper’s letter also provided comfort to the field enumerators, who the researcher selected and trained to adhere to research processes as per the ethical clearance from UKZN and for the assistance in data collection. They played a role in further recruiting participants in all municipal areas, as well as assisting to complete questionnaires and interview sheets by the smallholder farmers. The findings derived from the data collected have been examined separately yet consolidated for a simultaneous presentation.

3.9.3 Data management and storage

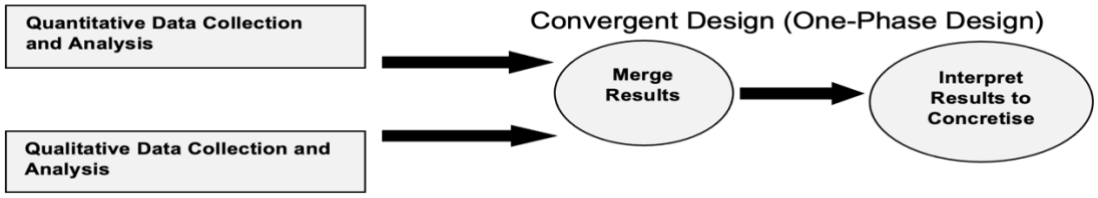
Data management, sharing and preservation practices are becoming essential for researchers to ensure that the data they collect becomes readily available with institutional needs that arise (Cheung et al., 2022). In ensuring data security and access by UKZN-approved authorities, officials and entities, the researcher uses UKZN's secured Microsoft Office OneDrive portal, which is a secure "Cloud" software storage platform that allowed encrypted sharing of files between users, therefore allowing any required approved access.

The researcher also uses "in the Cloud software" secured storage only accessible with a password. Therefore, the researcher highly ensured that the study's data security. This security aspect relates to the currently analysed data from this study. The researcher, furthermore, has stored hard copies in a safe storage space, whereafter they will be scanned into encrypted data once the researcher has submitted the final thesis. After five (5) years of secured storage, the researcher will dispose of the data by permanently deleting files that are available "in the Cloud software" secured storage.

3.10 REPORTING THE RESULTS

The final step in the research methodology was to arranging the data in a format that is conducive to research, facilitating effortless reading and uninterrupted analysis. The information was encoded using software applications like SPSS and Excel, transforming the data into visual representations in the form of tables, charts, and illustrations for both the qualitative and quantitative aspects (Creswell 2014). These representations have been statistically connected to measurements, like response frequencies, deviations, variable effects, variable interactions, and metrics, among other indicators used in the quantitative study aspect. The result is according to the convergent design for mixed methods, as shown in Figure 3.10 below.

Figure 3.10: The convergent mixed methods design



Source: Adapted and redrawn from Creswell et al, 2018.

In Figure 3.10, and according to the research framework (Figure 3.11), both quantitative and qualitative data are simultaneously gathered and separately examined. Ultimately, these findings are consolidated to produce a conclusion. Following ethical guidelines as well as considering the welfare of smallholder farmers, the outcomes of this research will be disseminated to the appropriate parties, in line with the rules and regulations of UKZN.

3.10.1 Summary of steps in this study research process

Quantitative elements of income production and durability have been examined using descriptive statistics, gathered from questionnaires. Conversely, qualitative elements were assessed through interviews during the exploratory stage. The research aimed to examine the importance of smallholder gross farming income sustainability in contributing to agricultural GDP and the revenue streams of the smallholder farmers. Consequently, this can have positive implications for employing gross farming income to address issues of hunger, poverty eradication, reduced unemployment, enhanced food security, as well as stimulating growth and development in rural areas.

Using mathematical and statistical equations, the gross revenue of participating smallholder farms is calculated as follows, in order to determine the GFI of smallholder farmers:

GR_k = Gross revenue of the produce/product (Pendell et al., 2003).

$= P_k \times Y_k$

Where: P_k is the price of the produce/product.

Y_k is the yield of the harvest or of sales of the produce/product.

$_k$ is the produce/product.

This research was aiming to classify farming entities based on common agricultural indicators and variables, which could measure the extent of change or significance in these metrics. The purpose of this classification was to support smallholder farmers in FS and develop strategies to generate a sustainable income through farming. The data collected through questionnaires and interview sheets were analysed and interpreted using various types of analyses, as outlined in the chapters that follow, as described by (Leavy, 2017; Creswell & Creswell, 2018):

1. Descriptive statistical analysis

This analysis involves simple calculations that determine central tendencies, such as the mean, median, and mode. It also includes measures of spread, such as standard deviation and variance, frequencies, as well summary of numbers, patterns, meanings, and implications derived from the data. It provides a descriptive account of the interpretations and meanings of the data.

2. Exploratory analysis

This analysis involves a comprehensive cross-classification of research data, which can be presented in graphical or non-graphical formats.

3. Correlation

Correlation analysis involves determining the degree of association between variables, expressed as a numeric value. It indicates the increase or decrease in values of dependent (Y) and independent (X) variables.

4. Regression

Regression analysis is a method to examine how one or more independent explanatory variables influence a dependent outcome variable.

Where two or more relevant independent variables in the presented data, predict or explain the variance in the dependent variable, i.e. income (Zhang, 2015), the multiple linear regression (MLR) equation has been applied as follows:

$$Y = \beta o + \beta 1\ X1 + \beta 2\ X2 + \ldots + \beta k\ Xk + \varepsilon i$$

Where Y = Total farming income received in a seasonal period, and it is a dependent variable.
βo = the intercept with β1, β2…, βk being coefficients of the variable X1,X2,…,Xk are independent variables and εi the error term.

3.10.2 List of metrics, variables and indicators

Table 3.10.2 lists the metrics, variables and indicators that the study has identified as important in the development of a model for smallholder farmers in the Free State province, South Africa. This model has been developed at the lowest level of recommended indicators frameworks, i.e. at the smallholder farm level.

Table 3.10.2: Metrics and variables linked to indicators measuring GFI

Name of Metric	Description of Metric	Purpose of Metric	Independent Variables	Indicators
a. Farm size	Total farm area. Some of the area may not be utilised for production.	Records the profile of farmers in an area of interest, as well as the diversity of farm sizes.	i. Cultivation area ii. Soil quality iii. Livestock per HA iv. Total land owned v. Land type vi. Marketed crop or livestock vii. Intensity viii. Access to credit ix. Household size x. Non-farm income xi. Household assets xii. Education xiii. Access to markets xiv. Access to training xv. Household income xvi. Management practice xvii. Family labour xviii. Total production cost xix. Diseases xx. Pesticides	i. Farm land ii. Water use iii. Farm labour productivity iv. Agricultural yield of produce v. Mechanisation skills vi. Farming technology vii. Household income gap viii. Farm income gap ix. Poverty income gap x. Hunger levels xi. Malnutrition levels xii. Food security gap xiii. Food price xiv. Food expenditure xv. Market access xvi. Agricultural expenditure xvii. Plant based diseases xviii. Animal diseases
b. Land size	Area of land used for crop production. It is usually smaller than farm area/size.	Records the productive area size.		
c. Yield of crop or product	Total volume of production harvested. Harvest may be smaller than production.	Yield is a recorded measure of success. It is a channel used to measure improvement in income levels. It also indicates efficiencies of production.		
d. Farm household size	Number of people who lives there irrespective of relation.	To measure number of people dependent on the income.		
e. Price of crop or product	Price received per unit of the product.	Price received by the farmer for the product to measure revenue.	Dependent Variable GFI	Dependent Variable GFI
f. Revenue of the crop or product	Gross revenue of all sales per production period (last season).	Basis for measuring profitability per period (last season).		
g. Production costs of the crop or product	Total costs incurred to produce the product during the last season.	To measure sustainability of production i.e. whether it is profitable to continue.		
h. Off-farm revenue	Income not related to production.	Non-farming income.		

Source: Designed by the Author, adapted from Shipman, Soto, Mullan, González & Daniels, 2016

3.10.3 Selection of metrics, variables and indicators in this research study

The selection was based on previous agricultural research studies that have successfully used these measures. However, this study is unique as it applied these measures to smallholder farmers and focused specifically on income sustainability. The metrics selected were used to determine the levels of income sustainability, the variables provided information or data that contributed to income or GFI, and the indicators measured the economic performance, at the farm or entity level in the agricultural sector.

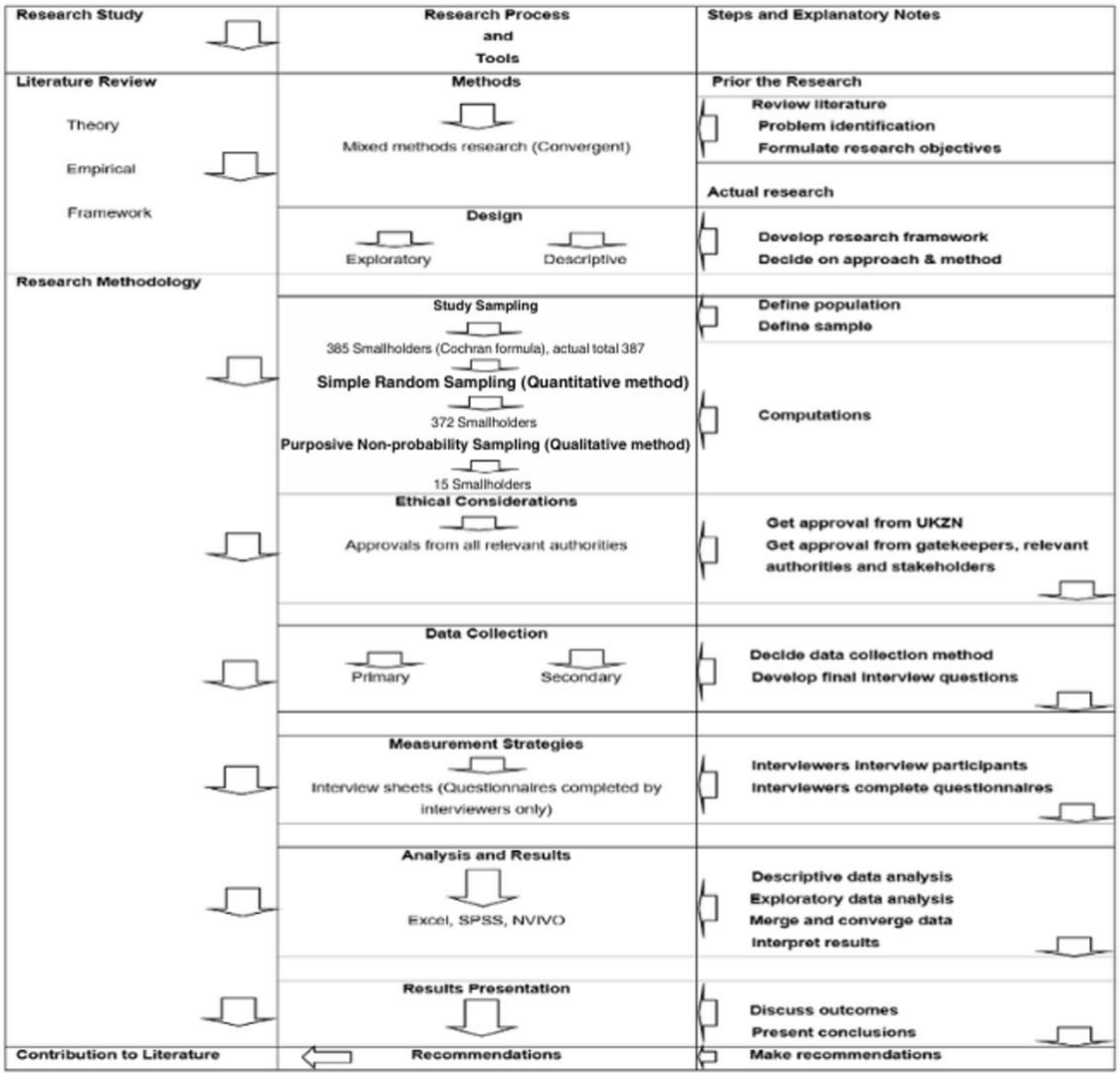
3.10.4 Justification and subjectivity statement

The qualitative phase of the research allows the researcher to interact directly with the respondents, resulting in a subjective but detailed information sharing (Rahman, 2016). In this study, the researcher experienced a subjective connection of understanding and awareness mostly resulting from common knowledge of the Free State province as a study area.

Although qualitative research methods are synonymous with some perceived subjectivity of the researcher, as an instrument of interpretation, Alhazmi and Kaufmann (2022), posit that the inherent approach within these methods is important towards ensuring a thorough description of the experiences being researched.

3.11 RESEARCH FRAMEWORK

Figure 3.11: Research framework smallholder income sustainability



Source: Designed by the Author. Constructed with information from literature references: Creswell 2009, Hesse-Biber & Johnson 2015, Israel 1992, Kothari 2004, Ranjit 2011.

CHAPTER 4 QUANTITATIVE DATA ANALYSIS AND FINDINGS

4.1 DESCRIPTIVE ANALYSIS (DEMOGRAPHIC INFORMATION)

This chapter presented results from the analysis of data from 372 farmers. The analysis was conducted in SPSS Version 27 and at a 95% confidence interval. The analysis was stepwise; it started with the descriptive and univariate types in the form of frequency tables, that presented the count and frequencies as well as mean and standard deviation for continuous data. It is followed by bivariate analysis in form of Chi-square tests of association between the dependent variable (farming income) and the independent variables of interest followed by multivariate analysis, where multiple regression was carried out to determine which variables affect the gross farming income.

The stepwise presentation of the analyses is uniform throughout to ensure a consistent delivery of findings, allowing variables reported on to also maintain a consistent predictive capacity and lessen the complexity of understanding (Bonacini et al., 2023). Valid percentages are presented in some of the variables, where there are differences in the number of respondents as a result of a decision to participate, or not to participate. This resulted in findings showing different percentage ranges, for the same data analysis, that was dependant on whether valid or non-valid percentages are presented.

4.1.1 Gender

Table 4.1.1: Gender

GENDER	Frequency	Percent %	Valid Percent %
Male	143	38,4	38,9
Female	223	59,9	60,6
Non-binary/LGBTIQ+	2	0,5	0,5
Sub-total	368	98,9	100,0
Missing information	4	1,1	
Total	372	100,0	

Table 4.1.1 represents the gender of smallholder farmers in the Free State province, South Africa, as part of a survey. Out of the 372 farmers surveyed, 143 (38.4%) were identified as male, 223 (59.9%), were identified as female, and 2 (0.5%) identified as non-binary/LGBTIQ+. The sub-total column indicates that, out of the total number of

farmers surveyed, 368 (98.9%), identified as either male, female, or non-binary/LGBTIQ+. The remaining 4 (1.1%), which points to missing information, indicates that 4 farmers either did not provide a response or did not provide a valid response to the question.

The data indicates that the majority of smallholder farmers surveyed in the Free State province of South Africa are women. Women make up the majority of the farming population in the region, with 60.6% of surveyed farmers identifying as female. In comparison, only 38.9% of surveyed farmers identified as male. Non-binary/LGBTIQ+ farmers make up a very small portion of the total surveyed population, with only 0.5% of surveyed farmers identifying as such. These results are in line with broader trends in South African farming, where women are the majority of the farming population.

4.1.2 Age

Table 4.1.2: Age

AGE	Frequency	Percent %	Valid Percent %
17-34 years	97	26.1	27.3
35-49 years	106	28.5	29.9
50-64 years	108	29.0	30.4
65-80 years	44	11.8	12.4
Sub-total	355	95.4	
Missing information	17	4.6	
Total	372	100.0	

Table 4.1.2 presents statistical information on the age distribution of a sample of 372 individuals. It shows the frequency, percentage and valid percentage of individuals in each age range. The highest number of individuals is in the 35-49 years old age range of the sample. The second largest age range is in the 50-64 years old of the sample. The last outcomes are in the age range of 17-34 years old and of 65-80 years old of the sample.

The valid percentage of the sample was slightly higher than the percentage, with 27.3% in the 17-34 age range, 29.9% in the 35-49 age range, 30.4% in the 50-64 age range, and 12.4% in the 65-80 age range. Overall, the Table 4.1.2, shows that the largest age range in the sample is 35-49 years, followed by 50-64 years. Both age ranges make up more than half of the sample (58.5%). There are fewer individuals in

the 17-34 years old age range (27.3%) and the 65-80 year age range (12.4%), respectively.

The table also shows that there is 4.6% of missing information in the sample. This could be due to individuals who did not report their age or those whose age could not be determined. In conclusion, the Table 4.1.2 presents the age distribution of a sample of 372 individuals. The two largest age ranges are 35-49 years old and 50-64 years old, making up 58.5% of the sample. There are fewer individuals in the 17-34 years old age range (27.3%) and the 65-80 years old age range (12.4%). The minimum age in this sample was 17 years while the maximum was 80 years old. median age was 46 years old, with an interquartile range of 33-58 years old.

4.1.3 Formal education qualification

Table 4.1.3: Farmer's education qualifications

FORMAL EDUCATIONAL QUALIFICATION	Frequency	Percent	Valid Percent
No formal education	31	8,3	8,8
Lower than Matric	91	24,5	25,7
Matric	181	48,7	51,1
Above Matric (Diploma, Degree...)	51	13,7	14,4
Sub-total	354	95,2	
Missing information	18	4,8	
Total	372	100	

Table 4.1.3 indicates that half of the farmers had Matric, a quarter had lower than Matric qualifications while fewer had no formal qualifications. A small group had post Matric qualifications, while another group also had lower than Matric qualifications.

Table 4.1.3 presents the formal educational qualifications of a sample of 372 respondents. Out of these, 31 (8.3%), had no formal education, 91 (24.5%), had lower than a matric qualification, 181 (48.7%), had a matric qualification and 51 (13.7%), had above a matric qualification (diploma or degree). The valid percentage column indicates that 8.8% of the respondents had no formal education, 25.7% had lower than a matric qualification, 51.1% had a matric qualification and 14.4% had above matric qualification. The lowest proportion of respondents had above matric qualification.

The data in table 4.1.3 can be used to make a number of inferences. It can be seen that a large proportion of the respondents had a matric qualification while a small proportion had no formal education or lower than a matric qualification. This suggests that overall, the respondents in the sample had a relatively high level of educational attainment. Furthermore, it can be seen that a very small proportion of the respondents had above matric qualification. This suggests that there is a low level of higher qualifications' educational attainment among the respondents in the sample.

According to the Free State Education Department, the current statistics show that 28.2% of the population in Free State Province had no schooling, 30.9% have lower than a matric qualifications, 34.5% have Matric qualifications and 6.4% have above a matric qualifications.

4.1.4 Formal agricultural qualification

Table 4.1.4: Agriculture qualifications

FORMAL AGRICULTURAL QUALIFICATION	Frequency	Percent	Valid Percent
No agriculture qualification	334	89,8	93,8
Agriculture qualification	22	5,9	6,2
Sub-total	356	95,7	
Missing information	16	4,3	
Total	372	100	

Table 4.1.4, indicates that many smallholder farmers in Free State did not have formal education in Agriculture, and very few did. This table shows the distribution of formal agricultural qualifications for Free State smallholder farmers. Of the 372 farmers surveyed, 334 (89.8%), had no agricultural qualification, and 22 (5.9%), had an agriculture qualification.

4.1.5 Household size information

Table 4.1.5: Household size

HOUSEHOLD SIZE	Frequency	Percent	Valid Percent
1-2 members	51	13.7	14.8
3-4 members	120	32.3	34.8
5+ members	174	46.8	50.4
Sub-total	345	92.7	
Missing information	27	7.3	
Total	372	100	

The average number of members per household was 5, with a minimum of 1 member per household, and a maximum of 16 members. Half of the households were composed of more than 5 members, a third had 3 - 4 members and the rest were composed of 1 - 2 members.

Table 4.1.5, above provides data on the household size of Free State smallholder farmers. This shows that 51 households (13.7%) belong to 1 - 2 members, 120 households (32.3%), belong to 3 - 4 members and 174 households (46.8%), belong to 5 or more members. This means that 92.7% of the households provided information on their household size while 7.3% of the households have did not provide information regarding their household size.

4.1.6 Household unemployment rate

Table 4.1.6: Household unemployment rate

HOUSEHOLD UNEMPLOYMENT RATE	Frequency	Percent	Valid Percent
None	34	9.1	10.3
One	81	21.8	24.5
Two or more	216	58.1	65.3
Sub-total	331	89.0	
Missing information	41	11.0	
Total	372	100.0	

The maximum number of households with unemployed households was 1 and the maximum was 8 unemployed adults, while the average was 2 unemployed members per households. Nearly two thirds of households in this sample had two or more

members who were unemployed, a quarter of households had one member who was unemployed, and a tenth had all members being employed.

Table 4.1.6, provides an overview of the unemployment rate for smallholder farming households in the Free State province of South Africa. The data collected indicates that 34 households (9.1%), reported having no unemployed individuals, 81 (21.8%), reported having one unemployed individual, and 216 (58.1%), reported two or more unemployed individuals. The valid percentage column shows that the total number of households with no unemployed individuals accounted for 10.3% of the sample, while households with one unemployed individual accounted for 24.5% and households with two or more unemployed individuals accounted for 65.3%.

4.2 UNIVARIATE ANALYSIS (CURRENT FARMING ACTIVITIES EXTENT)

The objective of this section is to measure the extent of current farming income of smallholder farmers in the district municipal areas of Free State. Furthermore, this section uses univariate form of analysis, which reviews concepts, with an examination of individual variables (Dunn, 2019). This means, to what extent these individual variables have an impact on the generation and sustainability of GFI from smallholder farming activities.

4.2.1 Main type of farming activity (Non-livestock)

Table 4.2.1: Main type of farming activity

MAIN TYPE FARMING ACTIVITY (NON-LIVESTOCK)	Yes/No	Frequency	Percent	Valid Percent
Cropping	No	278	74.7	74.7
	Yes	94	25.3	25.3
Bee keeping	No	370	99.5	99.5
	Yes	2	0.5	0.5
Horticulture	No	205	55.1	55.1
	Yes	167	44.9	44.9
Total		372	100.0	100.0

Table 4.2.1, indicates the main type of smallholder non livestock farm activities. A quarter of the farmers indicated that they practised cropping, four out of ten indicated they practised horticulture, while only two mentioned bee keeping.

Table 4.2.1, provide data on the main type of farming activity among smallholder farmers in the Free State province in South Africa. The data show that the majority of smallholder farmers, 74.7%, do not engage in any non-livestock farming activity. Of those who do, 25.3% are involved in crop farming, 0.5% in beekeeping and 44.9% in horticulture.

From table 4.2.1, it can be inferred that the majority of smallholder farmers in the Free State province are not engaged in non-livestock farming activities. This could reflect the fact that smallholder farmers in the Free State are mainly subsistence farmers, and are not involved in commercial production. It is also likely that the lack of access to resources, such as arable land, water, and capital, limit the ability of smallholder farmers to engage in non-livestock farming activities.

The data also suggests that the majority of smallholder farmers who are involved in non-livestock farming activities in the Free State province are involved in crop farming. This could be because crop farming requires less capital investment, and is less labour intensive than other non-livestock farming activities. It could also reflect the fact that crop farming is a more reliable source of income for smallholder farmers in the area, due to the presence of markets for the crops produced, albeit the extent of access to these markets has not been fully exploited.

The small number of smallholder farmers involved in beekeeping could be due to the fact that beekeeping requires a greater capital investment than other forms of non-livestock farming activities, and is also more labour intensive. There is furthermore a lack of information regarding the progress of beekeeping successes and challenges facing smallholder farming practices, as well as verification of this progress, in South Africa (Masehela et al., 2020). Additionally, there may be limited markets for bee-related products, such as honey and wax, in the Free State province.

The data shows that a significant proportion of smallholder farmers in the Free State province are involved in horticulture. This is likely due to the fact that horticulture is a relatively low-cost and low-risk form of farming, as it does not require as much capital investment or labour as other forms of non-livestock farming activities. Additionally, there may be more markets for horticultural products, such as vegetables and fruits, in the area.

Overall, the data in table 4.2.1, suggests that smallholder farming in Free State is mainly subsistence, and that the majority of smallholder farmers are not engaged in non-livestock farming activities. However, those who are involved in non-livestock farming activities are mainly involved in crop farming and horticulture, due to the relatively lower costs and risks associated with these activities. Additionally, access to markets for the products of these activities may also be more readily available in the area.

4.2.2 Main type of farming activity (Livestock)

Table 4.2.2: Main type of livestock farming

MAIN TYPE FARMING ACTIVITY (LIVESTOCK)	Yes/No	Frequency	Percent	Valid Percent
	No	288	77.4	77.4
Cattle	Yes	84	22.6	22.6
	No	329	88.4	88.4
Goats	Yes	43	11.6	11.6
	No	292	78.5	78.5
Piggery	Yes	80	21.5	21.5
	No	311	83.6	83.6
Poultry	Yes	61	16.4	16.4
	No	326	87.6	87.6
Sheep	Yes	46	12.4	12.4
Total		372	100.0	100.0

Table 4.2.2, indicates the main type of smallholder livestock farm activities. A fifth of the farmers practised cattle farming or piggery. Less than a fifth practised poultry while a tenth of them practised sheep and goats keeping. This means that piggery and cattle rearing were the two most common livestock kept.

This table is a summary of the type of farming activities conducted by smallholder farmers in the Free State province. Specifically, it looks at the frequency of livestock farming activities such as cattle, goats, piggery, poultry, and sheep. The table shows that 77.4% of smallholder farmers in the Free State province do not engage in any type of livestock farming activities. This is followed by 22.6% of farmers that keep cattle, 11.6% that keep goats, 21.5% that keep piggery, 16.4% that keep poultry, and 12.4% that keep sheep.

The data in table 4.2.2, suggests that the majority of smallholder farmers in the Free State province are not engaging in any type of livestock farming activities. This could be due to the fact that they are not able to access the resources necessary to start or maintain a livestock farming operation. It could also be due to the fact that they do not see the potential income that can be earned from such activities.

The data also suggests that the smallholder farmers who are engaging in livestock farming activities are mostly doing so with cattle, followed by goats, piggery, poultry, and sheep. This indicates that the majority of smallholder farmers in the Free State province are more likely to engage in cattle farming, as it is the most profitable livestock farming activity.

The data in this table further provides some insight into the type of farming activities being conducted by smallholder farmers in the Free State province from a South African smallholder farming income perspective. It suggests that the majority of smallholder farmers are not engaging in any type of livestock farming activities, and those that are doing so are primarily engaging in cattle farming.

4.2.3 Number of livestock held (in farming activity)

Table 4.2.3: Number of livestock

NUMBER OF LIVESTOCK HELD (IN FARM ACTIVITY)	Frequency	Percent	Valid Percent
None	187	50.3	50.3
One	112	30.1	30.1
Two to three	58	15.6	15.6
Four to five	14	4.0	4.0
Total	372	100.0	100.0

Half of the farmers did not practise livestock farming, followed by those who owned at least 1 livestock. Few of the farmers owned 1 - 3 livestock or 4 - 5 livestock. These results show that it was rare to own more than two livestock animals in total in this sample.

Table 4.2.3, provides a statistical overview of the number of livestock held by smallholder farmers in the Free State province of South Africa. The data indicates that out of the total 372 smallholder farms, the largest portion of 50.3% had no animals,

followed by 30.1% having one animal, 15.6% having two to three animals, and 4.0% having four to five animals.

The data from table 4.2.3, reveals that the majority of smallholder farmers in the Free State province had no livestock, or only one animal. This indicates that the majority of smallholder farmers in the Free State province have limited access to livestock and may be struggling to make a living from farming activities that do not include livestock. The lack of livestock could be due to several factors, such as lack of access to capital and resources, limited land, and lack of access to markets.

In addition, this data from table 4.2.3, further shows that the majority of smallholder farmers in the Free State province have limited access to animals, which may be impact on their ability to increase their income. Animals are often used as a source of food, fertilizer, and draught power, and can be used to diversify farming activities and increase income. Thus, the lack of access to animals and the small number of animals that smallholder farmers own may be limiting their ability to increase their income from farming.

The data, also highlighted the need for more support for smallholder farmers in the Free State province. The lack of access to animals and resources, and the limited number of animals that smallholder farmers own, suggested that the smallholder farmers in the Free State province may not be able to make a living from farming without additional support.

This support could include access to resources, capital, markets, and/or training to help smallholder farmers increase their farming income. Overall, the data from table 4.2.3, provides an overview of the number of livestock held by smallholder farmers in the Free State province, and highlighted the limited access to animals and resources that many smallholder farmers have.

4.2.4 Summary: main type of farming activity

Table 4.2.4: Summary of farming activities

SUMMARY: MAIN TYPE OF SMALLHOLDER FARM ACTIVITY	Frequency	Percent	Valid Percent
Both Cropping and Horticulture	12	3.2	3.4
Cropping only	46	12.4	12.9
Horticulture only	113	30.4	31.7
Bee keeping only	1	0.3	0.3
Livestock only	116	31.2	32.5
Mixed farming	69	18.5	19.3
Sub-total	357	96.0	
Missing information	15	4.0	
Total	372	100.0	

Table 4.2.4, summarises the main types of farm activities. Three out of ten of the farmers practised horticulture only, while a third practised livestock rearing only. Nearly a fifth practised mixed faming, kept animals and did cropping too. A tenth of them practised cropping only while very few practiced both cropping and horticulture, with beekeeping a rare farming activity type practised by only 2 farmers.

Table 4.2.4, provides statistical information on the main type of activity among smallholder farmers in the Free State province. This provides a breakdown of the type of activity among smallholder farmers and the associated frequency, percentage, and valid percentage. The main type of activity among smallholder farmers in Free State, is crop farming. There is evidence shown in the fact that 46 smallholder farmers (12.4 percentage), engage in crop farming only, and 69 smallholder farmers (18.5 percentage), engage in mixed farming (combining crops and livestock). In addition, 12 smallholder farmers (3.2 percentage), engage in both cropping and horticulture.

The second most common type of activity among smallholder farmers in Free State is livestock farming. This is based on the evidence that 116 smallholder farmers (31.2 percentage), engage in livestock farming, only. This is followed by horticulture farming, with 113 smallholder farmers (30.4 percentage), engaging in horticulture farming, only. Beekeeping is the least common activity, with only 1 smallholder farmer engaging in beekeeping farming.

From a smallholder farming income perspective and data in table 4.2.4, it appears that crop farming is the most income generating activity in the Free State province. This is due to the fact that crop farming has the highest number of smallholder farmers engaging in it, and it is also the most diverse activity, with smallholders engaging in both cropping and horticulture, as well as mixed farming. On the other hand, livestock farming is the second most income generating activity, as it has the second highest number of smallholder farmers engaging in it. Beekeeping is the least income generating activity, as it has the fewest number of smallholder farmers engaging in it.

4.2.5 Main farming objectives

Table 4.2.5: Main farming objectives

MAIN FARMING OBJECTIVE	Frequency	Percent	Valid Percent
Own consumption	85	22.8	23.7
Marketing and selling	69	18.5	19.3
Own consumption and selling	204	54.8	57.0
Sub-total	358	96.2	
Missing information	14	3.8	
Total	372	100.0	

Table 4.2.5, provides information on the main objectives for smallholder farming in the Free State province of South Africa. Half of the farmers indicated that they practised farming for their own consumption and selling, a fifth for their own consumption, and fewer, for the purposes of marketing and selling.

The frequency and valid percentage of the data are indicated. According to the data, the majority of smallholder farmers in Free State have two main objectives, namely, own consumption (23.7%), and; own consumption and selling (57%). This means that a total of 80.7% of smallholder farmers in Free State are engaged in either their own consumption, or their own consumption and selling.

The data in table 4.2.5 indicates that the majority of smallholder farmers have these two main farming objectives, which are related to gross farming income generation. Own consumption is when farmers produce for their own consumption including for their families. This type of farming is usually done on a small scale and does not involve selling the produce. On the other hand, own consumption and selling is when farmers produce for their own consumption and then sell the surplus.

This type of farming is usually done on a larger scale, and involves a certain level of marketing and selling. From a smallholder farming income perspective, the data indicates that smallholder farmers in Free State are mostly engaged in their own consumption and selling. This type of farming is more profitable and provides the farmers with a steady income.

By selling the surplus, smallholder farmers in Free State can generate an income that can be used to cover their expenses and to purchase necessary farming inputs. It means this type of farming also provides them with an opportunity to expand their operations and increase their production.

4.2.6 Years in farming

Table 4.2.6: Years farming

YEARS IN FARMING	Frequency	Percent	Valid Percent
1-2 years	109	29.3	29.3
3-4 years	59	15.9	15.9
5-10 years	80	21.5	21.5
More than 10 years	60	16.1	16.1
Missing information	64	17.2	17.2
Total	372	100.0	100.0

Table 4.2.6, indicates that just under half of the farmers had been in farming for 1-4 years, one third had been in farming for 1-2 years, while less than a fifth had been in farming for 3-4 years. A fifth of the farmers had been in farming for 5-10 years, while another one fifth had been in farming for more than 10 years.

Table 4.2.6, further provides a statistical interpretation of the number of years that smallholder farmers in the Free State province have been farming. The data shows that the majority of farmers (29.3%), have been farming for between one and two years, with 15.9% having been farming for between three and four years and 21.5% having been farming for between five to ten years. Additionally, 16.1% of farmers have been farming for more than ten years and 17.2% of farmers did not provide information about the number of years that they have been farming.

The information in table 4.2.6 suggests that the majority of smallholder farmers in Free State have relatively little experience when it comes to farming. This is likely to have a

significant impact on their ability to make a sustainable income from their farming activities. Those with only one to two years of experience are likely to lack the necessary knowledge and skills to maximise their yields and minimise their costs, while those with more than ten years of experience are likely to have the necessary experience and technical knowledge to maximise their yields and minimise their costs.

Furthermore, the fact that 17.2% of smallholder farmers in Free State are unable to provide information regarding the length of time they have been farming indicates that there is a lack of reliable and accurate data available on the farming experience of smallholder farmers in the region. It signals the lack of understanding why this information is important in the industry. This is likely to make it difficult for policy makers to accurately assess the impact of different policies on the smallholder farming income sustainability in the region.

4.2.7 Sources of income (other than from farming)

Table 4.2.7: Government assistance received

SOURCES OF INCOME (OTHER THAN FROM FARMING)	Frequency	Percent	Valid Percent
Government grant	121	32.5	43.5
Pension	71	19.1	25.5
Business	49	13.2	17.6
Formal employment	37	9.9	13.3
Sub-total	278	74.7	
Missing information	94	25.3	
Total	372	100.0	

Table 4.2.7, indicates that other sources of income for smallholder farmers in Free State province were government grants, which were cited by four out of ten of the participants, this was followed by pension, cited by a quarter of farmers. Fewer indicated that other sources of income were through some form of business or formal employment.

Table 4.2.7, provides a breakdown of sources of income for smallholder farmers in Free State, other than from farming. Government grants are the most common source of income, with 32.5% of farmers receiving grants. Pension is the second most common source of income, with 19.1% of farmers receiving pensions. Business and formal employment are the two other sources of income, with 13.2% and 9.9% of

farmers respectively receiving income from these sources. The total number of farmers receiving income from any source other than farming is 278, or 74.7% of the sample.

There are sources of income that overlap within different categories of smallholder farmers, such as those in formal employment. However, also earning income from a business operated on a part-time basis. The data from table 4.2.7, demonstrates that government grants are the most common source of income for smallholder farmers in Free State. This suggests that government programs are an important source of income for these farmers, and that the government has a significant role in supporting smallholder farmers in the region.

The presence of pension and employment income shows that some farmers are able to supplement their farming income with income from other sources. It is likely that these sources of income are more common amongst older farmers, as they are more likely to receive pensions and to have more established employment.

However, the data from table 4.2.7, also shows that 25.3% of the respondents did not complete any information, suggesting that there are a significant number of smallholder farmers in the region that are not receiving any form of income other than from farming, if any. This therefore suggests that there may be a need for additional support for smallholder farmers in the region, in order to supplement their farming income.

In addition to the sources of income outlined in table 4.27, there are a number of other sources of income that could potentially impact the operations of smallholder farming in Free State. Smallholder farmers could receive income from the sale of agricultural products; such as eggs, milk, or honey. They could also receive income from the sale of their crops, or from the sale of services, such as veterinary services or agricultural consulting. Furthermore, smallholder farmers could receive income from government subsidies, such as those provided by the Department of Agriculture.

4.2.8 Farming income compared to off-farm income

Table 4.2.8: Off-farm income

FARMING INCOME vs OFF-FARM INCOME	Frequency	Percent	Valid Percent
Farming income	124	33.3	33.3
Off-farm income	214	57.5	57.5
Missing information	34	9.1	9.1
Total	372	100.0	100.0

Regarding income types in the household, at slightly more than half of the smallholder farmers solicited income from off-farm income, while a third indicated their households depended on farming income.

Table 4.2.8, shows the comparison between farming income and off-farm income in Free State. It is evident that off-farm income is more dominant than farming income (57.5% as compared to 33.3%, respectively). The remaining 9.1% of the respondents did not respond to relevant questions. The sustainability of smallholder farming income is heavily dependent on the income relationship of both farming and off-farm activities.

The data in table 4.2.8 suggests that the majority of smallholder farmers in the region are relying more on off-farm income for their livelihoods. This is likely due to the fact that farming is becoming increasingly difficult and less profitable in the region due to the climate and other factors, such as the lack of access to resources, markets and technology.

The predominance of off-farm income in the region is likely to have a negative impact on the sustainability of smallholder farming income. This is because off-farm income tends to be more volatile and unpredictable than farming income, which is generally more stable, but low. As a result, smallholder farmers are unlikely to be able to rely on off-farm income to provide a steady and reliable source of income.

Furthermore, off-farm income is often seasonal and may not be sufficient to meet the needs of smallholder farmers throughout the year. The dominance of off-farm income in the region is also likely to have a negative impact on the wider economy of the Free State province. This is because smallholder farmers are likely to be spending less on

inputs and services related to farming, which could lead to a decrease in agricultural production and an increase in poverty and unemployment in the region.

4.2.9 Banking practice

Table 4.2.9: Banking practice

BANKING PRACTICE	Yes/No	Frequency	Percent	Valid Percent
Are you banking any of your farming income at a financial institution?	No	326	87.6	87.6
	Yes	46	12.4	12.4
Total		372	100.0	100.0

Table 4.2.9, indicates that seven out of ten of the farmers did not bank their income, whereas fewer did bank their income.

Table 4.2.9, provides data on the banking practice of smallholder farmers in the Free State province. The results indicate that 87.6% of smallholder farmers in the province are not banking any of their farming income at a financial institution, while 12.4% do.

The data in table 4.2.9 means that most smallholder farmers in the province are not taking advantage of banking services to enhance their sustainability and income. This lack of adopting an appropriate banking practices among smallholder farmers in Free State may have significant implications for their living conditions sustainability and income sustainability. Banking has the option to offer access to credit for smallholder farmers, which can be used to purchase inputs such as seeds and fertilizers and to finance other investments that can enhance their productivity and profitability.

When smallholder farmers are unable to access credit, they are likely to be unable to purchase production inputs and invest in their farms, which can significantly limit their ability to generate sufficient gross farming income. Also, banking can also provide smallholder farmers with access to other financial services, such as savings and insurance, which can help them to manage their income more effectively. Savings allow smallholder farmers to set aside money for times of need, while insurance can protect them against potential losses due to weather events and other risks. Without access to such services, smallholder farmers may find it difficult to cope with financial shocks, which can further undermine their ability to generate a sustainable farming income.

Banking practices can furthermore provide smallholder farmers with access to other resources, such as financial literacy training and access to financial markets. Financial literacy training can help smallholder farmers to better understand the financial services available to them, while access to financial markets can help them to access capital to invest in their farms. Without access to such resources, smallholder farmers in Free State may be further limited in their ability to generate a sustainable gross farming income.

4.2.10 Farm related debt

Table 4.2.10: Farm debt

FARMING RELATED DEBT	Yes/No	Frequency	Percent	Valid Percent
Do you have any farming related debt?	No	319	85.8	85.8
	Yes	53	14.2	14.2
Total		372	100.0	100.0

Table 4.2.10, shows the frequency, percentage and valid percentage of smallholder farmers in the Free State province, who have farming related debt. The data indicates that 85.8% of smallholder farmers in the province do not have any farming related debt while 14.2% have farming related debt.

The existence of farming related debt among smallholder farmers, shown in table 4.2.10 has a significant impact on the sustainability of their farming income. Farmers with high levels of debt are often unable to invest in their farms due to the need to make payments towards the debt. This limits their ability to increase their production and income, and makes it more difficult for them to reduce their level of poverty.

The need to make payments towards debt which may lead to cash flow problems that could result in a decrease in income that further limits their ability to invest. Furthermore, the presence of farming related debt can also reduce farmers' access to additional credit, as lenders are wary of providing loans to those with high levels of debt. This can limit the ability of farmers to purchase equipment and inputs needed to increase production, leading to a decrease in income.

The presence of farming related debt can also lead to a decrease in the ownership of assets among smallholder farmers. Farmers who are unable to pay off their debt may be forced to sell off their assets, most times at lower prices, in order to make payments towards the redemption of debt. This can lead to a decrease in their ability to produce further as they no longer have access to the equipment and production inputs they need.

An indirect but critical impact, resulting from the presence of farming related debt, is the negative effect debt can have on the mental health of smallholder farmers. Stress and anxiety associated with debt can lead to depression and other mental health issues which can further reduce their ability to produce and earn farming income. This presence of farming related debt among smallholder farmers in Free State has a significant impact on consistent generation and therefore the expected sustainability of their gross farming income.

4.2.11 Farming cooperative membership

Table 4.2.11: Cooperative membership

COOPERATIVE MEMBERSHIP	Yes/No	Frequency	Percent	Valid Percent
Are you a member of any cooperative?	No	245	65.9	65.9
	Yes	127	34.1	34.1
Total		372	100.0	100.0

Table 4.2.11, above presents the results of a review of smallholder farmers in the Free State province, which asked whether or not they were members of any farming cooperative. The results indicate that out of the 372 smallholder farmers surveyed, 245 (65.9%), were not members of any cooperative, while 127 (34.1%), were members.

The data presented in table 4.2.11, indicate that there is a relatively low proportion of smallholder farmers that are members of any farming cooperatives.
This could have a notable impact on the sustainability of smallholder farming income in the area, as the lack of cooperative membership could limit the access of smallholder farmers to resources and services which requires group membership.

Cooperative membership could provide smallholder farmers with access to services such as financial services, technical assistance, and market access. It could also provide smallholder farmers with access to resources such as credit, production inputs, and agro-processing facilities, which generally lean towards group-run entities rather than individuals.

Organised group membership could help to increase the farming income of smallholder farmers through the pooling of resources, as well as improve their access to markets, thus increasing their ability to sustain their farming operations. Additionally, cooperative membership could help to increase the bargaining power of smallholder farmers in the market, as they would be able to access larger number of buyers and sellers.

The data presented in table 4.2.11, also indicate that the take-up of cooperative membership among smallholder farmers in Free State, is very low. A variety of factors could be at play, such as a lack of awareness of the benefits of cooperative membership, or a lack of access to the necessary resources and services that would enable smallholder farmers to join a cooperative. There could also be a general observation or experience by smallholder farmers that cooperatives do not provide benefits expected.

4.2.12 Agricultural association membership

Table 4.2.12 Membership of an agricultural association

FARMERS ASSOCIATION MEMBERSHIP	Yes/No	Frequency	Percent	Valid Percent
Are you a member of any cooperative?	No	207	55.6	55.6
	Yes	165	44.4	44.4
Total		372	100.0	100.0

Table 4.2.12, presents data from a review of agricultural association membership by smallholder farmers, in the Free State province. The data show that 55.6% of the respondents were not members of any agricultural association, while 44.4% were members.

The table 4.2.12 suggests that he majority of the smallholder farmers in Free State are not members of any agricultural association. The choice of not being members of any agricultural association among smallholder farmers of Free State, can have a related negative impact on the sustainability of their gross farming income.

Agricultural associations can provide smallholder farmers with a platform to access resources and information that can help them increase their agricultural productivity, gain access to relevant markets and develop their agribusinesses. Through these associations, smallholder farmers can gain access to better inputs such as improved seeds, fertilizers and resources to access credit facilities. This in turn can lead to better yields and improved income for the smallholder farmers.

In addition, smallholder farmers who are members of agricultural associations can benefit from collective bargaining power to access better prices for their produce from industry buyers. This can lead to improved farming income for the smallholder farmers. The lack of agricultural association membership among smallholder farmers can also have a negative impact on their access to new technologies. Agricultural associations often provide access to new technologies that can help smallholder farmers increase their productivity, such as improved irrigation systems, mechanisation, and crop protection technologies.

Without access to these technologies, smallholder farmers may be unable to increase their agricultural productivity and farming income. In addition, the decision of these smallholder farmers, not to become members of an agricultural association may limit their access to important industry-related information. Agricultural associations usually provide smallholder farmers with information on market trends, farming practices and government policies. Without access to this information, smallholder farmers may be unable to make informed decisions that can improve their gross farming income.

4.2.13 Receiving mentorship

Table 4.2.13 Receiving mentorship

RECEIVING MENTORSHIP	Yes/No	Frequency	Percent	Valid Percent
Are you receiving farming guidance from a mentor?	No	170	45.7	45.7
	Yes	202	54.3	54.3
Total		372	100.0	100.0

More than half of the farmers were receiving guidance from a mentor in farming, with fewer reporting that they were not receiving any form of guidance. Table 4.2.13, shows that 54.3% of smallholder farmers in the Free State Province, are receiving farming guidance from a mentor.

Table 4.2.13 indicates that the majority of smallholder farmers in the region are taking advantage of mentorship opportunities. This is beneficial for the sustainability of smallholder farming income as mentorship can help smallholder farmers to access resources, increase their farming knowledge, farming skills and improve their farming practices.

Mentorship programmes can help to bridge the gap between smallholder farmers and larger scale commercial farmers (Nwafor & van der Westhuizen, 2020). Mentorship can also provide access to other resources, such as land and capital. Mentors can specifically help to provide guidance on the best farming practices, such as the use of fertilizers, irrigation, and pest control. Furthermore, mentors can provide guidance on business skills and marketing strategies, which can help smallholder farmers to better market their products and increase their gross farming income, and consequently their farm profitability.

Importantly, mentorship can be beneficial in providing access to networks, such as agricultural research organisations, government agencies, and other experienced farmers. This can help smallholder farmers to access additional resources, collaborate with other farmers, and find information that can help to improve their farming practices.

4.2.14 Providing mentorship to others

Table 4.2.14 Providing mentorship to others

GIVING MENTORSHIP	Yes/No	Frequency	Percent	Valid Percent
Are you a mentor to any one or more farmers?	No	180	48.4	48.4
	Yes	192	51.6	51.6
Total		372	100.0	100.0

Above half of the farmers reported that they were mentors giving guidance to other colleagues in the smallholder farming business (51.6%), with less than half (48.4%), not providing this guidance to others. Table 4.2.14 shows the frequency and percentage of respondents from the Free State province, who are providing mentorship to other less experienced smallholder farmers, in the smallholder farming business. The results suggest that slightly above half (51.6%) of the respondents are providing mentorship to their colleague farmers, while the remaining 48.4% are not providing this guidance.

The results of this study point to the potential impact of providing mentorship to smallholder farmers on their farming income, as per table 4.2.14. Many studies have shown that mentorship is a form of hands-on training that can lead to improved productivity, reduced costs, greater access to markets and financial services, access to supply chains which can ultimately lead to increased gross farming income for smallholder farmers (Nwafor & van der Westhuizen, 2020).

4.3 DESCRIPTIVE ANALYSIS (LAND OWNERSHIP AND USAGE)

The descriptive type of analysis used in this section refers to information about any variable being researched, in a simplified form, without any manipulation or impact to its form; therefore, allowing identification of existing problems, issues regarding current practices, the ability to determine alternatives in a meaningful manner and to create possible theories (Honfo et al., 2019; Loeb et al., 2017). The following section reviews land ownership and usage thereof by smallholder farmers in the Free State province, to identify its impact on the generation of gross farming income by these smallholder farmers.

4.3.1 Size of farm land

Table 4.3.1 Size of farm land

SIZE OF FARM LAND	Frequency	Percent	Valid Percent
Less than 1Ha	203	54,6	72,2
1Ha-2Ha	58	15,6	20,6
More than 2Ha	20	5,4	7,1
Sub-total	281	75,5	100,0
Information not provided	91	24,5	
Total	372	100,0	

Table 4.3.1, provides statistical information about the size of farm land. The data consists of three categories; less than 1Ha, 1Ha - 2Ha and more than 2Ha with a total of 372 responses. From the data in table 4.3.1, it is evident that the majority of the farm land size is less than 1Ha, with 72.2% of the responses falling into this category. The next largest category is 1Ha - 2Ha, with 20.6% of the responses falling into this category. The smallest category is more than 2Ha, with only 7.1% of the responses falling into this category.

4.3.2 Area of farm land utilised

Table 4.3.2 Utilised area of the farm

AREA UTILISED FOR FARMING	Frequency	Percent	Valid Percent
Less than 1Ha	191	51,3	78,9
1Ha-2Ha	34	9,1	14,0
More than 2Ha	17	4,6	7,0
Sub-total	242	65,1	100,0
Information not provided	130	34,9	
Total	372	100,0	

Table 4.3.2, is about the land area utilised by each smallholder farmer on their farm land, in the Free State province. The data was collected from 372 respondents. The results show that the majority of the farmers, 65.1%, utilised less than 1 hectare for their farming activities. This was followed by 9.1% of farmers who utilised 1 - 2 hectares and 4.6% who used more than 2 hectares.

The remaining number of respondents did not provide information on the land area they use in carrying out their farming activities. The results show that the majority of

smallholder farmers in the Free State province are utilising small plots of land, with less than 5% of the respondents utilising more than 2 hectares.

4.3.3 Farm land owned or rented

Table 4.3.3 Ownership or rental of farm land

FARM LAND OWNED OR RENTED	Frequency	Percent	Valid Percent
Information not provided	52	14,0	14,0
Commonage	2	0,5	0,5
Communal farming	1	0,3	0,3
Own	275	73,9	73,9
Rent	42	11,3	11,3
Total	372	100,0	100,0

Table 4.3.3, provides statistical information on the farm land owned or rented by smallholder farmers in the Free State Province. The table presents the frequency and percentage of smallholder farmers that own, rent, or otherwise have access to farm land.

Out of the total sample of 372 smallholder farmers, 275 (73.9%), reported that they own their farm land, 42 (11.3%) reported that they rent it, 2 (0.5%), reported that they have access to commonage land, and 1 (0.3%), reported that they are involved in communal farming. 52 (14.0%), of the respondents did not provide any information about their status of land ownership.

4.4 DESCRIPTIVE ANALYSIS (MARKET ACCESS AND SALES)

4.4.1 Condition of roads used to access markets

Table 4.4.1 Road conditions relative to markets' access

CONDITION OF ROADS USED TO ACCESS MARKETS	Frequency	Percent	Valid Percent
Good	32	8,6	8,6
Not Sure	12	3,2	3,2
Poor	328	88,2	88,2
Total	372	100,0	100,0

Table 4.4.1, provides information on the condition of roads used by smallholder farmers in the Free State province, to access markets. According to the data, the majority of roads used by smallholder farmers are in poor condition; with 88.2% of the roads surveyed classified as being under developed. Only 8.6% of roads were classified as good, while 3.2% were uncertain as to how to rate the road network condition.

4.4.2 Access to reliable transport

Table 4.4.2 Access to reliable transport

ACCESS TO RELIABLE TRANSPORT	Frequency	Percent	Valid Percent
No	279	75,0	75,0
Yes	93	25,0	25,0
Total	372	100,0	100,0

The data from Table 4.4.2, is a summary of the responses from smallholder farmers in the Free State province regarding their access to reliable transport for their produce. The data showed that 279 out of 372 respondents, or 75%, did not have access to reliable transport for their produce. Approximately, 93 of the respondents, or 25%, reported that they did have access to reliable transport for their produce. 75%, reported that they do not have access to reliable transport for their produce.

4.4.3 Sales and gross farming income

Figure 4.4.3: Annual average sales resulting in gross farming income

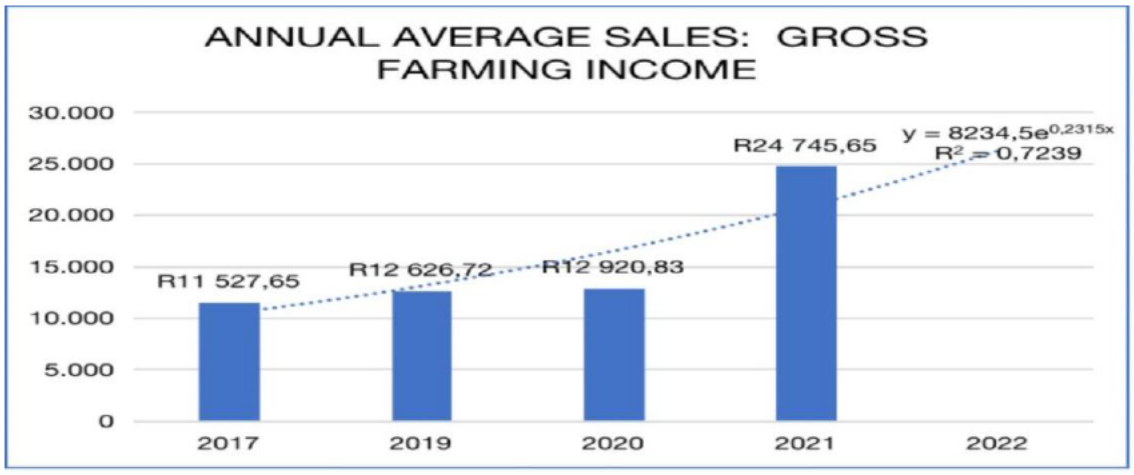


Figure 4.4.3, indicates that the ratio and relationship of annual average sales to gross farming income had been consistently stagnant and flat over the years, with an average of R11K in 2017, to R12.6K in 2019, to R12.9K despite Covid-19 in 2020. Due to legislative provisions that ensured agricultural entities including smallholder farming businesses remain in trade during the protracted Covid-19 pandemic period, there was a sharp increase in 2021 (R24.7K), a possible non-sustainable once-off reprieve.

The maximum recorded gross income was R540K in 2021; this was four times the maximum gross amount realised in 2017 (R120K). The extrapolation from the graph shows that gross sales are likely to increase in 2022 and beyond.

4.4.4 Regular customers

Table 4.4.4 Regular customers

REGULAR CUSTOMERS	Yes/No	Frequency	Percent	Valid Percent
Do you have any regular customers?	No	237	63.7	63.7
	Yes	135	36.3	36.3
Total		372	100.0	100.0

Table 4.4.4, indicates that six out of ten (63.7%), of the farmers did not have any regular customers, only 36.3% had customers.

Table 4.4.4, shows the frequency and percentage of smallholder farmers in Free State Province, who have regular customers. According to the data, 63.7% of the smallholder farmers have no regular customers, while 36.3% do have regular customers.

4.4.5 Contractual agreements

Table 4.4.5 Contractual agreements

CONTRACTUAL AGREEMENTS	Yes/No	Frequency	Percent	Valid Percent
Do you have any formal or informal contractual agreements e.g. offtake agreements?	No	335	90.1	90.1
	Yes	37	9.9	9.9
Total		372	100.0	100.0

The majority of 90% of farmers did not have any formal or informal contractual agreements, with suppliers. Table 4.4.5, shows the frequency and percentage of smallholder farmers in Free State province, who have any formal or informal contractual agreements, such as offtake agreements. The vast majority of these smallholder farmers, 90.1%, do not have any such arrangements in place.

4.4.6 Plant production skills and gross farming income

Table 4.4.6 Plant production skills and GFI

SKILLS: PLANT PRODUCTION	Yes/No	Frequency	Percent	Valid Percent
Does anyone provide crop, vegetables, horticulture production skills at your farm?	No	166	44.6	44.6
	Yes	95	25.5	25.5
Missing information		111	29.9	29.9
Total		372	100.0	100.0

Table 4.4.6, presents the results of a review conducted to determine whether any person is providing necessary skills in plant production in smallholder farming in the Free State province. The results indicate that 44.6% of respondents answered “No”, meaning that no person is providing necessary skills in plant production on their farms. On the other hand, a 25.5% of respondents answered “Yes”; meaning that there is a person who is providing the necessary skills in plant production on their farms. Additionally, 29.9% of respondents did not provide responses to this question.

4.4.7 Animal production skills and gross farming income

Table 4.4.7 Animal production skills and GFI

SKILLS: ANIMAL PRODUCTION	Yes/No	Frequency	Percent	Valid Percent
Does anyone provide animal, livestock, poultry production skills at your farm?	No	162	43.5	43.5
	Yes	80	21.5	21.5
Missing information		130	35.0	35.0
Total		372	100.0	100.0

Table 4.4.7, shows the responses to the question ‘does anyone provide animal, livestock, poultry production skills at your farm?’ This was collected from smallholder farmers in the Free State province. Of these, 43.5% of the respondents answered ‘No’,

while 21.5% answered 'Yes' and 35% of the respondents did not provide any information in this regard.

4.4.8 Financial management skills and gross farming income

Table 4.4.8 Financial management skills and GFI

SKILLS: FINANCIAL MANAGEMENT	Yes/No	Frequency	Percent	Valid Percent
Does anyone provide financial management skills at your farm?	No	171	46.0	46.0
	Yes	76	20.4	20.4
Missing information		125	33.6	33.6
Total		372	100.0	100.0

Table 4.4.8, illustrated the responses of smallholder farmers in the Free State Province, regarding whether they have access to financial management skills at their farms. The results show that 46% of smallholder farmers reported that they do not have anyone who provides financial management skills at their farm, while 20.4% reported that they do have access to financial management skills and 33.6% did not provide any information in this regard.

4.4.9 Recordkeeping skills and gross farming income

Table 4.4.9 Recordkeeping skills and GFI

SKILLS: RECORD KEEPING	Yes/No	Frequency	Percent	Valid Percent
Does anyone provide record keeping skills at your farm?	No	171	46.0	46.0
	Yes	79	21.2	21.2
Missing information		122	32.8	32.8
Total		372	100.0	100.0

Table 4.4.9, is a statistical representation of the frequency and percentage of whether smallholder farmers in the Free State province have recordkeeping skills, or access to people with recordkeeping experience and skills. The results showed that 46% of smallholder farmers answered that no one provides record keeping skills at their farms; with 21.2% answered in the affirmative, while 32.8% did not respond to the question.

4.4.10 Marketing and sales skills and gross farming income

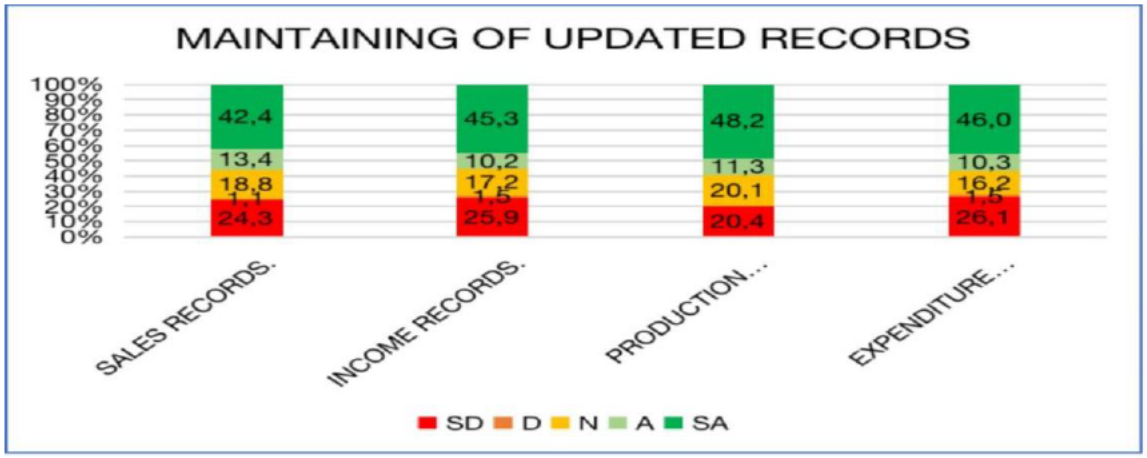
Table 4.4.10 Marketing and sales skills, and GFI

SKILLS: MARKETING AND SALES	Yes/No	Frequency	Percent	Valid Percent
Does anyone provide marketing and sales skills at your farm?	No	167	44.9	44.9
	Yes	82	22.0	22.0
Missing information		123	33.1	33.1
Total		372	100.0	100.0

Table 4.4.10, presents data on the availability of marketing and sales skills at smallholder farms in the Free State province. It shows that 44.9% of smallholder farmers do not have anyone providing marketing and sales skills at their farms, 22.0% have someone providing those skills, and 33.1% of the respondents did not respond to this question.

4.4.11 Updated records and gross farming income

Figure 4.4.11: Maintaining updated records leading to gross farming income



SD=Strongly Disagree D=Disagree N=Neutral A=Agree SA=Strongly Agree

Figure 4.4.11 indicated that at least half of the farmers maintained updated production records (59.5%), expenditure records (56.3%), income records (55.5%) and sales records (55.8%). Between a fifth and a quarter of the smallholder farmers did not keep these records.

4.5 DESCRIPTIVE ANALYSIS (AGRICULTURAL PRACTICE)

4.5.1 Government subsidy and gross farming income

Figure 4.5.1: Government subsidy resulting in gross farming income

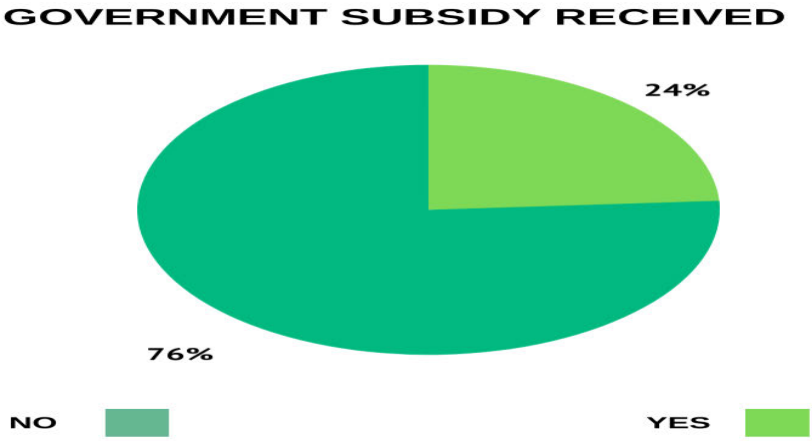


Figure 4.5.1, indicates that three quarters of the farmers did not receive subsidies (76%), it a was fewer portion (24%) who received such subsidies.

4.6 BIVARIATE ANALYSIS (GFI CHI-SQUARE TESTS OF ASSOCIATION)

Bivariate analysis explores whether variables share a functional relationship, with a view to determine margins of significance, with chi-square tests further examining the association of the significance between variables in similar or different categories, against expectations (Khumalo & Sibanda, 2019). In this section, the impact of the selected variables is looked into.

Furthermore, this section provides an analysis on relationships or associations of variables related to the actual gross farming income amounts, provided by not more than 140 smallholder farmers, out of the total sample of 372 respondents.

4.6.1 Age group and GFI determinants

Table 4.6.1 Age group and GFI determinants

AGE GROUP AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic significance (2-sided)
Age group	17-34 years	42	5	47	0.000
		89.4%	10.6%	100.0%	
	35-49 years	46	4	50	
		92.0%	8.0%	100.0%	
	50-64 years	21	4	25	
		84.0%	16.0%	100.0%	
	65-80 years	6	7	13	
		46.2%	53.8%	100.0%	
Total		115	20	135	
		85.2%	14.8%	100.0%	

Table 4.6.1, indicated that there were significant differences between the age of the smallholder farmers and gross faming income. The p-value is less than 0.05. The results showed that farmers who were older than 65 years old (46.2%), were less likely to have farming income below average, compared to those who were 50-64 years old (84%) or 35-49 years old (92%). Having higher farming income was associated with older ages (53%), those aged 65 years and older were 3-5 times more likely to have higher farming income.

Table 4.6.1, furthermore provided insight into the determinants of smallholder farmers' income in the Free State Province. This showed the farming income (below average or above average) of smallholder farmers in the four age groups of 17-34 years old, 35-49 years old, 50-64 years old, and 65-80 years old. The data reveals that a majority of smallholder farmers in the 17-34 years old age group (89.4%), had a below average income, while the rest of the age groups had only slightly higher proportions of below average income earners (84%-92%). Further analysis revealed that the proportion of smallholder farmers with an above average income increased with age, with the highest proportion (53.8%) being in the 65-80 years old age group.

Table 4.6.1 suggested that age is an important factor in determining the farming income of smallholder farmers, in Free State, with older farmers having a better chance of achieving an above average income. The asymptotic significance (2-sided) in the table also showed that the data was statistically significant, with a p-value of

0.000. It showed that the observed differences in income between the age groups are not due to chance, but instead display real and significant differences.

Overall, this data revealed that these smallholder farmers are more likely to have below average income instead of an above average income, and that income is strongly linked to age. These findings therefore suggest that policies and interventions targeted at smallholder farmers in the province should consider the age of the farmers, when designing and implementing smallholder farming initiatives, as older farmers may have more opportunities for earning above average income than their younger counterparts.

4.6.2 Number of livestock kept and GFI determinants

Table 4.6.2 Number of livestock and GFI determinants

NUMBER OF LIVESTOCK KEPT AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Significance (2-sided)
Livestock kept in number	0-1 Livestock	89	11	100	0.010
		89.0%	11.0%	100.0%	
	2-5 livestock	28	12	40	
		70.0%	30.0%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Figure 4.6.2, indicated that there were significant differences between the number of livestock kept and farming income, where the p-value is less than 0.05. The results showed that farmers who had fewer livestock (89%) were more likely to have farming income below average, compared to those who had 2-5 livestock (70%). Having more livestock was therefore associated with higher farming income (30% versus 11%), meaning that those with 2-5 livestock had 2.5 times likelihood of having higher farming income.

It can be seen that the majority of the farmers (83.6%), earn a below average farming income, while only 16.4% of the farmers earn an above average income. The significance of this is further highlighted when looking at the number of livestock kept.

Approximately 89% of farmers with 0-1 livestock, earn below average income, while 70% of farmers who keep 2-5 livestock also earn below average income.

The earnings in table 4.6.2, are below average. This can be attributed to the fact that farmers with 0-1 livestock have the least amount of resources and thus, are unable to generate enough income to sustain their livelihoods. On the other hand, farmers who keep 2-5 livestock and have generated a higher average income, may have more resources.

4.6.3 Experience and GFI determinants

Table 4.6.3 Farming experience and GFI determinants

EXPERIENCE AND FARMING INCOME (DETERMINANTS)					
		Income		Total	Significance (2-sided)
		Below average	Above average		
Experience	Less than 5 years	53	5	58	0.571
		91.4%	8.6%	100.0%	
	More than 5 years	58	9	67	
		86.6%	13.4%	100.0%	
Total		111	14	125	
		88.8%	11.2%	100.0%	

Although the Chi-square test did not provide significant associations between farming experience and farming income (p-value is greater than 0.05), the results suggest that farmers with more experience, more than 5 years were more likely to realise higher income (13.4%) compared to those with less experience (8.6%).

Table 4.6.3, provided information on the correlation between experience and farming income of smallholder farmers in the Free State province. Across both groups of farmers with less than 5 years of experience and those with more than 5 years of experience. The majority have a below-average income. In the group with less than 5 years of experience, 91.4% had below-average income and 8.6% had above-average income. In the group with more than 5 years of experience, 86.6% had below-average income and 13.4% had above-average income. In total, 88.8% of the farmers had below-average income and 11.2% had above-average income. The significance (2-sided) is 0.571, indicating that there was not a strong correlation between experience and farming income.

The findings in table 4.6.3 suggest that the experience of smallholder farmers in the Free State province, does not have a major impact on their farming income. The data indicated that the majority of these farmers, regardless of their experience level, have below-average income. This could be due to a variety of factors, such as access to resources and training, market access, and the availability of credit, among other notable causes. In order to increase the farming income of smallholder farmers, it is essential to identify and address the underlying factors that are contributing to their below-average income. The interventions could include providing access to training and resources, improving market access, and providing access to credit. These measures could help to improve the income of smallholder farmers in the Free State province and improve their overall quality of life.

4.6.4 Main farming objective and GFI determinants

Table 4.6.4 Main objective of farming and GFI determinants

MAIN OBJECTIVE OF FARMING AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Own consumption	16	0	16	0.003
		100.0%	0.0%	100.0%	
	Marketing and selling	24	12	36	
		66.7%	33.3%	100.0%	
	Own consumption and selling	75	11	86	
		87.2%	12.8%	100.0%	
Total		115	23	138	
		83.3%	16.7%	100.0%	

Table 4.6.4, indicated that farmers whose objectives were to farm for own consumption were much more likely to realise a lower farming income (100%), compared to those who practiced farming for their own consumption and selling. Farmers who marketed and sold their produce were much more likely (33%), to have a higher income, as compared to those who sold and consumed their produce (12.9%), or produced for their own consumption (0%). It can therefore be concluded that there were positive associations between the objective of farming for both consumption and selling, also marketing and selling; and farming income on the other side.

Table 4.6.4, provided a breakdown of the main objectives of smallholder farming in the Free State province. The objectives were broken down into three categories, namely own consumption, marketing and selling, and own consumption and selling. The data showed that the majority of smallholder farmers (83.3%), are farming for their own consumption. This suggested that they are primarily concerned with providing for their own needs and those of their families.

The data also revealed that 16.7% of smallholder farmers are involved in marketing and selling their farming produce, while 12.8% of them are involved in both their own consumption and selling.

The indication from table 4.6.4 is that although the majority of smallholder farmers farm for their own consumption, there is still a significant portion of them who are involved in marketing and selling their produce. This further suggested that there are those interested in generating an income from their farming activities. The data further revealed that the majority of smallholders who are involved in marketing and selling their produce have relatively above average farming income. This showed that smallholder farmers who are involved in marketing and selling their produce are more successful than those who only focus on their own consumption. This could be a result of higher levels of investment in inputs and/or access to better markets for their produce.

4.6.5 Other income sources and GFI determinants

Table 4.6.5 Other type of income and GFI determinants

OTHER SOURCES OF INCOME AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Government grant	43	5	48	0.047
		89.6%	10.4%	100.0%	
	Pension	14	8	22	
		63.6%	36.4%	100.0%	
	Business	24	4	28	
		85.7%	14.3%	100.0%	
	Formal employment	15	2	17	
		88.2%	11.8%	100.0%	

Table 4.6.5, indicated that there were associations between other sources of income other than farming, and farming income, the p-value was less than 0.05%. Notably, farmers who received pension were more likely to have higher income (36%), compared to those who received a government grant (10.4%), were doing business (14.3%) or were in formal employment (11.8%).

Table 4.6.5, outlined different sources of income other than farming income. It also provided the proportion of income that falls below or above the average and the asymptotic significance (2-sided). Government grants make up the highest proportion of these other sources of income, with 89.6% of income falling below the average. This was followed by pension income at 63.6% and business income at 85.7%. Formal employment made up the smallest percentage of other sources of income, with 88.2% of income falling below the average.

According to table 4.6.5, government grants have the highest asymptotic significance (2-sided) at 0.047, indicating that it is the most reliable source of income among the other sources. This could be because government grants are typically provided on an annual basis and paid monthly, on an ongoing basis, and are generally determined by the government's budget. Pension income has the second highest asymptotic significance (2-sided) at 0.009, suggesting that it is also a reliable source of income. Pension income is usually provided for, through a private or public program and is often determined by the amount of contribution and years of service, or by a qualification of a regulatory old age.

Business income has the third highest asymptotic significance (2-sided) at 0.001, indicating that it is another relatively reliable source of income. This could be because businesses are often able to generate more income through sales and investments. Businesses can also take advantage of tax deductions and other incentives to increase their income.

Formal employment has the lowest asymptotic significance (2-sided) at 0.000, suggesting that it is not the most reliable source of income among the other sources, in this smallholder farming sector. This could be because formal employment often requires a certain level of education or experience, is subject to market conditions, and related job statistics have indicated that employment levels have been under tremendous stress over a long time.

Overall, the table suggests that government grants, pension income, and business income are the most reliable sources of income when compared to other sources, while formal employment is the least reliable. It also shows that the proportion of income that falls below or above the average varies depending on the source. This highlights the importance of diversifying one's sources of income in order to maximise their financial stability.

4.6.6 Off-farm income and GFI determinants

Table 4.6.6 Off-farm income and GFI determinants

OFF-FARM INCOME AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Missing information	3	1	4	0.002
		75.0%	25.0%	100.0%	
	Farming income	46	18	64	
		71.9%	28.1%	100.0%	
	Off-farm income	68	4	72	
		94.4%	5.6%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.6, indicated that there were associations between off-farm income type and farming income, the p-value was less than 0.05%. Farmers who had off-farm income had more chances to have less overall higher income (94.4%), meaning their income would cumulatively become lesser compared to those who depended on farming income (71.9%).

In table 4.6.6, higher and more consistent overall income was therefore associated with a dependence on farming income, where those who depended on farming income were 4 to 5 times more likely to have a higher and more consistent income.

In the first column of the table the overall income level is shown, with "below average" and "above average" as the two categories. The second column shows the total number of people in each category, and the third column provides the percentage of people in each category. The fourth column displays the asymptotic significance of the results (2-sided). The first row of the table shows the non-response by some of the respondents. There were 3 people in the "below average" income category and 1 in

the “above average” income category, a total of 4 people. The asymptotic significance of the results (2-sided) was 0.002, indicating that there is a statistically significant difference between the two categories. The second row of the table displays the results for farming income. There were 46 people in the “below average” income category and 18 in the “above average” income category, with a total of 64 people. The asymptotic significance of the results (2-sided) was not provided, indicating that there is no statistically significant difference between the two categories.

The third row of the table shows the results for off-farm income. There were 68 people in the “below average” income category and 4 in the “above average” income category, with a total of 72 people. The asymptotic significance of the results (2-sided) was 0.000, indicating that there is a statistically significant difference between the two categories.

The final row of the table displays the total results for the two categories. There were 117 people in the “below average” income category and 23 in the “above average” income category, a total of 140 people. The asymptotic significance of the results (2-sided) was 0.000, indicating that there is a statistically significant difference between the two categories.

Based on the above table, it is evident that off-farm income is a major determinant of overall income level. This is evidenced by the statistically significant differences between the “below average” and “above average” income categories in both the off-farm income and the “total results” rows of the table.

It is also evident that farming income is not a major determinant of overall income level, as the evidence provided by the lack of a statistically significant difference between the “below average” and “above average” of income categories in the farming income row of the table. Overall, the findings in table 4.6.6 suggest that off-farm income is a major determinant of overall income level, while farming income is not. This is an important finding, as it suggests that off-farm income is an important factor to consider when looking at the overall economic health of a smallholder farmer or a farming household.

4.6.7 Banking practice and GFI determinants

Table 4.6.7 Banking practice and GFI determinants

BANKING PRACTICE AND FARMING INCOME (DETERMINANTS)					
		Income		Total	Fisher's Exact Test
		Below average	Above average		Exact Significance (2-sided)
	No	77	4	81	0.000
		95.1%	4.9%	100.0%	
	Yes	40	19	59	
		67.8%	32.2%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.7, indicates that there were associations between banking practices and farming income, the p-value was less than 0.05%. Higher income was associated with banking practices where those who banked their income were 6 times more likely to have higher income (32.2%), compared to those who did not (4.9%).

Table 4.6.7, shows this relationship between banking practice and farming income, by using Fisher's Exact Test to examine the data and determine the exact significance of that relationship.

Fisher's Exact Test used in table 4.6.7 is a statistical test used to determine if there is a significant association between two categorical variables (Connelly, 2016). It is used when the sample size is small or when the expected values in the two by two table are small. The test works by constructing a contingency table of observed values and then calculating the probability of obtaining that exact set of observed values given the marginal totals of the table (Guogen & Gerstenberger, 2017).

If the probability of obtaining the observed values is very small, then this provides strong evidence that there is a significant association between the two variables. The table is divided into two main columns, one for income below the average and one for income above the average, and two main rows, one for those who do banking and one for those who do not. The data showed that 77 of the participants surveyed who did not utilise banking services, had income below the recorded average, while only 4 of them had income above the average. On the other hand, 40 people who did have banking services had an income that was below the average, while 19 had income

that was above average. Overall, this data suggested that there is a statistically significant relationship between banking practice and farming income.

Specifically, it suggests that those who do banking are more likely to have an income that is above average, while those who do not are more likely to have an income that is below average. This data can be used to inform banking practices in order to improve farming income for farmers. Banks may want to consider offering more products and services that are tailored to the needs of smallholder farmers, such as low interest loans or specialised financial transactions and products.

4.6.8 Cooperative membership and GFI determinants

Table 4.6.8: Cooperative membership and GFI determinants

COOPERATIVE MEMBERSHIP AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	No	84	5	89	0.000
		94.4%	5.6%	100.0%	
	Yes	33	18	51	
		64.7%	35.3%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.8 shows that 84 out of the 140 respondent smallholder farmers (60%), had income that was below the average, and 33 (23.5%), of those had cooperative membership. Those in cooperatives were 5 times more likely to have higher income (35.3%), as compared to those not in cooperatives (5.6%). The remaining 23 smallholder farmers (16.4%), had income above the average, and 18 (12.9%), of them had cooperative membership.

The data suggested that cooperative membership was positively associated with a higher farming income among smallholder farmers. This was since a higher proportion

of farmers with income that was above the average had a cooperative membership (35.3%), compared to those with an income below the average (5.6%).

Table 4.6.8, shows the cooperative membership and farming income of smallholder farmers. There were links or associations between membership in a cooperative and farming income, the p-values were less than 0.05%. The table presents the number and percentages of farmers with income that are below and above average, and the asymptotic significance (2-sided) for the respondent sample. The asymptotic significance (2-sided) of 0.000 suggested that the difference between the two groups is statistically significant. The data in Table can be used to analyse the impact of cooperative membership on the farming income of smallholder farmers. It is possible that cooperative membership provides smallholder farmers with access to better resources and support that enables them to produce higher income.

Cooperatives may provide access to credit, better seed varieties, improved agricultural practices, and other resources that can increase farming production and farming income. Cooperatives may also provide access to technical assistance and training that can help farmers to better manage their production and increase farming revenues.

4.6.9 Agricultural association membership and GFI determinants

Table 4.6.9: Membership of agricultural associations and GFI determinants

AGRICULTURAL ASSOCIATION MEMBERSHIP AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	No	67	3	70	0.000
		95.7%	4.3%	100.0%	
	Yes	50	20	70	
		71.4%	28.6%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.9 indicates that those with membership in agriculture associations were also 5 times more likely to have higher income (28.6%), as compared to those not in agriculture associations (4.3%). Of the 117 farmers with an income below the average, 95.7% were not members of an agricultural association, while only 4.3% were members. Of the 23 farmers with income above the average, 71.4% were members of an agricultural association, while 28.6% were not.

Table 4.6.7, showed the impact of agricultural association membership on the farming income of smallholder farmers. There were links or associations between membership in an agriculture association, and farming income, as the p-values were less than 0.05%. It showed that, when comparing those with and without membership in an agricultural association, those who are members have a significantly higher income than those who are not.

Specifically, of the 140 farmers surveyed, 67 of them reported an income below the average, while 50 of the farmers with membership reported an income that was below the average. This suggested that agricultural association membership may play a role in helping smallholder farmers increase their farming income. Furthermore, the table also showed that from the 140 respondent farmers, 117 reported an income below the average and 23 reported an income above the average.

The table showed that the asymptotic significance (2-sided) for the impact of agricultural association membership on farming income is 0.000. This indicates that

there is a statistically significant difference between the income of those with and without membership in an agricultural association, and that the difference is not due to chance.

Overall, the table suggested that agricultural association membership has a positive impact on the farming income of smallholder farmers. Specifically, those who are members, are more likely to have an income above the average, which suggested that the benefits of the association are helping to increase the income of farmers.

4.6.10 Receiving mentorship and GFI determinants

Table 4.6.10 Receiving mentorship and GFI determinants

RECEIVING MENTORSHIP AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	No	55	4	59	0.009
		93.2%	6.8%	100.0%	
	Yes	62	19	81	
		76.5%	23.5%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.10 shows that those receiving guidance from a mentor in farming business were 3 times more likely to have a higher farming income (23.5%), as compared to those who did not receive (6.8%). The data table showed that of the 140 smallholder farmers reviewed, 117 were not receiving mentorship while 23 received mentorship. Of those who did not receive mentorship, 93.2% had below average income while 6.8% had above average farming income. For those who did receive mentorship, 76.5% had below average income and 23.5% had above average income.

Table 4.6.10, highlights the impact of receiving mentorship on smallholder farmers on their farming income. There were interconnections between receiving guidance from a mentor in farming business and farming income, where the p-values were less than 0.05%. The data provides information on the income of smallholder farmers who received mentorship and those who did not, and included the total number of farmers in each group as well as the percentage of farmers with below average and above average income in each group.

The results of this survey indicated that receiving mentorship had a statistically significant impact on the farming income of smallholder farmers. The asymptotic significance for the two-sided test was 0.009, which was well below the commonly accepted significance level of 0.05 and thus indicated that the differences observed between the two groups are likely to be real and not the result of chance.

The data from this survey suggested that smallholder farmers who receive mentorship, tend to have a higher income than those who do not. This could be due to the fact that mentorship provides smallholder farmers with the opportunity to gain important skills, knowledge and resources which may help them to increase their production yields and thus their farming income.

Additionally, mentorship may give smallholder farmers access to networks and resources which can help them to improve their production and marketing strategies in order to increase their revenues. It is important to note, however, that more research is needed in order to fully understand the effects of mentorship on farming income. Additionally, further research is needed to understand the specific types of mentorship which have the most beneficial impacts on farming income.

4.6.11 Providing mentorship and GFI determinants

Table 4.6.11 Providing mentorship and GFI determinants

GIVING MENTORSHIP AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	No	50	4	54	0.022
		92.6%	7.4%	100.0%	
	Yes	67	19	86	
		77.9%	22.1%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

In table 4.6.11, those who were mentors were 3 times more likely to have a higher income (22.1%), as compared to those who did not receive an income (7.4%). Table 4.6.11 shows that there were associations between being a mentor giving guidance in farming business and farming income.

4.6.12 Plant production skills and GFI determinants

Table 4.6.12 Plant production skills and GFI determinants

SKILLS IN PLANT PRODUCTION AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Missing information on skills	24	8	32	0.030
		75.0%	25.0%	100.0%	
	No	49	3	52	
		94.2%	5.8%	100.0%	
	Yes	44	12	56	
		78.6%	21.4%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Those who were accessing plant production skills were 3 times more likely to have a higher income (21.4%), as compared to those who did not receive these (5.8%). The data shows that, of the 140 smallholder farmers, who supplied their income amounts out of the total 372 respondents, 24 of those did not provide information on their access to skills in plant production, while 49 indicated they had no skills and 44 had some skills.

Of the 24 without this information, 75.0% however, still indicated that they had an income, and these were below average, while 25.0% had an income above average. On the other hand, of the 49 with no skills, 94.2% had an income below average, while 5.8% had an income above average. Finally, of the 44 with some skills, 78.6% had an income below average and 21.4% had an income above average.

Table 4.6.12 provided an overview of the impact that smallholder farmers' skills in plant production have on their farming income. Specifically, the table highlighted the impact of absence of skills, as well as the presence of skills, on income that were below or above average. It shows that there were associations between plant production skills and farming income, where the p-values were less than 0.05%. The results suggested that there was a statistically significant association between, where there are existing skills in plant production and farming income outcome. The results suggested that smallholder farmers with skills in plant production are more likely to have an income above average than those without.

The asymptotic significance (2-sided) is 0.030, indicating that there was a statistically significant association between smallholder farmers' skills in plant production and their farming income. Overall, these results suggested that smallholder farmers who have some skills in plant production are more likely to a have higher income than those without any skills.

This is likely due to the fact that these farmers are better able to manage their crops and maximise their yields. As such, investing in smallholder farmers' skills in plant production is likely to lead to increased income and improved livelihoods. Furthermore, this could have a positive impact on local economies, as an increased income is likely to lead to increased spending and economic growth.

4.6.13 Animal production skills and GFI determinants

Table 4.6.13 Animal production skills and GFI determinants

SKILLS IN ANIMAL PRODUCTION AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Missing information	35	12	47	0.024
		74.5%	25.5%	100.0%	
	No	49	3	52	
		94.2%	5.8%	100.0%	
	Yes	33	8	41	
		80.5%	19.5%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.13 indicated that those who had access to animal production skills were 3 times more likely to have a higher income (19.5%), as compared to those who did not (5.8%). The data was based on the information of 140 respondents, out of a total 372. These 140 respondents shared information about their received gross farming income. Of these 140 respondents, 35 of them did not provide any information regarding their animal production skills, while 49 of them have no animal production skills, and 33 of them have animal production skills or had access to animal production skills.

The data showed that the total farming income of smallholder farmers who did not provide information on their animal production skills is 47. This makes up 74.5% of the total farming income of smallholder farmers. Another set of data showed that the total

farming income of smallholder farmers with no animal production skills is 52, which made up 94.2% of the total farming income of smallholder farmers. Another row in the table indicated that the total farming income of smallholder farmers with animal production skills, which was noted as 41. This made up 80.5% of the total farming income of smallholder farmers.

Table 4.6.13, indicated the impact of animal production skills of smallholder farmers on their farming income. The columnar information indicated the total number of smallholder farmers; the total farming income of smallholder farmers who did not share any information about their animal production skills; the total farming income of smallholder farmers with no animal production skills, and the total farming income of smallholder farmers who answered yes to receiving animal production skills.

The above is an indication that smallholder farmers with no information on their animal production skills had the lowest farming income. This was followed by smallholder farmers with no animal production skills and smallholder farmers with animal production skills. There were associations between animal production skills and farming income, where the p-values were less than 0.05%. The data also indicated that the asymptotic significance (2-sided) for smallholder farmers with no information on their animal production skills was 0.024. This suggested that there is a statistically significant difference in the farming income of smallholder farmers with missing information on their animal production skills and those with no or existing animal production skills.

4.6.14 Financial management skills and GFI determinants

Table 4.6.14 Financial management skills and GFI determinants

SKILLS IN FINANCIAL MANAGEMENT AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Missing information	37	3	40	0.000
		92.5%	7.5%	100.0%	
	No	50	3	53	
		94.3%	5.7%	100.0%	
	Yes	30	17	47	
		63.8%	36.2%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.14 indicates that those who had financial management skills provided for them, were 3 times more likely to have higher income (32.6%) compared to those who did not receive the said skills (5.7%). The table then showed that a significant majority (83.6%), of smallholder farmers do not have any financial management skills, or have anyone providing the required skills.

This was further supported by 117 of the 140 confirmed farming income earners, that are without access to financial management skills, which resulted in 92.5% of participants that reported a below average farming income. This was in contrast, to the 23 farmers who reported having financial management skills, or access thereto. Only 36.2% of participants have reported a below average farming income.

The data in table 4.6.14 illustrated the impact of financial management skills of smallholder farmers on their farming income. The data showed the presence or absence of financial management skills, that resulted in whether the farmer's farming income is below or above average. The total number of farmers in each category was also displayed, with the associated asymptotic significance (2-sided). There were associations between financial management and farming income, as the p-values were less than 0.05%. This suggests that having provision of financial management skills was associated with higher farming income, as the presence of such skills appeared to increase the likelihood of having an above average income.

The asymptotic significance (2-sided) column further reinforced this conclusion, as it showed that the difference between the two columns is statistically significant (p=0.000). This indicated that the difference in farming income between those with and without financial management skills was not likely to have occurred by chance. Overall, Table suggested that smallholder farmers with financial management skills tend to have higher farming income than those without such skills. This highlights the importance of financial management skills for smallholder farmers, as they can potentially increase their income by acquiring and leveraging such skills. It is therefore important for smallholder farmers to invest in acquiring financial management skills in order to maximise their farming income.

4.6.15 Recordkeeping skills and GFI determinants

Table 4.6.15 Recordkeeping skills and GFI determinants

SKILLS IN RECORD KEEPING AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Missing information	35	3	38	0.004
		92.1%	7.9%	100.0%	
	No	48	5	53	
		90.6%	9.4%	100.0%	
	Yes	34	15	49	
		69.4%	30.6%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.15, presented the data collected from 140 smallholder farmers who commented on their recordkeeping skills of their farming income. The data shows that out of the 140 smallholder farmers, 117 have an income that was below average and 23 have an income that was above average.

A higher percentage of smallholder farmers without recordkeeping skills (90.6%), that had a below average income, compared to those with recordkeeping skills (69.4%), that had an above average income. Furthermore, the data also showed that out of the 117 smallholder farmers who had an income that was below average, 35 participants did not provide any information on their recordkeeping skills and 48 participants have no recordkeeping skills available to them. On the other hand, out of the 23 smallholder farmers who have an income that was above average, 15 have recordkeeping skills.

It was clear from table 4.6.15 that there is a significant relationship between recordkeeping skills and farming income. Those smallholder farmers who have recordkeeping skills had an above average income while those without recordkeeping skills had a below average income.

4.6.16 Marketing and sales skills and GFI determinants

Table 4.6.16 Marketing and sales skills and GFI determinants

SKILLS IN MARKETING AND SALES, AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Missing information	33	4	37	0.090
		89.2%	10.8%	100.0%	
	No	46	6	52	
		88.5%	11.5%	100.0%	
	Yes	38	13	51	
		74.5%	25.5%	100.0%	
Total		117	23	140	
		83.6%	16.4%	100.0%	

Table 4.6.16 shows that those who have marketing and sales skills, were 2 times more likely to have a higher income (25.5%), as compared to those who did not poses those skills (11.5%). The data further showed that the majority of smallholder farmers (83.6%), had an income level that was below average. Of those, 89.2% of them did not provide information on their marketing and sales skills, while only 10.8% said they have no skills in marketing and sales. Of those with skills in marketing and sales, 74.5% had an income level that was below average. The data also showed that 16.4% of smallholder farmers had an income level that was above average. Of those, 11.5% of them have no skills in marketing and sales, while 25.5% have some skills in marketing and sales.

There were weaker associations between marketing and sales, and farming income levels, with results being significant at 10% level, in table 4.6.16. Table 4.6.16, further showed the impact of marketing and sales skills of smallholder farmers on farming income. Specifically, it looked at the income level of smallholder farmers, their level of marketing and sales skills, and the associated asymptotic significance (2-sided).

The asymptotic significance (2-sided) for the table is 0.090, which indicated that the results are statistically significant. Specifically, it appears that having skills in marketing and sales can help smallholder farmers increase their income levels from below average to above average. Furthermore, the results suggest that smallholder farmers who lack these marketing and sales skills may benefit from obtaining training in that are line with increasing their income levels.

4.6.17 Up to date production records and GFI determinants

Table 4.6.17 Updated production records and GFI determinants

UPDATED PRODUCTION RECORDS AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Strongly disagree	20	0	20	0.003
		100.0%	0.0%	100.0%	
	Neutral	25	0	25	
		100.0%	0.0%	100.0%	
	Somewhat agree	13	0	13	
		100.0%	0.0%	100.0%	
	Strongly agree	45	12	57	
		78.9%	21.1%	100.0%	
Total		103	12	115	
		89.6%	10.4%	100.0%	

The data in table 4.6.17 showed that out of the 103 farmers who had a below average income, 100% of them strongly disagreed with the statement that their production records had any impact on their income. Similarly, out of the 12 farmers who had an above average income, 100% of them strongly agreed with the statement that their production records had an impact on their income. Farmers who strongly agreed that they maintained updated production records where they were more likely to realise a higher income (21%), compared to those who disagreed (0%).

Table 4.6.17, provided data on the impact of up to date production records on farming income. It is clear that there is a strong correlation between having most up to date production records and having a higher income. This suggested that having up to date production records is an important factor in increasing farming income. The data also suggested that there is a statistically significant correlation between having strong production records and having a higher income.

The asymptotic significance (2-sided) for the data is 0.003, which is considered to be statistically significant. There were associations between maintaining updated production records and farming income levels, that showed $p<0.05$. These results suggested that not maintaining updated production records was associated with a lower farming income.

4.6.18 Up to date sales records and GFI determinants

Table 4.6.18: Updated sales records and GFI determinants

UPDATED SALES RECORDS AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Strongly disagree	25	1	26	0.002
		96.2%	3.8%	100.0%	
	Somewhat disagree	1	0	1	
		100.0%	0.0%	100.0%	
	Neutral	23	0	23	
		100.0%	0.0%	100.0%	
	Somewhat agree	15	2	17	
		88.2%	11.8%	100.0%	
	Strongly agree	39	18	57	
		68.4%	31.6%	100.0%	
Total		103	21	124	
		83.1%	16.9%	100.0%	

In table 4.6.18, farmers who generally agreed that they maintained updated sales records were 10 times more likely to realise a higher income (43.4%), as compared to those who disagreed (3.8%). Upon examining the data, it was clear that there is a strong correlation between up-to-date sales records of smallholder farmers and their farming income. The data showed that out of the total sample size of 124 respondents, 83.1% (103 respondents), reported having a “below average” farming income, while 16.9% (21 respondents), reported an “above average” farming income.

Furthermore, the data showed that respondents with a “below average” farming income were more likely to “strongly disagree” (96.2%), than those who “somewhat disagree” (3.8%) or were “neutral” (0%), when asked about the impact of up-to-date sales records on their farming income. On the other hand, respondents with an “above average” farming income were more likely to “strongly agree” (68.4%), than

"somewhat agree" (11.8%) or being "neutral" (0%), when asked about the impact of maintaining up-to-date sales records on their farming income.

The results of table 4.6.18 suggested that a lack of maintaining updated sales records was associated with a lower farming income. There were associations between maintaining of updated sales records and farming income levels ($p<0.05$).

The data highlighted the impact of up-to-date sales records of smallholder farmers on their farming income. The table was divided into columns that showed the income level of the respondents and the other representing the total number of respondents. The columns section displays the income level of the respondents, with the categories being "below average" and "above average". The other column section showed the total number of respondents in each category.

4.6.19 Up to date income records and farming income determinants

Table 4.6.19: Updated income records and GFI determinants

UPDATED INCOME RECORDS AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Significance (2-sided)
	Strongly disagree	28	0	28	0.000
		100.0%	0.0%	100.0%	
	Somewhat disagree	2	0	2	
		100.0%	0.0%	100.0%	
	Neutral	18	0	18	
		100.0%	0.0%	100.0%	
	Somewhat agree	13	0	13	
		100.0%	0.0%	100.0%	
	Strongly agree	42	21	63	
		66.7%	33.3%	100.0%	
Total		103	21	124	
		83.1%	16.9%	100.0%	

Table 4.6.19 indicated that farmers who generally agreed that they maintained updated revenue records were more likely to realise a higher income (33.3%), compared to those who disagreed (0%). These results suggested that not maintaining an updated revenue records was associated with lower farming income.

Of the 124 respondent smallholder farmers, who confirmed their income, out of the overall 372, 103 (83.1%), of those reported that they strongly agreed or somewhat agreed that having an up-to-date income generated records had a positive impact on their farming income. This was compared to the 21 (16.9%), smallholder farmers who reported that they either strongly disagreed or somewhat disagreed that having an up-to-date income generated records, had a positive impact on their farming income.

Table 4.6.19, showed the impact of an up-to-date income generated records of smallholder farmers on their farming income. The data indicated that there is a strong correlation between regularly updating income records, the skills associated and farming income. The significance (2-sided) of the data was 0.000, indicating that the correlation between income records maintained and farming income was statistically significant. There were also associations between maintaining of updated revenue records and farming income levels ($p<0.05$). By maintaining up-to-date records, smallholder farmers can better track their expenses, profits, and losses from their farming operations.

4.6.20 Up to date expenditure recordkeeping and GFI determinants

Table 4.6.20: Updated expenditure records and GFI determinants

UPDATED EXPENDITURE RECORDS AND FARMING INCOME (DETERMINANTS)					
		Income		Total	
		Below average	Above average		Asymptotic Significance (2-sided)
	Strongly disagree	29	0	29	0.000
		100.0%	0.0%	100.0%	
	Somewhat disagree	2	0	2	
		100.0%	0.0%	100.0%	
	Neutral	16	0	16	
		100.0%	0.0%	100.0%	
	Somewhat agree	12	0	12	
		100.0%	0.0%	100.0%	
	Strongly agree	44	21	65	
		67.7%	32.3%	100.0%	
Total		103	21	124	
		83.1%	16.9%	100.0%	

Farmers who generally agreed that they maintained updated expenditure records in table 4.6.20 were more likely to realise a higher income (32.3%), compared to those who disagreed (0%).

Table 4.6.20, further showed that out of the total sample size of 124 smallholder farmers, 103 (83.1%), agreed that having their expenditure records updated had an impact on their farming income. Of these 103 farmers, 44 (67.7%), strongly agreed that their up to date expenditure records had an impact on their farming income, 12 (9.7%), somewhat agreed, 16 (12.9%), were neutral, and 2 (1.6%), somewhat disagreed.

On the other hand, 21 (16.9%), of the respondents disagreed that their up to date expenditure records had an impact on their farming income, and all of them strongly disagreed. The results of the survey showed that an overwhelming majority (83.1%) of smallholder farmers agreed, that maintaining up to date expenditure records had an impact on their farming income. This was further reinforced by the fact that out of the 103 farmers who agreed that their up to date expenditure records had an impact on their farming income, a majority (67.7%), strongly agreed.

The impact of up to date expenditure records of smallholder farmers on their farming income can be interpreted from Table 4.6.20. The data showed the responses of smallholder farmers when asked about how strongly they agreed or disagreed with the impact their up to date expenditure records had on their farming income. The responses were divided into five categories: "strongly disagree", "somewhat disagree", "neutral", "somewhat agree", and "strongly agree".

There were associations between maintaining of updated expenditure records and farming income levels ($p<0.05$). These results suggested that no maintenance of updated expenditure records was associated with lower farming income. This furthermore highlighted that the majority of smallholder farmers understand the importance of having up to date expenditure records, and how it can help them increase their farming income. On the other hand, the fact that 16.9% of the respondents disagreed that their up to date expenditure records had an impact on their farming income showed that there is still a significant portion of smallholder farmers who are unaware of the benefits of having up to date expenditure records.

4.7 UNIVARIATE ANALYSIS (WITH UNIVARIATE MEASURES)

Univariate measures are able to determine patterns and is one of the simplest form of analysing data; where variables in a data set are explored separately to show why they vary to others, as well how they connect within the unit that is the subject of analysis (Tessler, 2023); in this case the GFI.

4.7.1 Years in farming

Table 4.7.1: Years in farming

YEARS IN FARMING (DESCRIPTIVE STATISTICS)		
Number of farmers who responded	Valid information	308
Number of farmers who did not respond	Missing information	64
Mean		7.150
Median		4.000
Standard deviation		8.9792
Skewness		3.033
Standard error of skewness		0.139
Minimum		0.0
Maximum		72.0
Percentiles	25	2.000
	50	4.000
	75	9.000

The median years in farming was 4 years (IQR: 2-9 years), with a minimum of 1 year and maximum of 72 years (outlier).

Table 4.7.1, provides descriptive statistical information about the number of years' smallholder farmers have been practising farming. The table included the number of farmers who responded and the number of farmers who did not respond, along with the mean, median, standard deviation, skewness, standard error of skewness, minimum, maximum, and percentages of the data.

In total, there were 308 farmers who responded and 64 farmers who did not respond. The mean, or average, of the data is 7.150 years. This means that, on average, the farmers who responded have been farming for 7.150 years. The median, or middle value, of the data is 4.000, which means that 50% of the farmers have been farming for 4 years or less.

The standard deviation of the data was 8.9792. This means that the data was spread out over a range of 8.9792 years. The skewness of the data was 3.033 and the standard error of skewness is 0.139. These values indicate that the data is right-skewed, as the skewness value is greater than the standard error of skewness, meaning that the right tail of the data is longer than the left tail, and that the majority of the values are located on the left side of the data.

The minimum value of the data is 0.0, meaning that at least one farmer has been farming for 0.0 (0) years, or less than a year. The maximum value of the data is 72.0, meaning that at least one farmer has been farming for 72 years.
Finally, the percentages indicated that 25% of farmers have been farming for 2.000 (2), years or less, 50% of the farmers have been farming for 4.000 (4), years or less, and 75% of the farmers have been farming for 9.000 (9), years or less.

4.7.2 Gross farming income

Table 4.7.2: Gross farming income

GROSS FARMING INCOME (DESCRIPTIVE STATISTICS)		
Number of farmers who responded	Valid information	140
Number of farmers who did not respond	Missing information	232
Mean		57251.62
Median		11250.00
Skewness		3.806
Standard error of skewness		0.205
Minimum		150.00
Maximum		841000.00
Percentiles	25	2505.00
	50	11250.00
	75	45950.00

Table 4.7.2, presented the results from question(s) on gross farming income of 372 smallholder farmers. The valid responses from the review were from 140 farmers, and the remaining 232 farmers did not respond. The mean value for the survey was 57251.62, which was the average income of the 140 farmers who responded. The median value was 11250.00, which was the midpoint of the dataset. This means that half of the farmers who responded had an income that was lower or equal to R 11250.00.

The skewness value of 3.806 suggested that the data is heavily skewed to the right, meaning that most of the responses were on the high end of the income scale. This is supported by the standard error of skewness, which is 0.205. The minimum and maximum values of R 150.00 and R 841,000.00 respectively, suggested a wide range of income among the farmers surveyed. The 25th, 50th and 75th percentages of 2505.00; 11250.00 and 45950.00 respectively indicated that the lower quartile of smallholder farmers surveyed had an income of R2,505.00 and below, the median quartile had an income of R11,250.00 and below, and the upper quartile had an income of R45,950.00 and below.

4.7.3 Budgeted sales

Table 4.7.3: Budgeted sales

SALES BUDGETED AMOUNT (DESCRIPTIVE STATISTICS)		
Number of farmers who responded	Valid information	174
Number of farmers who did not respond	Missing information	198
Mean		119519.08
Median		10000.00
Skewness		5.290
Standard error of skewness		0.184
Minimum		100
Maximum		3000000.00
Percentiles	25	3000.00
	50	10000.00
	75	50000.00

The Sales Budgeted Amount, in Table 4.7.1, displayed the information gathered from 174 out of the 372 smallholder farmers who responded on their expected sales for the upcoming year. The table showed the mean, median, skewness, standard error of skewness, minimum, maximum, and percentages of the data collected. The mean of the data was 119,519.08, while the median was 10,000.00.

The mean was higher than the median, which indicated that the data is skewed to the right. This could be due to the presence of outliers in the data set. The skewness of the data was 5.290, which further confirmed that the data is right skewed. The standard error of skewness is 0.184, which indicated that the data is not normally

distributed. The minimum and maximum values in the data set are 100 and 3,000,000.00 respectively.

This large difference in the extreme values indicated that the data set is highly variable. The percentages indicate that the lower quartile is R 3,000.00 and the upper quartile is R 50,000.00. This implied that most of the values lied between R 3,000.00 and R 50,000.00.

4.7.4 Target sales

Table 4.7.4: Target sales

SALES TARGETED AMOUNT (DESCRIPTIVE STATISTICS)		
Number of farmers who responded	Valid information	204
Number of farmers who did not respond	Missing information	168
Mean		87926.07
Median		11500.00
Skewness		5.286
Standard error of skewness		0.170
Minimum		38.00
Maximum		2000000.00
Percentiles	25	3125.00
	50	11500.00
	75	47250.00

The descriptive statistics of the Sales Targeted Amount included the number of farmers who responded and those who did not respond, with the mean, median, skewness, standard error of skewness, minimum, maximum, and percentages. The number of farmers who responded with valid information was 204, and those who did not respond were 168. The mean of the sales targeted figure was 87926.07. The median of the sales targeted number was 11500.00. This means that half of the values are higher than amounts of R11,500.00 and half of the values are lower than amounts of R11,500.00.

The skewness of the sales targeted figure was 5.286. This showed that the data was more heavily concentrated on the right side of the distribution, meaning that the right tail is longer than the left tail. This could indicate that the majority of the smallholder

farmers had higher sales targets than the median. The standard error of skewness was 0.170 which indicates that the skewness is statistically significant.

The minimum sales target amount was R 38.00, and the maximum amount was R 2000,000.00. The percentiles indicate that 25% of the farmers had sales targets below amounts of R 3,125.00, with 50% of the farmers having sales targets below R 11,500.00, and 75% of the farmers having sales targets below amounts of R 47,250.00

4.8 MULTIVARIATE ANALYSIS

In order to propose a relevant farming income model for smallholder farmers in Free State province, South Africa, a multiple linear regression analysis was conducted on two models. The first model being on general factors that affect GFI and the second model on demographic factors affecting GFI.

The coefficients and the embedded standard errors for each independent variable, as well as the p-values and confidence intervals, are shown in the compact or matrix model:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + ... + \beta n*Xn$$

Where, Y is the dependent variable (smallholder farming income),
X1, X2, …, and Xn are the independent variables,
β0 is the intercept (constant term), and
β1, β2, ..., βn are the coefficients of the independent variables.

4.8.1 Regression analysis model 1, farm practice factors affecting GFI

Table 4.8.1: Regression model showing farm practice factors affecting GFI

INCOME (Above average)	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
MAINTYPEOFFARMACTIVITIES					
Cropping	.425758	.240796	**0.080	-.052155	.903672
Horticulture	.320020	.230927	0.169	-.138307	.778347
Livestock only	.479925	.243837	**0.052	-.004024	.963875
Mixed Farming	.454696	.242670	**0.064	-.026937	.936329
LIVESTOCK (None)					
1-2 Livestock	-.040588	.097906	0.679	-.234904	.153728
3-4 livestock	0	omitted			
A11_MAINFARMINGOBJECTIVE (Consumption only)					
Marketing and selling	.166793	.119812	0.167	-.07100	.404588
Own consumption and selling	.045167	.104547	0.667	-.162331	.252666
A13_OTHERSOURCEOFINCOME (Grant)					
Pension	.254060	.083131	**0.003	.089067	.419054
Business	-.016208	.078133	0.836	-.171282	.138864
Formal employment	-.048248	.090944	0.597	-.228747	.132251
Income banked (No)					
YES	.284419	.067233	*0.000	.150979	.417858
A16_Activities_Debted (No)					
YES	-.099907	.085286	0.244	-.269177	.069362
A16_COOPORATIVE	.146637	.064140	*0.024	.019335	.273939
A18_ASSOCIATION	.104693	.065008	0.111	-.024329	.233716
(Constants)	-.804564	.275708	0.004	-1.35176	-.25736

*Significant at 5% level **Significant at 10% level R-squared = 0.4319 P = 0.0001 F = 3.154

The multiple linear regression equation is therefore detailed as follows, in the regression model 1:

Smallholder farming income = - 0.804564 (β0) + 0.425758 (Cr) + 0.320020 (Ho) + 0.479925 (Li) + 0.454696 (Mi) - 0.040588 (Ow) + 0.166793 (Ma) + 0.045167 (Co) + 0.254060 (Pe) - 0.016208 (Bu) - 0.048248 (Fo) + 0.284419 (Ba) - 0.099907 (Fa) + 0.146637 (Me) + 0.104693 (As)

Where, (Cr) is cropping, (Ho) is horticulture, (Li) is livestock, (Mi) is mixed farming, (Ow) is ownership of one to two (1 – 2) livestock, (Ma) is main objective of farming being to market and sell produce, and (Co) is main objective of farming being to consume and sell. Furthermore, (Pe) is other sources of farming income being pension, (Bu) is other sources of farming income being business income, (Fo) is other sources of farming income being formal employment, (Ba) is other sources of farming income being banked income, (Fa) is farming debt, (Me) is cooperative membership, and (As) is association membership.

Based on the information collated and given in table 4.8.1, the significance of the relationship for each of the independent variables is as follows:

For cropping, the coefficient is 0.425758 and the associated p-value is 0.080, which is not significant at the 5% level but significant at the 10% level. On horticulture, the coefficient is 0.320020 and the associated p-value is 0.169, which is not significant at both the 5% and 10% levels.

With livestock, the coefficient is 0.479925 and the associated p-value is 0.052, which is not significant at the 5% level but significant at the 10% level. Mixed farming has a coefficient of 0.454696 and an associated p-value of 0.064, which is not significant at the 5% level but significant at the 10% level.

The coefficient for ownership of one to two (1 – 2) livestock is -0.040588. The associated p-value is 0.679, which is not significant at both the 5% and 10% levels. Where the main objective of farming is to market and sell, the coefficient is 0.166793. The associated p-value is 0.167, which is not significant at both the 5% and 10% levels.

For smallholder farmers who consume and sell, the coefficient is 0.045167 and the associated p-value is 0.667, which is not significant at both the 5% and 10% levels. Where the other source of farming income is pension, the coefficient is 0.254060. The associated p-value is 0.003, which is significant at the 5% level.

Those smallholder farmers earning business income, where the coefficient is -0.016208, the associated p-value is 0.836, which is not significant at both the 5% and 10% levels. Formal employment is the other source of farming income where the coefficient is equals to - 0.048248. The associated p-value is 0.597, which is not significant at both the 5% and 10% levels.

The impact of banked income has a coefficient of 0.284419. The associated p-value is 0.000, which is significant at the 5% level. For farming debt, the coefficient is -0.099907. The associated p-value is 0.244, which is not significant at both the 5% and 10% levels.

Regarding the cooperative membership, the coefficient is 0.146637 and the associated p-value is 0.024, which is significant at the 5% level, while the coefficient for association membership is 0.104693. Its associated p-value is 0.111, which is not significant at both the 5% and 10% levels.

Significance at the 5% level represents a more stringent criteria for determining significance compared to the 10% level. Therefore, variables that are significant at the 5% level are generally considered more reliable indicators of the relationship with the dependent variable. The above factors that affect the GFI relationship are presented in a summary of categories below:

1. Type of farming

Table 4.8.1, indicated that there was a relationship between main types of smallholder farming activities and farming income. The results were significant at a 10% level, highlighting a significant weakness. Compared to those who were involved in cropping or horticulture farming only, where owning livestock had the greatest positive effect on income ($B=0.478$, $p<0.05$), followed by those who practiced mixed farming of both livestock and cropping ($B=0.45$, $p<0.05$).

2. Other sources of income

Other sources of income had an effect on farming income, as results are significant at 5% level. Receiving pension had some positive effects on farming income, with those who received pension being more likely to have a higher farming income in this study ($B=0.25$, $p<0.05$). Notably, business and formal employment did not have any effect on farming income.

3. Banked income

Banked revenue from sales had an effect on gross farming income, with results being significant at 5% level ($b=0.284$, $P<0.05$). Those who banked their income after sales had a higher farming income in this study, as compared to farmers who did not bank their revenue income.

4. Cooperatives

Belonging to a cooperative was positively associated with more farming income, where results are significant at a 5% level. Farmers who belonged to a cooperative

were more likely to have a higher farming income, compared to those who were not (B=0.147, p<0.05).

5. Associations of farmers

This study, also highlighted that being in an association showed lesser, and therefore a weak positive effects on farming activities (B=0.104, p=0.1).

4.8.2 Regression analysis model 2, demographic factors affecting GFI

Table 4.8.2: Regression model showing demographic factors affecting GFI

INCOME	Coef.	Std. Err.	P>t	[95% Conf.	Interval]
GENDER	.1028595	.0680846	0.135	-.0325582	.2382771
Age Group (<34 years)					
35-49 years	-.0641725	.0756273	0.399	-.2145921	.0862471
50-64 years	.0199132	.1037873	0.848	-.1865155	.226342
65-80 years	.3540646	.1480775	*0.019	.0595443	.6485849
Education (No education)					
Below Matric	-.0949949	.2003654	0.637	-.4935136	.3035238
Matric	-.0710648	.1913192	0.711	-.451591	.3094614
Above Matric (Diploma, Degree...)	-.0334977	.2018498	0.869	-.4349687	.3679733
AGRIC_CERTIFICATE (None)					
Agric qualification	-.0567162	.1115609	0.613	-.2786064	.1651739
A6_HH_Members (1-2 members)					
3-4 members	.228413	.1113309	*0.043	.0069803	.4498457
5+ members	.1532381	.1076175	0.158	-.0608088	.3672849
A7_UNEMPLOYED (None)					
One	-.0658894	.1366459	0.631	-.3376725	.2058937
Two or more	-.0677098	.1297584	0.603	-.3257939	.1903744
A12_YEARS_FARMING (1-2 years)					
3-4 years	.2325722	.0927908	*0.014	.0480149	.4171294
5-10 years	-.0074605	.0924426	0.936	-.1913251	.1764041
More than 10 years	.0964986	.0873322	0.272	-.0772015	.2701988
Missing	.2588376	.1607598	0.111	-.0609071	.5785823
Constants	-.2563543	.2716179	0.348	-.7965913	.2838827

*Significant at 5% level R-squared = 0.4189 P = 0.0001 F = 4.66

The multiple linear regression equation for the demographic factors that affect GFI is detailed as follows, in the regression model 2 below:

Smallholder farming income = - 0.2563543 (β0) + 0.1028595 (Ge) - 0.0641725 (Ag A) + 0.0199132 (Ag B) + 0.3540646 (Ag C) - 0.0949949 (Be) - 0.0710648 (Ma) + 0.0334977 (Ab) - 0.0567162 (Ce) + 0.228413 (Th) + 0.1532381 (Mo) - 0.0658894 (On) - 0.0677098 (Tw) + 0.2325722 (Fo) - 0.074605 (Fi) + 0.0964986 (Te)

Where, (Ge) is gender, (Ag A) is age group 35 – 39 years, (Ag B) is age group 50 – 64 years, (Ag C) is age group 65 – 80 years, (Be) is below matric, (Ma) is matriculated, (Ab) is above matric, and (Ce) is certificate in agricultural qualification.

Furthermore, (Th) is three to four household members, (Mo) is more than five household members, (On) is one household member unemployed, (Tw) is two or more household members unemployed, (Fo) is three to four years farming experience, (Fi) is five to ten years farming experience, and (Te) is more than ten years farming experience.

For each of the independent variables, the significance of the relationship is based on the information provided in table 4.8.3, as follows:

Gender has a coefficient of 0.1028595 and the associated p-value is 0.135, which is not significant at the 5% level (p-value > 0.05). On age group 35 – 49 years, the coefficient is -0.0641725 and the associated p-value is 0.399, which is not significant at the 5% level (p-value > 0.05). The coefficient of age group 50 – 64 years is 0.0199132 and the associated p-value is 0.848, which is not significant at the 5% level. Age group 65 – 80 years has a coefficient of 0.3540646 and an associated p-value of 0.019, which is significant at the 5% level.

The coefficient for below matric level education is - 0.0949949. The associated p-value is 0.637, which is not significant at the 5% level. For that of matric level education, the coefficient is - 0.0710648. The associated p-value is 0.711, which is not significant at the 5% level. The above matric level education has a coefficient of -0.0334977, and the associated p-value of 0.869 and this is not significant at the 5% level. Agricultural qualification certificate shows a coefficient of - 0.0567162, and the associated p-value is 0.613, which is not significant at the 5% level.

Where the other source of farming income is pension, the coefficient is 0.254060. The associated p-value is 0.003, which is significant at the 5% level.

A three to four members in a household has a coefficient 0.228413, with the associated p-value of 0.043, which is significant at the 5% level. The household with more than five members has a coefficient that is equals to 0.1532381. The associated p-value is 0.158, which is not significant at the 5% level.

Where one household member is employed, a coefficient of -0.0658894 applies. The associated p-value is 0.631, which is not significant at the 5% level. For two or more household members unemployed, the coefficient is - 0.0677098. The associated p-value is 0.603. This is not significant at the 5% level.

With three to four years farming experience, the coefficient is 0.2325722 and the associated p-value is 0.014, which is significant at the 5% level, while the coefficient for five to ten years farming experience is - 0.074605. Its associated p-value is 0.936, which is not significant at the 5% level. For more than ten years farming experience, the coefficient is 0.0964986 which is not significant at the 5% level.

The analysis show a number of variables with their coefficients and p-values that indicate a significant relationship with the gross farming income of smallholder farmers in the Free State province, at the 5% level. These include the age group of 65 – 80 years, three to four members living in a household, and three to four years of farming experience. The remaining variables under this model do not show a significant relationship.

The R-squared value of 0.4189, indicates that a 41.89% in the variation of the gross farming income of smallholder farmers can be explained by the independent variables. The overall p-value of 0.0001 further indicates that the regression model 2, is also wholly statistically significant.

4.8.3 Non-significant factors affecting GFI

Other results, not shown in the tables, namely off farm income, skills, maintenance, receiving guidance did not appear to be significant factors that affected farming income in this study.

CHAPTER 5 QUALITATIVE DATA COLLECTION FINDINGS

This chapter presented results of the qualitative data from the first ten participants who were interviewed, of the fifteen smallholder farmers, due to time constraints. The fifteen participants were selected in line with the purposive sampling technique stated in chapter 3 above, and by consulting with community members, especially gatekeepers, to help identify smallholder farmers, who were known to be doing well, as smallholder farmers, in their respective smallholder farming businesses.

The researcher managed to get participation of smallholder farmers who met the following qualification criteria:

1. Any gender, age and farming in FS province.
2. Fairly acceptable experience and continuity in smallholder farming with a fairly stable farming income.
3. Farming in any commodity, from crop, horticulture, stock, poultry, piggery, or any form of ongoing smallholder farming business.
4. Participants had to be known and referred, by other community members, as currently operating smallholder farmers.

Adaptive member checking was carried out by the facilitators, who assisted the researcher, as well as by the gatekeepers, who had become an important coordinating part of the lead research team, from their earlier experience of participating in the quantitative phase of the research. This review was carried out immediately the responses were completed, with answers that were provided by participants repeated in summary format to confirm correctness, by trusted gatekeepers (McKim, 2023).

5.1 MEASURING THE CURRENT GFI

The analysis of the text indicated that there are two groups of farmers: those who measure gross farming income, and those who do not.

5.1.1 Farmers measuring their GFI

The results indicated that more farmers do measure gross farming income, fewer did not. This was alluded to by (QL1), who indicated that many emerging farmers do revenue measurements on an ad hoc basis or do not do that at all.

5.1.2 Farmers not measuring their GFI

QL10 indicated that they did not measure their small farming income because they live from hand to mouth. Another respondent indicated that they did not bother to keep records of their income as they already knew it was too little, “I hope one day I will make more money” (QL4). One farmer said, “although we keep a record of all receipts, we have not yet started measuring the level of income because it is still too little”. Another farmer indicated that they use the money they get from selling garden project vegetables to buy electricity top up vouchers (QL9). They however cited the following challenges. “…not being able to save, results in us not measuring our income.” Some farmers felt that green energy is a future possibility, if emerging farmers buy in bulk, they can get these solar supplies cheaper (QL10), this will curb the problem of load shedding.

In summary, those who do not measure farming income indicated that they do not do so because they live from hand to mouth and the money they get from selling garden projects vegetables is used to buy electricity top up vouchers. They also cited the lack of being able to save as a challenge to measuring their income.

5.1.3 Farmers keeping records and measuring their GFI

The smallholder farmers who confirmed measuring their farming income, indicated that they measure income from street and auction sales, but this is done on an ad-hoc basis. They keep a book and record of all income received from sales. However, they only sell their cattle according to a laid out plan, which includes when to sell the animals, informed by their budget needs (QL9). Furthermore, records are also kept on purchase of seeds and chickens, and these are calculated and monitored manually with monthly reconciliations (QL9).

Another farmer said their way of keeping records, was only done when one remembers to keep receipts and transaction slips, which they did not consider necessary, most of the time (QL2). Other respondents kept a book to record all income received from sales (QL5) while others had a bank account dedicated to farming income (QL6). “My poultry sales are recorded in a notebook, together with contact details of buyers. This helps me with my sales budget monthly (QL4)”.

Other related records were kept to track purchase of seeds, which came from multiple sources. For instance, a farmer had received seeds and vouchers from 3 (three) different agricultural stakeholders, a government department and 2 (two) local private companies who have programmes to benefit local communities.

The results of this analysis revealed that there is a need for a more comprehensive and reliable recordkeeping for farmers in order to measure their gross farming income more accurately and efficiently. This could be achieved through the use of digital tools such as accounting software, which can help farmers to keep track of their income, expenses and other financial data. For starters, these farmers could seek help from scholars and students, who have access to online applications, where they can use free programs as trials to get used to the type of technology.

Additionally, farmers could benefit from training and support in financial management, which could help them better understand the need to measure their gross farming income and how to go about doing so. It is also important to consider the challenges that are specifically faced by emerging farmers, such as limited access to financing, lack of resources and technology, and lack of knowledge and experience.

Solutions to these challenges may include initiatives that provide farmers with access to capital, mentorship and support, and training on financial management. Government and non-governmental organisations, as well as private companies, can play an important role in providing these resources and support. In conclusion, the results of this analysis demonstrate the importance of measuring gross farming income in order to evaluate the financial health of a smallholder farm business.

It is essential for these smallholder farmers to have access to the relevant resources, tools and training necessary in order to help them measure their gross farming income, which may assist them to make informed decisions about their future. It is also important to consider the specific challenges faced by emerging farmers and to provide them with the support and resources they need in order to be successful.

5.1.4 Tools used in measuring current GFI and keeping records

From the above, it can be concluded that farmers who measured their faming income kept their records in notebooks, and nothing sophisticated or electronic. Reasons could be that they are not at a level where they need to employ an accountant to run

their accounts. This was said by one farmer (QL9), who felt they had “not yet made a lot of money;” therefore, they did not need sophisticated ways of measuring income except for the use of notebooks that some farmers in this sample did.

One farmer indicated that they used a point of sale machine from one of the local Banks, for transactions with customers and for larger purchases. They also have a card machine from a technology company for small businesses, that help them generate time-based income records. These machines assist the farmer to measure upward and downward trends of sales as well as profits. However, more advanced training is required in order to understand how to leverage reports generated by these card machines. They did this on a weekly basis and did reconciliations on a monthly basis.

5.2 DETERMINANTS OF RECEIVING GFI

5.2.1 Identified determinants of GFI

The respondents were asked to identify the determinants that are necessary to derive a sustainable income for smallholder farmers in Free State. This received mixed results.

1. Experience level of farmers in farming

Some farmers (QL10) argued that indigenous knowledge and skills, cooperation in farming business, farming type specific training, adapting farming activities to seasons were all determinants in ensuring income is received consistently (internal factors). Some farmers felt that the correct type and levels of animal feed for their pigs and larger farming and grazing area (QL4) will determine higher income (QL2). Both statements speak to farmers’ experience as being essential for farming profits.

Other farmers felt farming experience was a determinant of farming income. *“My experience is an important determinant (QL6).”* One farmer cited experience in terms of relevant training on crop, horticulture and permaculture farming, correct farming equipment, support from department of agriculture, irrigation water and fertilised soil were determinants for receiving farming income (QL5). Access to extension officers, helping with relevant information will allow famers’ access to factors contributing to income improvement (QL1).

2. Group membership

Some farmers felt that group membership was a catalyst to sustainable income from farming. They felt that determinants of farming income include being allowed to join established commercial farmer groups as members, or participate in their organised events, even though they may not be commercial farmers themselves at this stage (QL9). *"Group meetings known as farmers imbizos are important to be arranged as this is where farmers can share important information regarding grants and other funding instruments* (QL1)." Some suggested that stokvels will enable farmers to save money on a monthly basis, by starting small, then forming cooperatives with committed members (QL3). In order for groups to function effectively, there is a need for farmers to form cordial working relationships with traditional leaders in rural communities in order to create large customer bases influenced by those community leaders (QL10).

Two respondents indicated that through group membership, they were able to keep their income records. They had recently started keeping sales slips and had grouped themselves so that they could from time to time discuss their stock sales (QL3). Another farmer (QL8) indicated that they had formed a partnership with a group of ladies, who carry out relevant research exercises to address needs. For their sales, they keep records of all transactions including income in notebooks. The farmers indicated that their tools to measure income included a sales plan, which specified what the income is after planned auctions and farmer's days (QL9).

In terms of skills development, experienced farmers have varied skills that can be transferred to less knowledgeable farmers (QL1). The advantage of group membership is that farmers in groups and in the same region or area will be able to transfer knowledge easier than importing foreign knowledge, which will take a long time to be understood and adopted correctly, for example importing knowledge from China will not bear immediate benefits (QL9).

3. Associations membership

It is suggested that the smallholder farmers should subscribe with stakeholder associations like SA poultry association, which offer many benefits to small-scale farmers, for example, it gives alerts on things like disease outbreaks, thereby allowing farmers to avoid losses as they can then buy necessary animal medication. Lastly, the farmers should ensure enrolment on the Department of Agriculture database, which

also releases necessary alerts (QL9). Moreover, one farmer added that interest in farming, initiative and savings income were determinants of income (QL7).

A poultry farmer (QL8), mentioned that working as a group (cooperative), was advantageous in the marketing of their poultry produce. This was emphasised by another farmer who said: *"Forming partnerships and working together with other farmers will bring better income* (QL2)*."* It is important for farmers to also have bank accounts (QL1), which will allow them to purchase stock in bulk, therefore as a group, they will derive benefits on discounted prices (QL9). These groups could be in the form of stokvel associations to benefit on economies of scale (QL9).

4. Financial management

Other farmers attributed the causes of loss of farming income included the customers who buy chicken products on credit and do not pay on time. This is often unavoidable as South African consumers mainly depend on debt for survival (QL7). This is an area which perhaps needs market value chain interventions through large companies, an aspect mention by some farmers. On the other hand, in order to build wealth from farming business, farmers must reduce debts, be given training opportunities as well as start saving funds (QL8).

5. Farming best practices

Some farmers felt that following farming best practices would ensure that farming income is sustainable. They cited the correct type and levels of animal feed for livestock such as pigs could determine higher income levels (QL2). They felt that monitoring the growth of animals in order to sell at the correct size, would ensure they do not overspend on animal feed expenditure (QL3). "*Breeding of piglets must be monitored correctly so that we have enough stock at all times and be able to sell when there is a demand QL3."* In addition, (QL3) felt that farmers must also practice poultry breeding specifically for selling eggs, as these were a good income source. Additionally, they should formalise their farming businesses through registered companies (QL1).

6. Government support

There were farmers who felt that establishing area committees with government support to coordinate land allocation, equipment allocation, market access

facilitation, and strategies to avert losses through climate changes and diseases was essential for their farming income sustainability (QL5).

One farmer indicated that a decrease in farming income can result from natural disasters such as floods and climatic conditions (QL6), which had nothing to do with Government. Others felt that Government could devise "*methods to avert losses through drought and floods as these are key to help smallholder farmers derive consistent income through continuous sales of farm produce (*QL5)."

Farmers felt that Government support was not adequate band support should also be sought from large companies: "*We need big companies to support smallholder farmers with grants and other forms of financial and non-financial assistance (QL6)."* They suggested that more local companies should pledge support to smallholder farmers, with contributions like training to increase farming expertise (QL6). For instance, garden project initiatives at local schools should be supported by both government and companies by giving incentives in the form of stipends to those who participate fully in them (QL5). One township based farmer appreciated the support given by schools who have shared their free pieces of land, where the farmers can plant vegetables to sell and generate an income (QL7).

7. Lack of government support

There are farmers, however, who indicated that they were aware that the government has programmes that are approved to help smallholder farmers, unfortunately there are government officials who repeatedly give support to the same people over the years, and these are people personally known to them, which is not fair to other deserving farmers (QL5).

8. Natural resources

The farmers indicated that apart from larger farms and grazing area, irrigation water (QL5) through tunnels (QL6) was needed to increase farming sales, thereby increasing income (QL4). Another farmer agreed that the same factors were important. These were, the need for grazing camps, free feed for animals, and irrigation water (QL4). One farmer lamented that "*unless we get larger land sizes and access to irrigation water, it will be useless to dream about becoming a commercial farmer (QL1)."*

9. Diversification

Farmers were of the view that diversifying their farming activities would sustain their farming income. Steps and actions required to ensure income include the need to diversify the product which farmers sell by adding different presentations and product mix, doing further research on customer needs, and offering the same product in different forms or flavours (QL8). Diversification could be promoted through tips and shared information about farming practices, partnerships, doing a SWOT analysis and research about other types of farming, as well as getting the appropriate type of training relevant to the type of farming done (QL8).

One farmer indicated that farming income could be improved consistently through *"correct integration,"* such as by using a bank account, bulk buying at wholesalers and avoiding direct purchases of raw materials at retailers as they can become expensive (QL1). They mentioned that subscribing with representative organisations such as South African Poultry Association helps in giving alerts, also in price fluctuations (QL1).

10. Fluctuations in farming income levels

The farmers were asked what instances led to increases in their farming income. One indicated that they had applied for, and received procurement contracts, so they bought raw materials and equipment at hugely discounted prices, which they then sold to farmer groups and some retail shops at relatively good prices (QL1). They did this seasonally to groups of about 250 farmers, although these could not be sustained due to challenges such as, poor roads, which delivery trucks could not regularly travel on. This resulted in a loss of these contracts, and therefore a loss of income, in consequent years.

11. Lack of markets

There were a number of market related factors which the framers felt were challenges if they had to sustain their farming activities. Firstly, garden farming in communal places like schools were reported to have taken off nicely, but there were not enough markets to sell their produce (QL7). A poultry farmer (QL8) indicated that their own experience was necessary for knowledge on sustainable and profitable poultry farming itself, marketing of chickens, demand and supply trends for chicken meat, and readiness to make the chickens readily available. Another farmer felt that increasing the number of their distributor channel, such as

hawkers, that they sell to (customer base), coupled with active participation in markets could boost income receipts. It was observed that on pensioner days, there were periods in which they were able to increase sales (QL1).

12. Road conditions

Factors that led to a decrease in farming income were mainly due to a lack of markets, caused partly by poor roads. One farmer indicated that a surplus in raw materials (equipment and feed) resulted in loss of income as sales were mostly lower than prices of purchasing the raw materials (QL1).

Another was of the view that farmers should form distributorship partnerships with same suppliers, therefore they should not be in a habit of purchasing things like raw materials from different suppliers as they tend to lose purchase discounts (QL9). They should not keep their farming stock for extended periods, resulting in excessive expenditures on things like animal feed (QL8), meaning their stock turnaround time should be shorter.

Similarly, another farmer indicated that there was limited stock to sell, as orders were mostly cancelled due to poor road conditions (QL9). In this case buyers refused to come collect their stock as their trucks broke down. Their option of providing own alternative transport delivery to customers ultimately resulted in their own sedan also breaking down while pulling a trailer, and this increased their maintenance cost, as well as became unbearably expensive, leading to them discarding this option.

Lastly, a decline in sales was also attributed to courier companies that regularly delayed on delivering ordered items, due to distance and road conditions to their farm, leading to cancellations and losses (QL9). In this instance*, "some buyers complained that my farm location is difficult to find* QL9." Some suggested that due to poor transport network, partnerships with reliable truck owners in an area, could provide transport on demand which would go a long way to improve the situation (QL10).

5.3 STRATEGIES FOR TRANSITIONING TO COMMERCIAL GFI LEVELS

5.3.1 Adequate resources

The smallholder farmers expect the government to help with land and irrigation water (QL10). One farmer felt that without funding the smallholder farmers may not be transformed into commercial farmers even if they had land and water. They indicated that commercial farming status requires funding. However, "*funding is difficult to raise as a smallholder farmer" (*QL9). There was a feeling that government continues to promise funding to small scale farmers, which were often viewed as empty promises (QL10).

In addition, the farmers need to work together in harmony, and support each other to become larger-scale commercial farmers (QL10). They are of the view that emerging farmers must establish their own warehouses, with uniform branded packaging for each group of organised farmers in order to gain from economies of scale (QL2). There should be an area database of buyers of farmers' produce, which will stabilise their seller to customer relationships (QL10), and will help in identifying buyers' trends. Due to current electricity problems of load shedding, poultry farmers struggle. This resulted in a need for solar systems to generate minimal electricity required in chicken breeding (QL7).

Regarding support required by smallholder farmers to use their current skills to derive farming income in Free State, farmers suggested that the Solidarity fund should be accessible to the farmers for immediate cash vouchers, as it is a vehicle created during the Covid-19 period (QL1). This would mitigate the economic losses incurred by the farmers during the Covid-19 period. One farmer noted that the Presidential employment stimulus initiative requires more information on skills and experience in order to provide support in respect of funding (QL1).

5.3.2 Forming co-operations

Farmers felt that to become commercial farmers, they must form co-operations and study groups. They indicated that the study groups must include extension officers from the department of agriculture, arrangement of both formal and informal training specifics to the type of farming in order to provide the correct type of support mechanisms (QL10). The farmers indicated that they want training specifics that are in line with their type of farming business, not general training (QL9).

One farmer indicated that such farmer co-operation (group business), per area should be managed by some kind of a constitution in order to resolve disputes (QL10). Some felt that smallholder farmers should form study groups where they invite established commercial farmers to mentor them on a continuous basis until they reach the required larger commercial farming status (QL9). *"We must go and get relevant information from larger and successful commercial farmers, on how they started and grew* (QL10)." Unfortunately, it is difficult to form cooperatives or collaborations as people are not willing to share their knowledge without being paid (QL5).

5.3.3 Promoting market linkages

Market linkages are key in transitioning smallholder farmers to commercial farmers. Farmers felt that they should establish marketing channels to drive sales and income growth via board advertisements and community radio broadcasts. "*To become commercial on a larger scale, we need to enhance our marketing strategies using advertising boards, flyers and pamphlets, word of mouth assisted by local non-profit organisations, broadcast media through local community radio stations and social media* QL10." They felt that emerging farmers must have visible presence, with locally based outlets in the whole local municipality, as an example, with one branding/packaging to enhance brand loyalty (QL10).

5.3.4 Agricultural extension services

The farmers were asked if there had been any persons involved in agriculture that have specifically asked any details about the income derived from their farming activities. Only two farmers indicated they had interacted with some organisations that were involved in agriculture. The South African poultry association was mentioned, which from time to time, conducted surveys on sales and income trends (QL1). The same farmer (QL1), indicated that a company (name not mentioned), does regular checks on smallholder farmers and provides advice. "*This company checks this information regularly to help determine levels of discounts I get, even when prices of raw materials increase, I am able to inform them, so they keep track of our market here"* (QL1). Towards commercialisation, the farmers felt that training is required on a continuous basis, yet the few who received some training did so once only, without a follow up (QL10). To this end, the farmers want programmes like Small Enterprise Development Agency (SEDA), to share their support information by taking it to where farmers are, and to also provide leads for farmers to get access to markets (QL8).

These farmers were however, convinced that SEDA does not provide the type of start-up assistance they purport, as they had not received any such support from it (QL10). Furthermore, on the lack of support from SEDA, some farmers indicated they were aware that SEDA has support programmes for small farmers, although these seem to be influenced by local municipality officials, and there is a bias as to who gets the assistance. "*I was promised assistance, which I never received",* (QL8).

1. Tools and equipment

The respondents were asked what farming tools and equipment they have been promised or supplied with by any stakeholder in agriculture, to help the transition to become a commercial farmer. It is only one farmer (QL1), who mentioned that (they) got some assistance from the Department of Small Business Development, Tourism and Environmental Affairs (DESTEA), and Small Enterprise Finance Agency (SEFA), in Free State. They were however, pessimistic about SEFA, as they indicated that the organisation collects funding applications from people, yet they do not hear of any successes (QL1). "*All I got was a reference number, and nothing happened afterwards* (QL1)." With regards to DESTEA, the farmer got assistance to formally register their own business as a close corporation (QL1). The farmer furthermore indicated that DESTEA received their business plan and promised to fund a wholesale business via a grant, however, this did not materialise (QL1).

2. Group membership

The farmers felt that in order to graduate to large scale commercial farmers, there was a need for farmers in one area to organise themselves into a group, to buy their equipment such as tunnels and irrigation systems, from one supplier with the same branding (QL1). Those carrying out livestock production need to use one abattoir with uniform packaging (QL10). Two farmers, indicated that they should stick to a single supplier, so that the standard of their produce and sales product is uniform and similar, and therefore quality standards are maintained at the same level (QL10, QL3).

3. Learning from best practices of larger commercial farmers

Large scale commercial farmers have annually organised relevant short courses, spread throughout the year, and according to relevance (QL1). Furthermore, large commercial farmers regularly organise farmers' days' events and exhibitions where they establish networking opportunities to gain on economies of scale (QL10).

These large scale commercial farmers operate banking accounts and maintain up to date records and books, therefore enhancing chances of funding. They also maintain online presence through websites and social media to create visibility (QL10).

5.4 TARGETED SUPPORT PROGRAMMES FOR DEVELOPING SKILLS

5.4.1 Current available skills to generate sustainable GFI

Many of the respondents highlighted a need for some structured form of training, as they are of the opinion that more smallholder farmers in their areas of operation, do require some upskilling. The current way and manner of farming operations by the smallholder farmers in Free State, finds them doing backyard and school gardens, open veld and communal land projects, and to a degree, garden or livestock production on their own smaller size plots, where they plant mostly vegetables, or small scale animal production for own consumption and selling to local communities (QL10). "*Most smallholder farmers in our area carry out their farming activities without adequate knowledge and need expert training* (QL3)."

"*Most of the farmers in our area are young therefore do trial and error farming. We need expert training* (QL4)." "*Very few small scale farmers have a structured way of doing farming, therefore it is important to have a mentoring arrangement where an experienced farmer mentors a less experienced farmer* (QL9)." Other farmers indicate that they, "*as emerging farmers require upskilling in business skills such as basic bookkeeping, cashflow and other types of relevant training through formal training courses* (QL1)."

There are however, other farmers who felt that they have adequate indigenous knowledge and capacity to train people themselves into farming, "*but we need resources' assistance from the government and other stakeholders* (QL10)." Even with the assertion that they are knowledgeable, they "*still require hands-on guidance where experts in animal farming carry out practical training on how to correctly breed pigs and other animals* (QL2)." This especially extends to the need for expert knowledge on preventing animal and plant diseases (QL6). The farmers therefore strongly suggest that government programmes should be more accessible to all smallholder farmers, including better access to extension officer support services (QL1).

5.4.2 Further skills development needs for a sustainable GFI

The smallholder farmers indicated that production structures used by them as smallholder farmers were of inferior quality and mostly substandard (QL1). They suggested a gradual introduction of managed automated applications (technological apps) to assist in checking things like climatical temperatures and thereby giving timely alerts to climatic conditions, as well as other seasonal and production-based information (QL10).

They have already put in place informal structures to train people on permaculture, amidst lack of travel resources and well-structured training packages (QL3). Against this backdrop of resources shortage, they suggested that government and private sector companies supply at the minimum, transport facilities to help them survive poor roads, transportation challenges, as well as be supplied with better structural storage facilities (QL10).

5.4.3 Involvement by stakeholders in agricultural skills development

It should not be left to the smallholder farmers to source private sector stakeholders in agriculture, that can assist in developing appropriate and correctly structured training, for further training and development of these farmers. Extension officers should be encouraged, to play a more meaningful and flexible role, to identify and encourage other outside of government stakeholders, to put in place various mechanisms accessible to smallholder farmers, for further training and development.

5.5 GFI SUSTAINABILITY FRAMEWORK AND MODEL

5.5.1 Current and suggested models of operation to derive GFI

The following are suggested GFI sustainability models for smallholder farmers in FS. Models in farming refer to approaches and practices that encompass crop production, stock production, mixed production and their interaction with natural occurrences such as climate conditions, as well as other resources like soil conditions (Talerngsri-Teerasuwannajak & Pongkijvorasin, 2021). Contract farming, traditional methods and group farming are examples of farming models which have existed for a long time (Talerngsri-Teerasuwannajak & Pongkijvorasin, 2021).

1. Farming wealth, food security and poverty alleviation

For farming wealth creation, which includes improved food security and poverty alleviation, farmers ought to know that income from selling animals at auctions and farmers' days should be re-invested as capital and not used for operational purposes (QL9). The farmers emphasise that farming should be diversified. For instance in selling chicken and layered eggs, which is revenue generated in-between auctions, as well as growing and selling vegetables (QL8).

They suggest that farmers in the same region or area should trade in the same breed, allowing them economies of scale, and exposure to uniform conditions of trade/farming (QL10). However, one smallholder farmer felt that South African small-scale farmers need a change of mind-set in order for them to succeed (QL5). They are not willing to work harder in order to make positive changes in their lives, despite the many poor conditions they find themselves in.

2. Farming practices

To carry out better farming practices and diversify, groups of farmers should be assisted in formalising their small businesses with organised business adopting these farmers under their guided business umbrella wings (QL10). One farmer encourages young farmers to form partnerships and register companies in order to benefit from group dynamics (QL6).

3. Creation of market access

Regarding market linkage, large corporates should buy their farming produce from smallholder farmers in exchange for funding (QL7). Farmers can become distributors of their produce. However, they must use one brand to ensure capturing of a big market (QL1).

CHAPTER 6 TRIANGULATING QUANTITATIVE AND QUALITATIVE RESULTS

6.1 ADVANCING SUSTAINABLE GFI OF SMALLHOLDER FARMERS

6.1.1 Main farming activities

Qualitative results indicate that most small farmers do backyard, school gardens, open veld and communal land projects where they plant mostly vegetables for their own consumption and which they sell to local communities. Quantitative results show that half of the farmers indicated that they practised farming for their own consumption and selling (57%), a fifth for own consumption (23%) and fewer-less than 20% for marketing and selling. These results pointed to a gap that the smallholder farmers need to transform to commercial farmers by diversifying their products as quantitative results showed that only 19% of the farmers practiced mixed farming and concentrate more on livestock. Inferential statistics results indicate that having more livestock was associated with higher farming income, those with 2-5 livestock had 2.5 times likelihood of having a higher income.

6.1.2 Farming experience

Qualitative results showed that farmers felt farming experience was a determinant of farming income. The median years in farming was 4 years, which could suggest little moderate experience, which may not be ideal if smallholder farmers have to transition to commercial in the near future. Chi-square tests did not provide any significant associations between farming experience and farming income. Hence, we conclude that farming experience in this study was low to medium, and was not an important determinant of farming income.

6.1.3 Banking farming income

Quantitative results indicated that the majority of the farmers did not bank their income (71.5%), fewer (28.5%) did. Of the farmers who had an income, used the point of sales from local Banks and card machine technology companies for small businesses, for transactions with customers and on large purchases. Chi-square results conclude that higher income was associated with banking-those who banked their income were 6 times more likely to a have higher income.

6.1.4 Marketing strategies

The quantitative survey indicated that farmers who had regular customers were 4 times more likely to realise a higher farming income compared to those who did not have regular customers. Farmers who had formal or informal contractual agreements were 2.5 times more likely to realise a higher farming income compared to those who did not have formal or informal contractual agreements.

The qualitative results indicated that inadequate markets where farmers could sell their produce was the main barrier in promoting their farming business. Yet, quantitative results indicated that farmers who marketed and sold their produce were much more likely to have higher income, compared to those who produced for their own consumption. Marketing barriers were attributed to poor road networks. These results point to a gap in market linkages among the farmers in Free State, which need to be strengthened.

6.1.5 Cooperatives and agricultural associations membership

Two thirds of the farmers did not belong to any cooperative, while just above half of the farmers were not members of any agricultural association (55.6%). Despite these quantitative findings, farmers were of a strong view that group membership was key in transforming their activities to commercial farming or in increasing their gross income. The qualitative results attribute low group membership to the difficulty in forming cooperatives or collaborations as people were not willing to share their knowledge without being paid. Chi-square results suggested that those in cooperatives were 5 times more likely to have a higher income compared to those not in cooperatives. In addition, to those in agriculture associations whom were also 5 times more likely to have a higher income compared to those not in agriculture associations.

6.1.6 Gross income and record keeping

Quantitative results show that the annual average sales gross farming income had been increasing exponentially over the years (2017-2021). Qualitative results indicated that more farmers do measure gross farming income, many emerging farmers do revenue measurements on an ad hoc basis or do not do that at all. The results indicated that farmers did not have formalised ways of measuring their farming income except for use the of notebooks. Quantitative results compliment these views, where fewer farmers kept plant production, animal production, financial, management, record keeping, and marketing and sales records.

6.1.7 Lack of government subsidies

Quantitative results indicated that three quarters of farmers did not receive subsidies (76%). Qualitative results showed that there was a feeling that the government continues to promise funding for small scale farmers animals, but these are to no avail. The farmers felt that without funding, the smallholder farmers may not be transformed into commercial farmers even if they had land and water. There is therefore a need for large companies to contribute to providing loans to smallholder farmers so that they are able to mechanise their farming activities.

6.1.8 Agriculture extension officer services

Quantitative results indicated that farmers receiving guidance from a mentor in farming business were 3 times more likely to have a higher income compared to those who did not receive that. In addition, those who were mentors were 3 times more likely to have a higher income compared to those who did not receive that. These results emphasise the importance of agriculture extension services, as perceived by farmers, yet there seems to be a low receipt of these services among farmers in the Free State (qualitative results).

6.1.9 Age of farmer

Older farmers aged 65-80 years were more likely to realise higher income sales in this study (0.35, $p<0.05$). This suggested that the younger farmers were more likely to have a low income.

6.1.10 Household size

Households with more members (3 - 4), were more likely to have a higher income, compared to those with fewer members (1 - 2 members).

6.1.11 Experience in farming

Farmers with more years in farming were more likely to realise a higher income (surprising, compared to those who had 1 - 2 years ($B=0.232$, $P<0.05$). These results suggested that the more the farming experience the higher the income and vice versa.

CHAPTER 7 FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 FINDINGS

The completion of quantitative and qualitative analysed data in chapters 4, 5 and 6 was presented. This was followed by the determination of various findings, that were in line with the objectives of this research study (Leavy, 2017). The detailed questions asked in the questionnaires and contained in interview sheets, were an expanded version of the 5 research questions presented in Chapter 1. The responses by the smallholder farmers have been validated by this study, in order to determine whether or not, they meet the expectations of the 5 objectives.

7.1.1 Quantitative data

The questionnaires were completed by the participation of 372 respondents which were then divided into 4 main categories. The demographics part had 20 questions, land ownership and usage 6, market access and sales 17, and lastly, agricultural practice had 23, adding up to a total number of 66 questions.

Many respondents had a challenge in responding to questions that required confirmation of volumes (quantities), and associated values of any produce for supply and sale. The majority did not maintain records, which was furthermore confirmed by the findings. In addition, questions related to mechanisation proved too technical for many of the respondents. There were many gaps, which would have affected the reliability of that category negatively; problematic questions were thus not included in the final analysis. However, within the same category, there were questions with a sufficient response to warrant inclusion. Hence, in the final analysis, only a total of 34 questions provided a valid outcome, creating an opportunity for future research.

7.1.2 Qualitative data

A semi-structured questionnaire of 26 questions was completed by 15 respondents. Although the respondents participated in the interview process, it was too late for the last set of 5 response sheets to be included in the coding exercise, hence only 10 responses were deemed valid for the analysis process.

7.2 CONCLUSIONS

Based on the triangulated findings, it can be concluded that there are several variables that impact on the indicators proposed in the conceptual framework in figure 2.10.1 contribute to advancing the sustainable income of smallholder farmers in Free State. These variables have been identified, and therefore require to be selected on a smallholder farm level and farming activity need, managed and monitored in line with the findings of this study, to help smallholder farmers generate and maintain sustainable farming income.

A summary of a comprehensive framework for advancing the sustainable income generation of smallholder farmers in Free State is proposed below, to include managed and monitored variables such as diversification of farming activities, banking farming income, marketing strategies and market linkages, cooperatives and agricultural associations membership, record keeping and financial management, government subsidies and support, agriculture extension services, age of the farmer, household size, and experience in farming, followed by a detailed presentation of conclusions, as derived from the analyses data in tables from sections 4.1, 4.3, 4.4 and 4.5, which are descriptive in their analysis.

1. Diversification of farming activities

Smallholder farmers should strive to diversify their products and move beyond backyard and school gardens to engage in mixed farming, including both plant and animal production. This can help increase income opportunities and reduce dependency on a single crop or product.

2. Banking farming income

Encouraging smallholder farmers to bank their income can provide them with better financial management tools and enable them to access credit and other financial services. This can help them invest in their farming activities and expand their operations.

3. Marketing strategies and marketing linkages

Improving market access for smallholder farmers is crucial for increasing their income. This can be done through the establishment of formal and informal contractual agreements with regular customers. Furthermore, efforts should be made to improve

road networks and strengthen market linkages to address the existing barriers to marketing and selling produce.

4. Cooperative and agricultural association membership

Promoting group membership, such as cooperatives and agricultural associations, can provide smallholder farmers with access to collective resources, knowledge sharing, and support networks. This can help them overcome challenges and increase their income-generating potential.

5. Recordkeeping and financial management

Smallholder farmers should be encouraged to keep records of their farming activities, including production, sales, and financials. This can help them monitor their progress, identify areas of improvement, and make informed decisions to optimize their income.

6. Government subsidies and support

There is a need for government support and funding to assist smallholder farmers in their transition to commercial farming. This can include subsidies for farm inputs, mechanization support, and access to finance. In addition, large companies can contribute by providing loans to smallholder farmers to help them mechanize their farming activities.

7. Agricultural extension services

Strengthening agriculture extension services is essential to provide smallholder farmers with guidance, mentorship, and technical assistance. This can help them improve their farming practices, increase productivity, and ultimately, enhance their income.

8. Age of farmer

While the study found that older farmers were more likely to have higher income, it is important to support and encourage younger farmers as well. Initiatives aimed at attracting youth to agriculture and providing them with training, mentorship, and access to resources can help improve their income prospects.

9. Household size

Larger households were found to be more likely to have a higher income. This highlights the importance of considering the household dynamics and socio-economic factors when designing interventions and support for smallholder farmers.

10. Experience in farming

The study found that farmers with more years of experience were more likely to have a higher income. This suggests that continuous learning, training, and capacity building initiatives in farming practices and business management are necessary to improve income generation for smallholder farmers.

7.2.1 Detailed conclusions on demographic information

There is lower educational attainment in Free State province. This could be due to the fact that the sample was gathered from particular regions or areas in Free State, where people with higher level of education do not favour smallholder farming as a preferred form of career choice. Hence, the lower educational attainment than the overall provincial average.

It could also be due to the fact that as the sample was self-selected by the gatekeepers, individuals with higher educational qualifications may have not belonged to groups of smallholder farming in those areas, therefore resulting in not taking part in the study. It is also worth noting that the data may have been interpreted by participants not to take into account non-formal educational qualifications, such as vocational training or community-based education, which may be more prevalent in Free State Province.

The results suggest that the majority of Free State smallholder farmers do not have a formal agriculture qualification. This lack of formal agricultural qualifications among these Free State farmers is concerning for several reasons. Firstly, these farmers may not have the skills and knowledge to farm effectively and efficiently. Without a formal education, they may lack the ability to utilise the latest farming practices and technologies, which can lead to a decreased crop yields and lower profits.

Secondly, these farmers may not be able to access the funding and other resources available to those with a formal agricultural qualification. This can make it difficult for them to invest in their farms and expand their operations. The lack of formal agricultural qualifications among Free State farmers can also have a negative impact on the country’s agricultural sector as a whole. Without the skills and knowledge to effectively utilise the latest farming practices and technologies, the sector will not be able to produce enough food to meet the needs of the population.

This could lead to food insecurity and continued high levels of poverty in the country, as well as a general decline in the quality of life. The lack of formal agricultural qualifications could also impact the income of Free State smallholder farmers. Without the necessary skills and knowledge directly related to agricultural qualifications, these farmers may not be able to maximise their yields and profits, resulting in lower farming income. This could have a dire effect on the economic wellbeing of farmers and their families.

The majority of Free State smallholder farmers also do not have a formal agricultural qualification, even though they may have other qualifications. This lack of agricultural-specific qualifications can have a negative impact on the required continued growth of the country's agricultural sector, as well as lack of reciprocity in the income of individual farmers.

Regarding household size, it is evident that the majority of the provinces' smallholder farmers belong to households with 5 or more members. This is likely due to the fact that most smallholder farmers are part of households with multiple generations, which can contribute to the pool of labour available to the farm. This also means that the average income of the smallholder farmer is likely to be lower, as it needs to be shared among a larger number of people.

Furthermore, the data suggests that households with 1 - 2 members are relatively rare among Free State smallholder farmers, indicating that the majority of smallholder farmers are part of larger households. Clearly, the majority of smallholder farmers come from lower-income backgrounds, and thus, may not have the resources to start and sustain a farm on their own. Approximately 7.3% of households did not share information on their size. They may not prefer to share this information due to reasons such as living alone with no family members helping them with the farm, or other reasons.

7.2.2 Detailed conclusions on land ownership and usage

Data suggests that most farms in the province are relatively small in size. It is worth noting that 24.5% of the responses did not provide information about the size of their farm land, which could be due to various factors such as lack of access to the necessary data or lack of knowledge about the size of the farm land.

The data further suggests that the majority of smallholder farmers are likely to be those commonly referred as subsistence farmers, that rely on small plots of land to feed themselves and their families. This is in stark contrast to large-scale commercial farmers, who typically utilise much larger areas of land. The results also suggest that the majority of smallholder farmers may not have access to larger areas of land, which could be due to a lack of financial resources or the long disputed access to land.

It is commonly known that the SA government's land reform policies, which have been put in place to redistribute land from white landowners to black South Africans, is faced with multiple challenges, and therefore the redistribution has been progressing at slow pace (Mubecua & Nojiyeza, 2019; Zantsi et al., 2021).

It is also possible that smallholder farmers are not able to access larger areas of land due to a lack of financial resources, or because the land has already been allocated to other individuals. This highlights the importance of understanding the context of smallholder farming in SA, and the need for policies that ensure that all citizens have equitable access to land and other relevant resources.

From the data presented, it can also be seen that the majority of smallholder farmers in Free State own their farm land. This is particularly significant, as it suggests that the majority of these farmers are able to retain control over their land and resources, which can lead to greater food security and improved livelihoods.

The majority of those that do not own their land, rent it, meaning it can be a more expensive and less secure farming arrangement. It is also noteworthy that a small number of smallholder farmers have access to commonage land where they carry out communal farming arrangements, which can provide additional resources and a better degree of security. While the data provides an overview of the farm land owned or rented by these smallholder farmers, it is important to note that the quality of the related data is limited.

The number of respondents, who did not provide any information regarding land rental or ownership, is proportionally high at 14.0%, which was therefore worrisome. Further, research is needed to better understand the intricacies of farm land ownership by smallholder farmers.

7.2.3 Detailed conclusions on market access and sales

The poor condition of roads used by smallholder farmers to access markets, as per the data is concerning, as inadequate infrastructure hinders their ability to transport their produce to market. The lack of good quality roads can lead to increased transport costs and longer journey times, both of which can reduce the profitability and competitiveness of smallholder farms.

Moreover, the safety of farmers travelling to and from the markets is compromised when the roads are in a generally bad condition. The poor condition of roads may be due to a lack of investment in infrastructure by the Free State provincial government. Investment in road maintenance and improvement is essential to ensure that smallholder farmers can access markets safely and efficiently.

The data further suggests that smallholder farmers in Free State do not have access to reliable transport for their produce. The lack of access to reliable transport for smallholder farmers is likely to have a significant impact on their ability to sell their produce as it may be difficult to transport it to local markets. This could result in a decrease in farming income as they may not be able to access the best prices for their produce. It is likely that this lack of access to reliable transport is due to a number of factors.

The province is a mainly rural area and it is likely that access to transport infrastructure is limited. Furthermore, the lack of access to reliable transport could be due to the cost of transport, which may be prohibitive for smallholder farmers.

Having regular customers as a smallholder farmer has a significant impact on the generation and sustainability of smallholder farming income, that may result in a reliable source of income and the ability to plan for their future transactions. This may also form a steady and reliable market for smallholder farmers.

The lack of contractual agreements imply that the smallholder farmers are without the security of having a confirmed and regular channel of income, and therefore are at the mercy of market prices and uncontrollable challenges, such as weather conditions, when selling their produce.

They are unable to negotiate better terms with buyers, who may be able to pay them a higher price for their produce, and this may reduce the incentive for smallholder farmers to invest in their businesses as well as adopt new farming practices, as there is no assurance that they will be able to sell their produce at reasonable prices. This would give them the assurance that they will be able to sell their produce at a reasonable price and would also provide them with an incentive to continue investing in their businesses and adopting new farming practices.

The lack of necessary skills in plant production has a negative impact on the sustainability of smallholder farming income. Without access to expert skills in plant production, smallholder farmers are unable to maximise yields, leading to lower income and revenue. The data also indicated that the majority of smallholder farmers did not have access to the necessary skills in animal production. Furthermore, a significant number of these farmers do not have the financial management skills they need to maximise their farm income.

7.2.4 Recommendation for future research

For future research, it would be valuable to explore the specific challenges and barriers faced by smallholder farmers in primarily accessing markets and forming cooperatives, with a linkage to the devised smallholder farmers sustainable income indicators framework. Further investigation into the impact of specific marketing strategies and the role of agricultural extension services in facilitating income generation could also provide valuable insights.

Additionally, studying the financial literacy and management skills of smallholder farmers and their impact on income generation could further enhance the understanding of the factors influencing sustainable income for smallholder farmers, and also allow a continuous review of how to allocate human resources in the best way possible to sustain the framework proposed, and equally, how to best involve all the critical stakeholders, such as smallholder farmers themselves, cooperatives, associations, government divisions including extension officers, private sector, educational and training institutions and others that have an equal interest in the successful implementation of this venture.

7.3 RECOMMENDATIONS

A foresight of scholars like Louis S. Drake (Drake, 1954), identified the need for farmers to take an interest in gross farming income (GFI) estimation, income charts and the linkage to farming production inputs, as well as expressing a necessity for these farmers to understand the concept of GFI in simplified terms. This simplicity approach was supported by this study and requires that smallholder farmers of Free State province, manage a framework or model of indicators that have proven as a basic requirement to advance the critical importance of a sustainable GFI.

The findings from this study have furthermore presented the researcher, with adequate information to deduct suitable recommendations. Although the approaches followed in the National Academies of Sciences, Engineering, and Medicines (NASEM, 2017) are not generic, the researcher acknowledged them as ideal was incorporated in many studies that involved smallholder farming, including the advancement of GFI and other dimensions.

The recommendations that followed, sought to balance the commonality of presenting them in reports, based on the grounds that these are a requirement and to a point of reference where diverse target groups of information finders look forward to querying, revising, critiquing, analysing, assessing and acknowledging as reasonably acceptable to work within projects of smallholder farming income advancement and sustainability, as well as other similar projects. This should be clear, interpretable and accurate (National Academies of Sciences & Medicine, 2019).

National Academies of Sciences and Medicine (2017) suggested that the results from which recommendations originate, should pass the test of integrity in the event they need to be verified. This can be done by allowing a process of being confirmed or refuted. While the researcher owns these recommendations, they should easily be cross-referenced and traceable to the overall responses of the respondents, without having the risk of a privacy breach They should be able to be implemented and transferable, within the breadth and width of smallholder farming with simplicity and ease, albeit their origin stem from the Free State province.

The recommendations of this study emanate from the outcomes of a detailed and diverse set of questions raised in 372 questionnaires, that sought to quantify the results using statistical analysis (Sarja, 2020), in order to form expectations of the research, as stated by the objectives of the research. Not all recommendations, however, ensue from quantified data. There are also those that resulted from the interpretation of qualitative data (Bryman, 2019), after fifteen smallholder farmers participated in semi-structured interviews, with responses of ten analysed. From both quantitative and qualitative sides, and out of a possible 17 recommendations that were collated.

The 17 recommendations below, underscore the findings from both the quantitative and qualitative aspects of this study. The correct and consistent implementation of these recommendations, sought to increase the chances of the resultant GFI sustainable framework or model that was being advanced or developed during this research. This also maintained an inclination to successfully benefit smallholder farmers in Free State in order for this to be rolled out in other provinces and to share in the success.

7.3.1 Formal agricultural qualifications

The low percentage of formal agricultural qualifications in Table 4.4, showed that it is important for the government to take steps to address this issue, by providing uniquely identified training and education opportunities that are suited to regional groups or smallholder farmers, that do similar farming activities which ensures that they can acquire skills and knowledge necessary to farm effectively and efficiently.

Summary of an actionable activity:
Customised training packages, according to farming activity, such as horticulture, livestock and crop. A mentor with expertise in one field is accredited to do on-site training at the places of production of smallholder farmers, and is remunerated according to the number of trainees who undergo this training.

7.3.2 Household unemployment rate

Unemployment challenges as presented in Table 4.1.6, require innovative solutions. In order to improve the financial security of these households with the availability of job opportunities, it is important for both government and individual smallholder farmers to work together to implement policies and initiatives that can help improve the living

conditions of smallholder farming families in the region, where opportunities to create jobs in livestock production projects, sub-tropical fruit production, and agro-processing are significant (Cousins et al., 2020).

Summary of an actionable activity:
Innovative unique solutions that include government subsidies that are able to pay for farm labour. These subsidies, smallholder farmers can create jobs.

7.3.3 Main type of livestock farming

Table 4.2.2, findings sought to reiterate missed opportunities of the majority of smallholder farmers that were not engaging in any type of livestock farming activities, while stuck in other non-profitable activities. It highlighted that there are opportunities that can still be further exploited in cattle farming. The finding required this information to be used in informing policies and programs that aim to support smallholder farmers with more interventions so as to help them increase their incomes on a sustainable basis. It is therefore essential that policy interventions are implemented to ensure that smallholder farmers carrying livestock farming in the region are able to access resources, markets and technology in order to ensure the sustainability of their farming operations and related income.

Summary of an actionable activity:
A survey of livestock type or meat primarily traded and consumed in a farming area can be done, with a tradeable database created, of all by-products of these livestock, such as quantities of milk, beef, cream and for poultry, quantities of eggs, so that an area is self-sufficient for a chosen farm production activity (Baltenweck et al., 2020).

7.3.4 Farm related debt

Unless private sector stakeholders play an active role in assisting smallholder farmers to take up debt solutions, will there ultimately be benefits with the building up of tangible assets (Tinsley & Agapitova, 2018), thereafter the findings in Table 4.2.10, will be ideal, where the majority of farmers do not have debt. Thus, in order to ensure the sustainability of smallholder farming income, it was important to provide the necessary support to farmers in order to reduce or eliminate their debt levels.

Summary of an actionable activity:

Creation of representatives of smallholder farmers groups by area, in order to negotiate the restructuring of debts into instruments that can help farmers to accumulate tangible assets, with private sector debt restructuring experts, rather than to allow self-destructing debts that consume their production income.

7.3.5 Farming cooperative membership

In order to increase the level of cooperative membership among smallholder farmers in the Free State province of South Africa, it is important for government and other stakeholders to provide smallholder farmers with access to resources and services that would enable them to join and benefit from being a cooperative. This could help to increase their profits and reduce their production costs. This would result in increasing their income and improving their ability to sustain their farming operations through scalability of corroboration.

Table 4.2.11, indicated findings that suggested that the majority of smallholder farmers in Free State showed a distrust to forming or being part of cooperatives, where more successes than failures were registered according to latest studies, with cooperatives working on various agricultural projects (Donkor & Hejkrlik, 2021; Mkhabela, 2013). Highlights included increased access to financial services, technical assistance, and market access, as well as getting easier access to credit, inputs, and agro-processing facilities.

Summary of an actionable activity:

Existing cooperatives, showcased their success stories to individual smallholder farmers whom did not belong to cooperatives, and shared best practices in order to motivate the formation of more cooperatives per area.

7.3.6 Poor road infrastructure and networks

The government and other stakeholders should invest in road maintenance and improvements in Free State province in order to improve the condition of roads used by smallholder farmers, as the majority of these farmers expressed regrettable poor conditions of this road infrastructure and network as shown in Table 4.4.1, impeding many forms of access and effort to transportation of their goods for business purposes (Mtombeni et al., 2019).

Summary of an actionable activity:

Submission of formal requests to private sector stakeholders in agriculture, by smallholder groups such as cooperatives and associations, may unlock a gradual assistance as part of corporate social investment ventures to repair and maintain unusable roads, especially in many rural areas that affect the business of smallholder farmers. Furthermore, continuously petitioning the government to carry out their democratic and social governance responsibility on road maintenance (Levy et al., 2021), may exert pressure that will ultimately force positive action.

7.3.7 Access to reliable transport

Table 4.4.2 was an extension of challenges that were identified in Table 4.4.1 The government needs to invest in more resources in improving the transport infrastructure in rural areas or provide subsidies to smallholder farmers to help them access reliable transport, which in any case, is in short supply due to poor road network.

Summary of an actionable activity:

Local transport organisations may be able to provide organised assistance to smallholder farmers in accessing reliable transport. Sharing of information through technology, may decrease transport and transportation costs, such as through the use or inter-leasing of transport closer to the active chain of supply and demand, with sharing of costs (Okole et al., 2021).

7.3.8 Access to regular customers

Having regular customers can help to reduce the risk of price fluctuations, as they are more likely to pay a fair price for the products. It can also help smallholder farmers to build relationships with their customers and develop trust. This can be beneficial for smallholder farmers, as customers who have established trust with their suppliers are more likely to purchase their products on a consistent basis.

These customers can furthermore help smallholder farmers to develop their business, by providing advice and assistance on improving aspects of their business. It is therefore a big challenge to have the majority of smallholder farmers that are unable to create consistent customer relationship, as displayed in Table 4.4.4 and, as a result require measures to improve the situation.

Summary of an actionable activity:

The ability to obtain market access information, and disseminate product information correctly may increase market participation, therefore may also result in sustained customer relationships (Zondi et al., 2022).

7.3.9 Contractual agreements

The paltry numbers reported in Table 4.4.5 about bigger players in agriculture were unable to show smallholder farmers their confidence in them and share a piece of the market pie, was a concern that requires drastic steps by the industry authorities like the government, where current deliberate unfair and skewed agreements are a disadvantage to smallholder farmers especially regarding monetary returns (Ncube, 2020).

Summary of an actionable activity:

To protect smallholder farmers, it is important that they are able to negotiate and enter into formal or informal contracts with buyers of their produce. Entities that receive government funding to develop various facets of agriculture, such as the National Agricultural Marketing Council (NAMC), have to be approached to increase the level of their interventions in assisting smallholder farmers to benefit from programmes that encourage contract farming, for example, contract farming workshop and training that took place in Gauteng (Anseeuw et al., 2009) and Eastern Cape (Lekgau et al., 2015), respectively.

7.3.10 Plant production skills and GFI

Only one quarter of smallholder farmers that participated in this study have access to the plant production skills, as shown in Table 4.4.6. Smallholder farmers without access to skilled labour may struggle to optimise the use of any little resources they may have, leading to higher costs and lower revenues. Furthermore, smallholder farmers without access to skilled labour may have a lack of knowledge and expertise needed to identify and implement best practices in sustainable farming, leading to further reductions in gross farming income. In order to ensure the sustainability of smallholder farming income, it is important for smallholder farmers to have access to expert skills in plant production. By not having this kind of access, smallholder farmers may further struggle to maximise yields, optimise their use of resources, build the capacity to use new technologies and tools as well as identify and implement best practices in sustainable farming.

Summary of an actionable activity:

AgriSETA, and other similar industry players, should be approached to commit plans that can be audited, to ensure that they are delivered to rightful smallholder farmer groups, as per reported programmes (Sibia, 2019).

7.3.11 Animal production skills and GFI

Similar to plant production skills aspect above, table 4.4.7, identified a lower than adequate animal production skills access by smallholder farmers. Without access to animal production skills, smallholder farmers are likely to produce lower yields, as well as lower quality animal products. This could in turn reduce their gross farming income, as they would be unable to meet the demands of the market. It may also lead to increased production costs, as these farmers may need to purchase more feed and other inputs, in order to maintain the same level of production.

Furthermore, this may result in negative environmental impact, due to the mishandling of related aspects in animal health and welfare production management. The mishandling of the environment, may lead to increased emissions and waste, and potentially to environmental degradation. There are many programmes available to upskill farmers (Marwick, 2019), however very little awareness to ensure that these farmers benefit from these, which highlighted the failure of those in authority.

Summary of an actionable activity:

A user-friendly database of skills improvement programmes can be compiled by smallholder farmer groups representatives, further identifying locations, times, and types of these programmes, and where training and workshops take place, to allocate participating candidates until the level of skill is at a satisfactory level.

7.3.12 Financial management skills and GFI

The statistical figure in table 4.4.8, is consistent with other skills-related outcomes with financial management skills in the same range. This indicated that smallholder farmers may be unable to make the most of their farming production resources, with their relatively high lack of financial management skills, which can lead to lower yields and lower farm incomes. They may also be less likely to invest in new technologies and innovations that could improve their yields, thus putting them at a competitive disadvantage to larger scale commercial operations.

Their lack of access to financial management skills has a further potential to have a significant impact on the sustainability of smallholder farming income. Not having access to financial management training and applied skills, smallholder farmers may struggle to keep up with larger-scale operations and may ultimately be forced out of business as this may lead to an inability to compete. This could have a devastating impact on the local economy, as smallholder farms are often considered to be an important source of employment and income in rural areas.

Summary of an actionable activity:
Other than training courses, community meetings and, self-help and study groups can be arranged, as they present a different and friendlier participative approach to that of the common class-based types, which may not be comfortable for many of the smallholder farmers without formal education background, or with negative school experiences (Heney, 1999).

7.3.13 Record-keeping skills and GFI

Table 4.4.9, is no different in showing the general lack of access to important skills by smallholder farmers in the agriculture industry. From a gross farming sustainability perspective, record keeping is essential for assessing the income and financial status of their smallholder farming business, and to determine whether a particular farm is financially sustainable or not. Without these records, it is difficult to identify which farming activities are generating income and which are not, and to make decisions about which crops to grow and how to use resources more efficiently.

Having farming activities' records or access to recordkeeping skills can have a positive impact on the sustainability of smallholder farming income, as it can help in identifying areas of the farm that need improvement, such as making better use of production inputs and reducing waste. Through record keeping, smallholder farmers can identify problems and make changes in their operations to increase income and reduce expenses. Furthermore, having access to these skills can help smallholder farmers to make better financial decisions, such as when and how much to sell their produce and when to purchase inputs.

Summary of an actionable activity:
Data management has become critical to the success of many business ventures, in this new age of technology, and the gradual introduction of technology-backed record-

keeping can go a long way in positively impacting on the performance of smallholder farming (Kuteesa & Kyotalimye, 2019).

7.3.14 Marketing and sales skills, and GFI

Lack of marketing and sales skills among smallholder farmers in Free State is likely to have a negative impact on the sustainability of their gross farming incomes, with Table 4.4.10, affirming the inadequacy of other previously mentioned skills' measures. Without people providing assistance in marketing and sales function as well as related skills, smallholder farmers may struggle to find buyers for their products, which could result in them having to sell them at lower prices than they would be able to if they had the necessary skills, or even incur outright monetary and production stock losses. This could lead to them not making enough money to cover their costs and generate necessary revenue.

However, having someone with marketing and sales skills on their farm or having access to someone with those skills could be a great asset for smallholder farmers. They would be able to find buyers for their products more easily, and could potentially negotiate better prices for their produce. Their incomes would as a result improve, as they would be able to generate more revenue from the sale of their production outputs.

Summary of an actionable activity:

According to the area of trading the smallholder farmer's production output, market information registers of accessible markets can be compiled and shared to farmers belonging to area groups (Mbatha, 2021). Easier access to the identified markets, can be improved by coordinating common transport per farmer group which has products to showcase and sell at the markets, furthermore making resources' sharing beneficial in terms of costs, transportation convenience and possibility of corroboration on prices to increase market share.

7.3.15 Government subsidy and GFI

Smallholder farmers do not have much control over the allocation of subsidies. Hence, table 4.5.1, showed a low benefit take-up level, also at less than one quarter of participants. Government subsidy programmes have a low success rate of satisfactory implementation because the correct monitoring is lacking, as reiterated by the non-completion of a project to update the national farmer database by the provincial

departments of agriculture after being mandated by the National Department of Agriculture (Popoola & Yusuf, 2021).

Summary of an actionable activity:
To improve the success rate of receipt of government subsidies, by smallholder farmers, representation of these farmer groups by areas is important, supported by an updated register of farmers belonging to these groups. They can monitor if their registers match those of the department of agriculture, such as by municipal wards, with any discrepancies, especially of resources' allocation, being investigated and attended to in a timely manner. This will ultimately eliminate complaints of bias, favouritism and organised exclusion alleged against government officials in different provinces; furthermore, of randomised and unfair allocation of these subsidies (Popoola & Yusuf, 2021).

7.3.16 Banking practice as a GFI determinant

Smallholder farmers have general knowledge that some form of banking related decisions are important in farming operations. However, they lack specific information on banking products, as well as banking related support services, that may be helpful in their running of smallholder farming businesses. Banks need to address the question of lack of access, and this they can do by sharing information on a wider basis, so that smallholder farmers become aware of any related benefits.

Summary of an actionable activity:
With Table 4.6.7, informing ideal banking practice by smallholder farmers, Banks should be approached to offer financial literacy, education programs as well as improve mobile banking services access or easier access to bank branches in rural areas, to help farmers better understand banking and financial services. The data regarding doing banking, highlights the importance of improved access to banking services for farmers, especially those with low incomes (Marutha & Oluwatayo, 2021).

7.3.17 Recordkeeping as a GFI determinant

Recordkeeping in any form of business is necessary. However, it is important to know the operational requirements of records to keep, including which ones, how to do the recordkeeping and why it is important to do it. Table 4.6.15 shows a very low recordkeeping action, therefore there is a higher necessity to review the need for it.

Summary of an actionable activity:

It is also important for smallholder farmers to ensure that their recordkeeping skills are regularly updated and maintained in order to ensure that their farming income remains above average, as highlighted in Table 4.6.15. Investing in record keeping skills can help smallholder farmers to effectively manage their resources, track their expenses and revenues, and make informed decisions that can lead to increased revenues, rather than depending primarily on memories of farmers (Nkadimeng et al., 2022).

7.3.18 Up to date records as a GFI determinant

The importance of keeping updated production, income and expenditure records was highlighted in Tables 4.6.17, 4.6.19 and 4.6.20 respectively. This could include traditional methods of paperwork, mass type media then adoption of digital technologies over time, with the use of mobile and internet platforms (Mdoda et al., 2022; Smidt & Jokonya, 2022). This can be done by investing in new technologies and software, taking classes on record keeping, or hiring a professional to help with record keeping.

Keeping up to date records can help farmers facilitate business planning (compiling of an actual business plan), save money and maximise their revenue (Kuteesa & Kyotalimye, 2019). This means that smallholder farmers should take steps to ensure that they have up to date production, income and expenditure records, if they want to increase their farming income.

Furthermore, having accurate records can help these smallholder farmers to apply for possible grants, loans, and other financial assistance programs that are available to them, as they create a credit risk profile that can be accessed by lenders and other financial institutions in the assessment of their applications for these grant and lending instruments (Mikolajczyk S et al., 2021).

They can do this in groups, to gain common benefit and achieve quicker compliance (AGRA, 2020; Choudhury et al., 2022). It is important that these smallholder farmers are continuously made aware of the benefits of having up to date records and how this can help them sustain their farming income.

The above recommendations were selected for their relative simplicity in implementation, although some of them are not under the full control of the

smallholder farmers, such as, those that require interventions by government and other corporate entities. However, the same smallholder farmers can influence the direction these recommendations can take, towards forming part of the process to implement these.

Extending this simplicity to the proposed GFI sustainability framework or model, the researcher highlights a viewpoint that the SDGs country model released in 2019, should be adapted accordingly, to reduce complexity and not heighten it. This can be done by initially incorporating indicators, that have a significant relationship with the few variables identified in this study, then allowing uptake by as many potential smallholder farmers who can derive benefits thereof. Rigour in the implementation of recommendations resulting from findings of this study, as emphasised by many studies, should not imply complexity, but correct interpretation and analysis of findings, leading to those recommendations.

7.4 LIMITATIONS OF THE RESEARCH STUDY

Three of the objectives in this study were mostly met, relating to measurement of current GFI, proposing the determinants of GFI and lastly, proposing a sustainability model of GFI, of smallholder farmers in the Free State province. However, the study also exposed the limitations related to commercialisation of these farmers' businesses and lack of support programmes available.

The challenges related to the availability of data, tools and strategies, required to accurately measure the GFI sustainability, when reviewing commercialisation potential and the success of support programmes in FS. These challenges, are partly exacerbated by stances, such as those of Statistics South Africa, where it has vehemently taken a decision, that statistics and data collection about the commercial and other operations of smallholder farmers, are not their responsibility (Nortjé, 2020).

In addition, there was a time limit due to the field work having started during peak season, and towards the end of year holiday period, where most people including smallholder farmers, tend to wind away from formal operations of daily activities. Lastly, while initial meetings with government officials were fruitful, at the time when the researcher was sharing information about the study during preparation visits, it

became difficult for the researcher to find assistance, largely due to lack of decision-making by government department officials.

For example, the gatekeeper letter of approval to carry out field work in the Free State province, was submitted to the agricultural department in May, 2022, but the approval letter was only received in July, 2022, which caused a delay of more than one month.

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A. Permission request letter to do research (FS Government)

To the Free State Provincial Department of Agriculture

The Head or Director/s or to Whom It May Concern

(Overseeing All District Municipalities Service Delivery Centres)

A letter asking for permission to conduct a research study

I am Badiri Moloabi, a DBA (Doctor of Business Administration) candidate (student) at University of Kwazulu-Natal (UKZN), Graduate School of Business & Leadership.

One always tries to find a way of giving back to the community you come from. Free State is my home province. By way of a research study, this will not only benefit me as a doctoral studies candidate, but also aims to benefit primarily the small-scale farmers in the Free State, as well as other agricultural industry stakeholders that have interest in the progressive development of these smallholder farmers.

I hereby request permission to carry out a research study in the five District Municipalities of the Free State province, by administering interview sheets (commonly referred to as questionnaires) and asking a total of about 385 smallholder farmers on the service centres database registers, questions related to their farming activities, on their smallholdings. The five district municipal areas are: Fezile Dabi, Lejweleputswa, Thabo Mofutsanyana, Xhariep and Mangaung/Motheo. This works out to about 77 smallholder farmers per district municipality. I intend to source a minimal number of local unemployed youth to assist me in carrying out the interviews, with a reasonable compensation. The period of interviews is estimated from around June until around August/September 2022.

The questions focus on how the production on their small farms helps them to earn farming income, and how challenges relating to this can be addressed to the benefit of the smallholder farmers in the municipality areas, to ensure sustained total farming income.

A letter of permission is required by UKZN, before it can grant me research study ethical clearance to continue doing the research with the smallholder farmers participants linked to the department of agriculture service centres in these five district municipal areas.

The letter from the university approving my research study proposal is attached for your reference.

Yours Sincerely,

Badiri V.M. Moloabi

Email: 217079590@stu.ukzn.ac.za

Cellphone: 082 565 6647

B. Addendum v1 Letter for permission to do research

To the Free State Provincial Department of Agriculture

The Head or Director/s or to Whom It May Concern

(Overseeing All District Municipalities Service Delivery Centres)

Addendum to: A letter asking for permission to conduct a research study

A waiver and disclaimer in favour of the Free State Provincial Department of Agriculture and all Government departments.

The researcher, Badiri V.M. Moloabi undertakes to observe and adhere to all the privacy and confidentiality provisions of the Government information and his research process will only use the information that is already in the public domain.

The research process will not access or use any information that is only privy to the Government, is currently private and confidential, thereby not yet accessible and available to the public.

The researcher, further undertakes that all the participants in the research process will only participate as per their written consent, and will have no obligation whatsoever, to participate in the research process. At any stage of the research process, they will be allowed to withdraw if they so wish. No harm of any form, will result from the participation in the research process, including but not limited to reputation, economic, social, environmental and any other relevant situation. The privacy and confidentiality of their participation in the research process is also confirmed and committed to, by the researcher.

Yours Sincerely,

Badiri V.M. Moloabi

Email: 217079590@stu.ukzn.ac.za

Cellphone: 082 565 6647

C. Addendum v2 Letter for permission to do research

To the Free State Provincial Department of Agriculture

The Head or Director/s or to Whom It May Concern

(Overseeing All District Municipalities Service Delivery Centres)

Additional Addendum (v2) to: A letter asking for permission to conduct a research study

A representative questionnaire and interview sheet with main questions that will feature during the field research process with the FS smallholder farmers.

The researcher, Badiri V.M. Moloabi hereby submits the required blueprint of the questionnaire and interview sheet to be used during the field research.

The smallholder farmers of interest, to be requested as participants in the research process are those that are involved in either/or and including, **horticulture, livestock and poultry**, as this research study focuses more on the farming income generation related aspects than the actual production.

Yours Sincerely,

Badiri V.M. Moloabi

Email: 217079590@stu.ukzn.ac.za

Cellphone: 082 565 6647

Electronic Signature:



Date: 14 June 2022

D. Addendum v3 Letter for permission to do research

To the Free State Provincial Department of Agriculture

The Head or Director/s or to Whom It May Concern

(Overseeing All District Municipalities Service Delivery Centres)

Additional Addendum (v3) to: A letter asking for permission to conduct a research study

Clarifying the relationship of research studies and the POPI Act regulatory provisions.

The researcher, Badiri V.M. Moloabi hereby further would like to point out that information about smallholder farmers, that is on the records of the Department of Agriculture, e.g. in Free State, is according to the above act, on public records. This information, is therefore accessible within good reason, to members of the public. Use thereof, is allowed and can further be vetted for correct and just use, by requesting those who are requested to participate in required exercises, to provide additional consent.

Please refer to Chapter 1, page 14, around line 40 and 50 of the Government Gazette, 26 November 2013, of the Act No.4 of 2013 (POPI Act of South Africa).

The researcher has made it clear, in his last submissions, including the representative questionnaire he submitted, that smallholder farmers of interest, who will also be participants in the research process, will be clearly asked for consent to participate in the study and will be free to withdraw their consent and participation, at any time during the exercise.

I, as the researcher, would like to reiterate that the study may not only benefit me in terms of possible qualification, but is likely to benefit, mainly the smallholders and secondarily the other players and stakeholders such as the government, if one looks at the research aim and objectives stated in the proposal document submitted to the department.

Yours Sincerely,

Badiri V.M. Moloabi

Email: 217079590@stu.ukzn.ac.za

Cellphone: 082 565 6647

Electronic Signature: [redacted] Date: 12 July 2022

E. Letters for permission to do research (Private Stakeholders)

The Director/s or to Whom It May Concern

Lead Afrika Development Institute
07 July 2022

Attention: Mr. Tshiamo Dichabe

A proposition letter for stakeholder support in conducting a research study

I am Badiri Moloabi, a DBA (Doctor of Business Administration) candidate (student) at University of Kwazulu-Natal (UKZN), Graduate School of Business & Leadership.

UKZN has approved my research study proposal which aims to establish mechanisms necessary to measure and sustain the gross farming income of smallholder farmers, with the main study to be piloted off in the Free State province (home province of the researcher). The intention is to ultimately roll it out to all the other provinces of South Africa, by partnering with relevant stakeholders.

This proposal seeks support of relevant stakeholders in the smallholder farming sector, typical gatekeepers of your organisation's stature. The smallholder farming sector includes small-scale, emerging, subsistence farmers etc; etc, farming in any commodity type.

The immediate assistance required, is for a gatekeeper intervention with access to smallholder farmers, that are generally accessible through organised forums including associations and social media group platforms. (Gatekeepers are institutions or authorities with a good working relationship with potential respondents in a research study, and can therefore facilitate working together with the researcher). The gatekeeper would assist in requesting the farmers for consent and to assist by participating voluntarily in the above research study, through completion of questionnaires and being interviewed to answer unstructured (open-ended) questions by field enumerators in selected municipal areas of farming. Farmers will not be requested to complete the forms, as trained field enumerators will complete the forms (typically unemployed graduates or youth, in the farming area).

The period of initial interviews is estimated from the beginning of August until around October 2022, in the five district municipal areas, namely: Fezile Dabi, Lejweleputswa, Thabo Mofutsanyana, Xhariep and Mangaung/Motheo. About 385 smallholder farmers are to be interviewed. This works out to about 77 smallholder farmers per district municipality. A minimal number of local unemployed youth will be sourced to assist in carrying out the interviews as field enumerators, with a reasonable compensation.

The contribution and objective of this research study is to primarily benefit the small-scale farmers in the provinces of South Africa, as well as provide other agricultural industry stakeholders that have interest in the progressive development of these smallholder farmers, an opportunity to utilise the expected derived outcomes for the betterment and transition of smallholder farmers to successful commercial farming ventures.

If hopefully, this request is welcomed and accepted, a gatekeeper's letter of support to the field work of the research study, is required by UKZN, before it can grant me the research study ethical clearance to continue doing the research with the smallholder farmers participants in these five district municipal areas.

The above participation approach suggested, sufficiently covers the regulatory requirements and provisions of the Protection of Personal Information Act (of South Africa), known as POPI act, as it proactively requests for consent by those smallholder farmers willing to voluntarily participate in the research study, before it commences.

The letter from the university approving my research study proposal is attached for your reference.

Yours Sincerely,

Badiri V.M. Moloabi

Email: 217079590@stu.ukzn.ac.za

Cellphone: 082 565 6647

A letter of proposition - research study on smallholder farmers
Tshiamo Dichabe <tshiamo@leadafrika.com>

To:
Badiri Moloabi (217079590)
Cc:
Dr Hendrik Cronje <hennie@leadafrika.com>;
ceo@uaff.co.za+3 others

Thu 2022-07-14 12:42

Good day Rre Badiri

Hope this email finds you well and in good spirits.

Just an indication that your email is noted and well received.

I will revert soonest with feedback or request for clarity.

Kindest regards

Tshiamo Dichabe
Chief Executive Officer (CEO)

Request letter: thoughts on sourcing research respondents

Craig Macaskill AHB <craig@agribook.co.za>

To:
Badiri Moloabi (217079590)
Cc:
mike@agribook.co.za

Wed 2022-09-07 14:12

Hi Badiri

You have already done well to get that letter of recommendation from the **department of agriculture**! Its extension officers would be the obvious, first-hand point of contact to people for your research. A pity if they won't help you!

We ourselves do not have a list of smallholder farmers (or commercial farmers, for that matter). Usually such a list if fiercely guarded by farm unions to protect their members from being pursued by companies selling fertiliser or agricultural products.

AgriSETA might be able to help, but I suspect the same protection of information would apply.

I emailed Dr Jack Armour from **Free State Agriculture** [https://vrystaatlandbou.co.za/] but haven't heard back from him yet. You are welcome to follow through with that. Although commercial farmers are the main constituency here, the union has smallholder farmers involved in the various district groups, especially when the **local co-op** is involved. OVK, VKB, GWK, Afgri and Senwes all have a presence in the Free State.

You could also approach **Grain SA** which does sterling work in developing new farmers and taking them through to commercial farmer status.
See https://www.grainsa.co.za/pages/farmer-development.

I wonder though if the **University of the Free State** wouldn't be able to help facilitate your research. We used to have contact with the Centre for Sustainable Agriculture and Extension (called CENSARD back then). The University now includes it under Sustainable Food Systems and Development [see https://www.ufs.ac.za/natagri/departments-and-divisions/Sustainable-Food-Systems-and-Development]. Prof Johan van Niekerk [vniekerkja@ufs.ac.za] might be able to assist.

We give a breakdown of contacts in the Free State at https://agribook.co.za/introduction/agriculture-in-the-provinces/#freestate. Usually each of the **district municipalities** has someone in charge of agriculture.

I'm afraid we can't help you more than this.

Best wishes!

Proposal Request for Smallholder Farmers Participants in a Research Study

Badiri Moloabi (217079590)
To:
feziledabi.unemployedforum@gmail.com

Tue 2022-09-27 11:35

Letter of Proposition – B Moloabi.pdf

Good day,

Kindly find attached my letter of proposition.

I will be at hand to answer any questions.

Regards,
Badiri 0825656647

Badiri Moloabi (217079590)

To:
agapefordevelopment@gmail.com
Cc:
feziledabi.unemployedforum@gmail.com

Thu 2022-11-10 12:09

B Moloabi proposition to Agape for Development.pdf
UKZN Proposal Outcome B Moloabi.pdf
FS Agric Dept Letter - Badiri - Permission to conduct a research study - Jul 2022.pdf
UKZN Ethics approval B Moloabi (1).pdf

Good day,

Kindly find attached the required documents.

Regards,
Badiri Moloabi 0825656647

Agape Foundation For Community Development <agapefordevelopment@gmail.com>

To:
Badiri Moloabi (217079590)
Cc:
feziledabi.unemployedforum@gmail.com

Thu 2022-11-10 18:40

Thank you very much for the information sharing as we requested. We will be able to freely work with you now and in the future.

F. Informed consent form (researcher)

Information Sheet and Consent to Participate in Research

Date: _____

Dear Farmer

My name is **Badiri V.M. Moloabi** (student number 217079590). I am a Doctor of Business Administration (DBA) candidate studying at the University of KwaZulu-Natal, Graduate School of Business and Leadership, Westville Campus.

I can be contacted using the following methods:

University (UKZN) Email: 217079590@stu.ukzn.ac.za
Personal Cellphone: 082 565 6647 (WhatsApp, SMS, Call or a request of a "Call back option").

You are being invited to consider participating in a study that involves research with the title: **Advancing gross farming income sustainability of smallholder farmers in the Free State province, South Africa**. The aim and purpose of this research is to determine whether the gross farming income currently earned by smallholder farmers, is traceable and determinable in a structured manner and primarily intends to propose more guidelines to ensure that this gross farming income is derived consistently, meaning that it should be sustainable.).

The study is expected to enroll 385 participants in total, with 370 farmers participating in answering short questions (known as the quantitative arm of the study) and 15 farmers participating in answering longer open-ended questions (known as the qualitative side of the study). The research study will take place in the five municipal districts of Free State province, namely:
1. Fezile Dabi district municipality
2. Lejweleputswa district municipality
3. Thabo Mofutsanyana district municipality
4. Xhariep district municipality
5. Mangaung metropolitan (formerly Motheo district municipality).

It will involve the following procedures:
1. Identification, recruitment and training of field enumerators who will assist the researcher, being one or two unemployed graduates or college level students per district municipal area.
2. This will be done with the help of the identified area extension officers, working in the local department of agriculture, with contact details as listed in the publicly available online provincial directories, per district municipal area, as they currently have a working relationship with the smallholder farmers in the Free State province.
3. Recruitment of smallholder farmers who will volunteer to participate in the research, also with the assistance of the local office department of agriculture extension officers, by word of mouth, use of flyers, personal approach and publicly accessible online media searches.
4. Informing farmers that I have requested and received a letter of general support from the Free State department of agriculture acknowledging that I will be carrying a research study with smallholder farmers in the province.
5. Completion of about 370 questionnaires (quantitative arm) and about 15 interview sheets (qualitative arm) by the researcher, assisted by the field enumerators, with smallholder farmers who voluntarily agree to participate in the research study.
6. The interviews will be audio recorded (where additional consent is given). The recording will only be used for the purpose of ensuring that the responses of the participant are accurately presented.

7. The interviews for the questionnaires and interview sheets will take place at the agreed meeting place, being the smallholder farmer's plot/farm or at the local department of agriculture offices, at the convenience of the smallholder farmers and agreed time frames, individually or preferably in groups as will be agreed.
The duration of your participation if you choose to enroll and remain in the study is expected to be about 60 minutes (1 hour) of being interviewed, in only one day, once off. The study is self-funded as there were/are no funders approached as yet by the researcher.

The study is not expected to involve any noticeable risks nor discomforts. **We hope that the study will create the following future benefits after the research has been completed:**

1. Webinars will be conducted for smallholder farmers to receive training and guidelines on how to potentially generate and maintain sustainable levels of gross farming income as operational benefits in the medium to long term.
2. In the process of participating, the farmers may themselves start to generate new ideas on ways to deal with their current farming income.
3. As a result of the research study after completion, there will be a potential growth of farming income on a sustainable basis, resulting in societies and communities benefiting from increased employment opportunities and reduction in poverty levels.

During the research study, immediate incentives and opportunity will accrue to an estimated ten (10) field enumerators, who may be selected to assist in the completion of questionnaires, in the five (5) municipal areas, with a reasonable stipend of R900 each, once-off, to compensate their assistance to the researcher. These field enumerators will be trained by the researcher, on how to assist in the completion of the questionnaires, in full compliance of the ethical considerations stated in the informed consent forms. They may also accept referrals from the farmers being interviewed, of other farmers that may agree, to also be participants in the research study, only with informed consent. Each field enumerator is expected to interview about 37 participants, to earn the above stipend. Should they be unable to reach the expected number, the rate per participant interviewed will be calculated at R20 (twenty rand) per participant interviewed.

Breakfast/lunch vouchers only, will be provided by the researcher, where participants have voluntarily decided and agreed with their area extension officers to gather in one place, specifically for the questionnaires completion and interviews, **as courtesy and appreciation.**

There are no immediate direct monetary, financial rewards or reimbursements of any kind that will result from participating in the research.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number [_will include upon approval_]).

In the event of any problems or concerns/questions you may contact the researcher at:

University (UKZN) Email: 217079590@stu.ukzn.ac.za
Personal Cellphone: 082 565 6647 (WhatsApp, SMS, Call or a request of a "Call back option").
or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557- Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Please note that:

• Your participation in the research study is entirely voluntary. You have a choice to participate, not to participate or stop participating in the research. You will not be penalized for refusing or withdrawing from participating in the research study, or taking such an action and you will not be treated any differently from other smallholder farmers as a result of not participating. Should there be any benefits resulting from the research study, you will normally benefit for those as normally entitled.

• When the participants decide to leave the research study, they should inform the researcher or the field enumerators that they wish to withdraw from the study. They may provide reasons why they are withdrawing, but they are not compelled or required to give those reasons. There are no special requirements for leaving the research study.

• If they had already started with the interview process and the completion of the questionnaire or the interview sheet, and they decide to withdraw, the questionnaire or interview sheet will be destroyed and will not form part of the research study data collection and analysis.

• Where the questionnaire or the interview sheet was fully completed and the participant decides to withdraw afterwards, whereupon it will be difficult to identify which questionnaire or interview sheet belongs to the said participant who decides to withdraw, then the researcher or field enumerators will accept the withdrawal but will not be able to withdraw the questionnaire or the interview sheet, as there is no way of being able to identify these from the lot. The completed questionnaire or interview sheet will therefore form part of data collection and analysis.

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• The termination of the participation will be done by verbally informing the participant causing the distraction that their participation is terminated at that point and reasons will be provided.

• The record of research data as well as other items associated with the interview will be held in a password-protected file accessible only for the purpose of the research study, in line with the rules of the university.

• The researcher also uses "in the Cloud software" secured storage, that is only accessible with a password, therefore data security is highly ensured.

• The data will be disposed of after a period of five (5) years of secured storage, by an option of permanent deleting of files, that is available "in the Cloud software" secured storage.

Participants are not expected to incur any costs, as it is expected they will be interviewed in the vicinity of their plots/farms. The researcher and field enumerators will travel to their choice of meeting place. However where they prefer to gather at one place away from their plots/farms, for example at the local agricultural department offices, they may incur common transport or taxi fare cost. The researcher will reimburse the common transport cost agreed before the travel to a common place has taken place, or amounts equal to local taxi fare. This reimbursement by the researcher is to ensure that farmers are not financially negatively impacted for participating in the research study.

The steps that will be taken to protect confidentiality of personal information are the following:

• The information that you provide will be used for scholarly research and related outcomes only.

• The information will never be used for any other reason, and the identities will remain highly confidential, in line with all the applicable regulatory provisions, for example, the Protection of Personal Information Act (POPIA).

• Your views in this interview will be presented anonymously. Neither your name nor identity will be disclosed in any form in the study.

There will be no clinical information collected in this research study, and therefore there are no further limits of confidentiality applicable.

CONSENT (The participants are requested to seek any clarification to ensure that each participating in the research study fully understand all the provisions of participating, that there is no risk, discomfort or harm that may result as a result of being a participant. Furthermore, it is reiterated that they may withdraw their participation any time they wish).

I _____(Name or if you prefer, use a nickname, a pseudoname, a tick/mark or just leave blank) have been informed about the study entitled **Advancing gross farming income sustainability of smallholder farmers in the Free State province, South Africa** by the researcher _____ V.M. Moloabi or the fieldworker/enumerator: Name_____).

I understand the purpose and procedures of the study as explained to me and as detailed in this consent document above.

I have been given an opportunity to answer questions about the study and have given answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

I have been informed that there are no anticipated risks associated with this research study-related procedures.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at:

University (UKZN) Email: 217079590@stu.ukzn.ac.za
Personal Cellphone: 082 565 6647 (WhatsApp, SMS, Call or a request of a "Call back option").

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION
Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable

I hereby provide consent to (please delete whichever is not applicable):

Audio-record my interview YES / NO

_____ _____
Signature of Participant Date
(or a tick “v” or mark "X" where you prefer not to provide a signature)

_____ _____
Signature of Witness (Where applicable) Date

_____ _____
Signature of Translator (Where applicable) Date

G. Informed consent form (field worker, assistant, enumerator)

Information Sheet and Consent to Participate in Research

Date: _____

Dear Farmer

My name is _____"Name and surname" of the field enumerator. I am a trained field enumerator, assisting Badiri V.M. Moloabi (student number 217079590). He is a Doctor of Business Administration (DBA) candidate studying at the University of KwaZulu-Natal, Graduate School of Business and Leadership, Westville Campus.

He can be contacted using the following methods:

University (UKZN) Email: 217079590@stu.ukzn.ac.za
Personal Cellphone: 082 565 6647 (WhatsApp, SMS, Call or a request of a "Call back option").

You are being invited to consider participating in a study that involves research with the title: **Advancing gross farming income sustainability of smallholder farmers in the Free State province, South Africa**. The aim and purpose of this research is to determine whether the gross farming income currently earned by smallholder farmers, is traceable and determinable in a structured manner and primarily intends to propose more guidelines to ensure that this gross farming income is derived consistently, meaning that it should be sustainable.).

The study is expected to enroll 385 participants in total, with 370 farmers participating in answering short questions (known as the quantitative arm of the study) and 15 farmers participating in answering longer open-ended questions (known as the qualitative side of the study). The research study will take place in the five municipal districts of Free State province, namely:
1. Fezile Dabi district municipality
2. Lejweleputswa district municipality
3. Thabo Mofutsanyana district municipality
4. Xhariep district municipality
5. Mangaung metropolitan (formerly Motheo district municipality).

It will involve the following procedures:
1. Identification, recruitment and training of field enumerators who will assist the researcher, being one or two unemployed graduates or college level students per district municipal area.
2. This will be done with the help of the identified area extension officers, working in the local department of agriculture, with contact details as listed in the publicly available online provincial directories, per district municipal area, as they currently have a working relationship with the smallholder farmers in the Free State province.
3. Recruitment of smallholder farmers who will volunteer to participate in the research, also with the assistance of the local office department of agriculture extension officers, by word of mouth, use of flyers, personal approach and publicly accessible online media searches.
4. Informing farmers that I have requested and received a letter of general support from the Free State department of agriculture acknowledging that I will be carrying a research study with smallholder farmers in the province.
5. Completion of about 370 questionnaires (quantitative arm) and about 15 interview sheets (qualitative arm) by the researcher, assisted by the field enumerators, with smallholder farmers who voluntarily agree to participate in the research study.
6. The interviews will be audio recorded (where additional consent is given). The recording will only be used for the purpose of ensuring that the responses of the participant are accurately presented.

7. The interviews for the questionnaires and interview sheets will take place at the agreed meeting place, being the smallholder farmer's plot/farm or at the local department of agriculture offices, at the convenience of the smallholder farmers and agreed time frames, individually or preferably in groups as will be agreed.
The duration of your participation if you choose to enroll and remain in the study is expected to be about 60 minutes (1 hour) of being interviewed, in only one day, once off. The study is self-funded as there were/are no funders approached as yet by the researcher.

The study is not expected to involve any noticeable risks nor discomforts. **We hope that the study will create the following future benefits after the research has been completed:**

1. Webinars will be conducted for smallholder farmers to receive training and guidelines on how to potentially generate and maintain sustainable levels of gross farming income as operational benefits in the medium to long term.
2. In the process of participating, the farmers may themselves start to generate new ideas on ways to deal with their current farming income.
3. As a result of the research study after completion, there will be a potential growth of farming income on a sustainable basis, resulting in societies and communities benefiting from increased employment opportunities and reduction in poverty levels.

During the research study, immediate incentives and opportunity will accrue to an estimated ten (10) field enumerators, who may be selected to assist in the completion of questionnaires, in the five (5) municipal areas, with a reasonable stipend of R900 each, once-off, to compensate their assistance to the researcher. These field enumerators will be trained by the researcher, on how to assist in the completion of the questionnaires, in full compliance of the ethical considerations stated in the informed consent forms. They may also accept referrals from the farmers being interviewed, of other farmers that may agree, to also be participants in the research study, only with informed consent. Each field enumerator is expected to interview about 37 participants, to earn the above stipend. Should they be unable to reach the expected number, the rate per participant interviewed will be calculated at R20 (twenty rand) per participant interviewed.

Breakfast/lunch vouchers only, will be provided by the researcher, where participants have voluntarily decided and agreed with their area extension officers to gather in one place, specifically for the questionnaires completion and interviews, **as courtesy and appreciation.**

There are no immediate direct monetary, financial rewards or reimbursements of any kind that will result from participating in the research.

This study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number [HSSREC/00004623/2022]).

In the event of any problems or concerns/questions you may contact the researcher at:

University (UKZN) Email: 217079590@stu.ukzn.ac.za
Personal Cellphone: 082 565 6647 (WhatsApp, SMS, Call or a request of a "Call back option").

or the UKZN Humanities & Social Sciences Research Ethics Committee, contact details as follows:

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4000
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Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Please note that:

• Your participation in the research study is entirely voluntary. You have a choice to participate, not to participate or stop participating in the research. You will not be penalized for refusing or withdrawing from participating in the research study, or taking such an action and you will not be treated any differently from other smallholder farmers as a result of not participating. Should there be any benefits resulting from the research study, you will normally benefit for those as normally entitled.

• When the participants decide to leave the research study, they should inform the researcher or the field enumerators that they wish to withdraw from the study. They may provide reasons why they are withdrawing, but they are not compelled or required to give those reasons. There are no special requirements for leaving the research study.

• If they had already started with the interview process and the completion of the questionnaire or the interview sheet, and they decide to withdraw, the questionnaire or interview sheet will be destroyed and will not form part of the research study data collection and analysis.

• Where the questionnaire or the interview sheet was fully completed and the participant decides to withdraw afterwards, whereupon it will be difficult to identify which questionnaire or interview sheet belongs to the said participant who decides to withdraw, then the researcher or field enumerators will accept the withdrawal but will not be able to withdraw the questionnaire or the interview sheet, as there is no way of being able to identify these from the lot. The completed questionnaire or interview sheet will therefore form part of data collection and analysis.

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• Your views in this interview will be presented anonymously. Neither your name nor identity will be disclosed in any form in the study.

There will be no clinical information collected in this research study, and therefore there are no further limits of confidentiality applicable.

CONSENT (The participants are requested to seek any clarification to ensure that each participating in the research study fully understand all the provisions of participating, that there is no risk, discomfort or harm that may result as a result of being a participant. Furthermore, it is reiterated that they may withdraw their participation any time they wish).

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Additional consent, where applicable

I hereby provide consent to (please delete whichever is not applicable):

Audio-record my interview YES / NO

_____ _____
Signature of Participant Date
(or a tick “√” or mark "X" where you prefer not to provide a signature)

_____ _____
Signature of Witness (Where applicable) Date

_____ _____
Signature of Translator (Where applicable) Date

H. Quantitative Section A Questionnaire

PARTICIPANT CODE NAME (E.G. A1 - FOR OFFICE PURPOSES)

SECTION 1 (Questionnaire)

BACKGROUND INFORMATION (DEMOGRAPHICS)

The questions in this section are designed to collect information about your household's background, actual farm living circumstances and conditions.

A1. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Non-binary/LGBTIQ+
- ☐ Prefer not to Say
- ☐ Other: _____

A2. What is your age?

_____

A3. What is your marital status?

Mark one only

- ☐ Married
- ☐ Living in a marriage-like relationship/Living with a life partner
- ☐ Widowed
- ☐ Divorced
- ☐ Separated
- ☐ Never married
- ☐ Prefer not to Say

A4. What is your highest formal educational attainment/qualification?

a. Lower than high/secondary school ..... ☐
b. High/secondary school/matriculation ..... ☐
c. Bachelor's degree ..... ☐
d. Master's degree (e.g., MA, MSc, MBA, etc.)..... ☐
e. Other degree/certification(Please specify)_____ ☐
f. No formal education ..... ☐

A5. Did you receive a formal qualification in agricultural studies? Please indicate the type of qualification

No qualification	
Certificate	
Diploma	
Bachelor's degree	
Higher degree	

A6. How many members (adults and children) are there in your household?

_____

A7. How many members (Adults) in your household are unemployed?

_____

A8. How many children are there in your household?

☐ Less than 05 Children

☐ Between 05 and 10 Children

☐ More than 10 Children

A9. What is your population group?

☐ Coloured

☐ Asian or Indian

☐ Black or African

☐ White

A10. Among the following, what is your main type of smallholder farm activity?

Please tick the relevant option (if mixed farming activities, tick all the relevant options)

Bee-keeping	
Cropping	
Horticulture	
Livestock	
Cattle/Beef	
Goats	
Piggery/Pork	
Poultry	
Sheep	
Off-farming (non-agricultural activities including employment elsewhere)	

A11. Among the following, what is your main objective for farming?

Please tick the relevant option

Own Consumption only (To have food for the household)	
Marketing and selling only (To sell in order to earn farming income)	
Own consumption and marketing (To feed the household and sell the surplus)	

A12. How many years have you been farming?

_____

A13. Do you have any other source of income besides farming income?

If yes, please indicate below the source of income

Government grant	
Formal employment	
Pension	
Business (other than farming business)	
Other (please specify)	

A14. Does your household depend more on farming income or off-farm income for living expenses?

Please tick the relevant option

Farming income	
Off-farm income	

A15. Do you bank any of your farming income at any of the financial institutions?

Please tick the relevant option

Yes	
No	

A16. Do you have any debt related to your farming activities, at any of the financial institutions?

Please tick the relevant option

Yes	
No	

A17. Are you a member of any cooperative?

Please tick the relevant option

Yes	
No	

A18. Are you a member of any agricultural association?

Please tick the relevant option

Yes	
No	

A19. Do you have a mentor that gives you guidance in the farming business?

Please tick the relevant option

Yes	
No	

A20. Are you a mentor that gives guidance to any member of the community or family in the farming business?

Please tick the relevant option

Yes	
No	

LAND OWNERSHIP AND USAGE

B1. What is the total size/area of your farmland?

_____

B2. What is the total land area used for crop production or animal husbandry?

_____

B3. What cropping system do you use (if applicable)?

_____

B4. Do you own or rent the plot?

Please tick the relevant option

Own	
Rent	

B5. If the plot is rented, what kind of payment agreement do you have with the owner?

Please tick the relevant option

Yearly rentals: Rent amount	R
Monthly rentals: Rent amount	R
Other: Please specify	R

B6. If the plot/farm/land is owned, what is the latest known market value?

R_____

MARKET ACCESS AND SALES

C1. What do you sell from your produce and what volumes do you supply to each market per year?

(You can tick more than one)

Commodity/Product sold	Volumes and/or	Value
Meat		
1. Beef	1.	1. R
2. Chicken	2.	2. R
3. Goat	3.	3. R
4. Lamb/Mutton	4.	4. R
5. Pork	5.	5. R
Livestock		
1. Live Cattle/Calf	1.	1. R
2. Live Chickens/Chicks	2.	2. R
3. Live Goats/Kids	3.	3. R
4. Live Lambs/Sheep	4.	4. R
5. Live Pigs	5.	5. R
Crop		
1. _____	1.	1. R
2. _____	2.	2. R
3. _____	3.	3. R
4. _____	4.	4. R
5. _____	5.	5. R
Vegetables		
1. _____	1.	1. R
2. _____	2.	2. R
3. _____	3.	3. R
4. _____	4.	4. R
5. _____	5.	5. R

Commodity/Product sold	Volumes and/or	Value
Fruit/Perennial crops		
1. _____	1.	1. R
2. _____	2.	2. R
3. _____	3.	3. R
4. _____	4.	4. R
5. _____	5.	5. R
Herbs		
1. _____	1.	1. R
2. _____	2.	2. R
3. _____	3.	3. R
4. _____	4.	4. R
5. _____	5.	5. R

Bee-keeping		
1. _____	1.	1. R
2. _____	2.	2. R
3. _____	3.	3. R
4. _____	4.	4. R
5. _____	5.	5. R

Other		
1. _____	1.	1. R
2. _____	2.	2. R
3. _____	3.	3. R
4. _____	4.	4. R
5. _____	5.	5. R

C2. When do you start looking for buyers? (Please tick correct option)

Please tick the relevant option

Before production	
Only once produce is ready for market	

C3. Where do you sell your produce and what volumes do you supply to each market per year?

(You can tick more than one)

Sell at the farm	Volumes	Value	Distance to market
Sell to neighbours			
Sell by the roadside			
Sell to local supermarkets			
Other (Please specify)			
Sell to large retailer			
Schools			
Events			
Local vegetable market			
Hospitality clients			

C4. How is the road network in your municipal area?

Please tick the relevant option

Good	
Poor	
I do not know / I am not sure	

C5. Do you have reliable transport or access to reliable transport to deliver you produce to any market at any required time?

Please tick the relevant option

Yes	
No	

C6. In the last five (5) years, what is the estimated yearly total farming income received from the sales of all your farming production?

2021: R_____

2020: R_____

2019: R_____

2018: R_____

2017: R_____

C7. Do you have regular customers?

Please tick the relevant option

Yes	
No	

C8. Do you have any contractual agreements (formal or informal)?

Please tick the relevant option and mention whether formal or informal

Yes	
No	

C9. How long does it take for payment to be effected?

_____

C10. Do you have a budget amount of how much your yearly total sales volume should be, from all your farming activities?

R_____

C11. Do you have a target amount of how much your total income per annum should be, from all your farming activities?

R_____

C12. Do you have anyone working on the farm who provides the following skills?

Please tick the relevant option

Skill Type	Yes	No
Crop/Vegetable/Horticulture production		
Animal/Livestock/Poultry production		
Financial management		
Record keeping		
Marketing and Sales		

From a scale of 1 to 5, how would you rate the following statements.

C13. We maintain up to date production records

Strongly disagree	Somewhat agree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

C14. We maintain up to date sales records

Strongly disagree	Somewhat agree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

C15. We maintain up to date income records

Strongly disagree	Somewhat agree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

C16. We maintain up to date expenditure records

Strongly disagree	Somewhat agree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

C17. We regularly change the products we produce to ensure that they are in line with what our customers want

Strongly disagree	Somewhat agree	Neutral	Somewhat agree	Strongly agree
1	2	3	4	5

AGRICULTURAL PRACTICE

D1. Did you receive any government subsidy in the last 5 years?

Yes/No

_____

If Yes, please indicate types of subsidy or inputs received (Year not received, please write "Not Received")

2021: _____

2020: _____

2019: _____

2018: _____

2017: _____

D2. When last did you test for soil quality?

Please tick the relevant option

Never tested soil quality	
More than 5 years ago	
In the last three years (excluding this year)	
This year	

D3. If you tested for soil quality, what was the last recent soil quality grading?

_____

If you tested for soil quality, please indicate how much you paid for soil testing out of your own pocket

R_____

D4. If you have not done a soil test, what are reasons for not conducting a soil test?

Please tick the relevant option

I did not request a soil test from the extension officer	
I requested a soil test, but the extension officer did not assist	
I cannot afford to pay for a soil test	
I am waiting for a soil test to be conducted	
Other (please specify)	

D5. How much do you spend per year in hiring animals or farming machinery?

R_____

D6. How much did you spend on labour/manpower for land preparation, sowing and any other agricultural activity?

R_____

D7. How do you cultivate your land? (Please tick relevant option)

	Own	Borrowed	Hired
Tractor			
Animal Traction			
Hand			
Government mechanization scheme			
Other (Please Specify			

D8. Do you use any seeds for your farming activities?

Answer Yes/No

_____

D9. If Yes, how much per year do you pay out of your own pocket for seeds?

R_____

D10. Do you buy any animal/bird feeds for your farming activities?

Answer Yes/No

_____

D11. If Yes, how much per year do you pay out of your own pocket for feeds?

R_____

D12. Do you use any fertilizer(s) for your farming activities?

Answer Yes/No

_____

D13. If Yes, how much per year do you pay out of your own pocket for fertilizers?

R_____

D14. Do you use any pesticides(s) for your farming activities?

Answer Yes/No

_____

D15. If Yes, how much per year do you pay out of your own pocket for pesticides?

R_____

D16. Do you irrigate your farming area?

Answer Yes/No

_____

D17. If Yes, where is the water for irrigation coming from?

_____

D18. If Yes, how much per year do you pay out of your own pocket for irrigation?

R_____

D19. What is the degree of erosion on your plot?

Severe	Major	Moderate	Minor	Negligible
1	2	3	4	5

D20. Do you use any methods to decrease soil erosion? If yes, please indicate the types of anti-erosion methods you use?

Yes/No

_____

If Yes, please indicate methods

_____

D21. Do you spend your own money to decrease soil erosion? If yes, please indicate how much you generally use per annum?

Yes/No

_____

If Yes, please indicate how much

R_____

D22. For each of your main crops, please indicate the appropriate responses:

Harvested crop area in ha	
Average Quantity harvested per annum (in Kg)	
What was the quantity sold per annum(Kg)?	
What was the average selling price per annum, per kilogram? (R/Kg)	
What was the average quantity used for own consumption, per annum (Kg)?	
What was the quantity used as wages, per annum (Kg)?	
What was the quantity used as seeds, per annum (Kg)?	
What was the quantity used to feed animals (Kg)?	
What was the quantity stored (Kg)?	
What was the quantity lost after harvest (Kg)?	

D23. For each of your livestock/poultry type, please indicate the appropriate responses:

Average Quantity harvested/sold per annum (in Kg/head/number)	
What was the average selling price per annum, per kilogram? (R/Kg or per head)	
What was the average quantity used for own consumption, per annum (Kg/head)?	
What was the quantity used as wages, per annum (Kg/head/number)?	
What was the quantity lost before sale/harvest (Kg/head/number) from natural disasters/death/diseases?	

I. Qualitative Section B Interview Sheet

SECTION 2

PARTICIPANT CODE NAME (E.G. A1 - FOR OFFICE PURPOSES)

Semi-structured Interview Questions
(A separate sheet of paper can be used if more space is required)

1. Do you have an understanding, of how smallholders in Free State currently measure their gross farming income? Yes/No _____

If Yes, please provide details.

2. Do you currently measure the income derived from all your farming activities? Yes/No _____ If Yes, how do you go about it?

3. Do you have any tools that you use currently in order to measure this farming income? Yes/No_____

If Yes, what are those tools and how do you use them?

4. Do you have any form of records that you keep, where the measured farming income is recorded. Yes/No _____

If Yes, how do go about keeping those records?

5. In cases where the derived farming income is being measured, do you measure it weekly, monthly or annually?

6. Do you remember if you have ever been asked about the details of the farming income derived from all your farming activities before?

Yes/No _____ If Yes, give any further details you remember.

7. Do you have an understanding of what the factors are, that determine receiving any form of farming income from your farming activities, i.e. do you understand what the determinants of farming income are, as it relates to your farming activities?

Yes/No_____ If Yes, kindly provide the details.

8. In your understanding, how can these determinants of gross farming income (GFI) assist smallholder farmers in FS to generate, improve and maintain the GFI sustainability of smallholder farmers in FS?

9. What do you think are the necessary steps, that should be taken to ensure that these determining factors are available in order for farming income to be generated consistently, for smallholder farmers in FS?

10. What do you think are the actions that needs to be taken in order to maintain the existence of farming income into the foreseeable future, for the smallholder farmers in FS?

11. Do you have any recollection of what led to any increase of farming income, at any stage of your farming activities in the previous years of farming, and if so, how did you discover that there was an increase of that farming income?

12. Do you have any recollection of what led to any decrease of farming income, at any stage of your farming activities in the previous years of farming, and if so, how did you discover that there was a decrease of that farming income?

13. What is your understanding of the currently used strategies of deriving sufficient gross farming income, that can assist to transition smallholder farmers to become commercial farmers in FS?

14. To the best of your knowledge, what are the plans of action and programmes that you are aware of, which aim to assist you as a smallholder farmer in FS, to grow and become a commercial farmer, and to help in increasing the current levels of your farming income?

15. Do you remember if there are any tools that you have been promised in the past or that you have been supplied with in the past, by any stakeholder in agriculture, that you deem could help smallholder farmers in FS to become commercial farmers who can generate better levels of farming incomes? Yes/No _____

If Yes, please give details.

16. Are there any farming business model, framework or guideline samples that you are aware of, that can help smallholder farmers like you, to become commercial farmers? Yes/No _____

If Yes, how are these farming models structured and used?

17. In your understanding, what are the farming activities that commercial farmers carry out, which smallholder farmers in FS can easily adopt in an effort to transition towards becoming commercial farmers?

18. What do you think, can be done for smallholder farmers in FS to be supported in deriving consistent, continuous and sustainable incomes using their current skills?

19. To the best of your knowledge, what are the support mechanisms which have been used by other known stakeholders in agriculture that can help to develop the current farming skills you have as a smallholder farmer in FS?

20. Do you have a recollection of any stakeholders in agriculture that previously helped you as a smallholder farmer in FS, to generate improved levels of farming income, more than you currently derive from your farming activities? Yes/No _____

If Yes, please give further details

21. Do you remember if there is any stakeholder in agriculture, that has previously taken any actions or steps to determine what type of skills you have as smallholder farmer in FS, that can assist you and be developed further, to generate improved and consistent levels of farming income? Yes/No _____

If Yes, please provide further details.

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22. What do you think should be done to further develop your current farming skills?

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23. What is your understanding of the current gross farming income sustainability model, framework or guideline for smallholder farmers in FS?

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24. Do you have any uniform way of doing things, in carrying out your farming activities, which is similar to how other FS smallholder farmers in your area do things, that has as a result always generated a certain level of farming income in the past?

Yes/No _____ If Yes, how do you go about doing that?

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25. In your understanding, what can assist you in doing things better than currently, and in future, in order to generate better and consistent farming income from the farming activities that you carry out as a smallholder farmer in FS?

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26. To the best of your knowledge, how many more years will the current farming activities that you carry out, sustain or keep the level of farming income that you consider necessary for your household to become food secure and survive poverty; and what will be required to help you generate wealth in the future as a farmer in FS?

J. Permission letter for research study (FS Department of Agriculture)

agriculture & rural development
Department of Agriculture and Rural Development
FREE STATE PROVINCE

| OFFICE OF THE HEAD OF DEPARTMENT |
|Chemistry Building, Ground Floor, Room 123 Glen| pa.hodagric@fs.agric.za |Bloemfontein |9300 |

Enquiries: Mrs. C. Klinck
Tel: 051 861 8440
Email: klinckc@dard.gov.za
Ref: Badiri Moloabi – permission to conduct study

To: Mr. Badiri V.M. Moloabi

Email: 217079590@stu.ukzn.ac.za

RE. PERMISSION TO CONDUCT A RESEARCH STUDY

With reference to your letter received during May 2022 requesting permission to conduct research study in the Free State on small scale farmers with the title: Advancing gross farming income sustainability of smallholder farmers in the Free State.

It is our understanding that about 77 smallholders per distict will be interviewed and that questions will focus on how the production on their small farms help them to earn farming income, and how challenges relating to this can be addressed to the benefit of the smallholder farmers in the municipality areas, to ensure sustained total farming income.

It is not clear exactly what is expected from the Department but it is our understanding that conducting this study will not have any financial implication, directly or indirectly for the Department of Agriculture and Rural Development.

Please also note that according to the POPI act we do not have approval from our farmers to release their details to third parties and we can also not force them to part take in research activities like this.

In principal we approve this research study for the benefit of our farmers and agree to invite you to our farmer's days where you can introduce yourself and the study to the farmers and to give them the opportunity to decide whether they want to participate or not.

We which you the best with your studies going forward.

Kind Regards,

[redacted]

Dr. TJ Masiteng
Head of Department: Agriculture and Rural Development
Date: 06/07/2022

Private Bag X02, Bloemfontein, 9300
Chemistry Building Ground Floor, Room 123 Glen
Tel: (051) 861 8509/10 Fax: (051) 861 8454, E-mail: pahod@fs.agric.za www.fs.gov.za

K. UKZN Ethics clearance approval letter



UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

31 August 2022

Badiri Victor Motlhabani Moloabi (217079590)
Grad School of Bus & Leadership
Westville Campus

Dear BVM Moloabi,

Protocol reference number: HSSREC/00004623/2022
Project title: Advancing gross farming income sustainability of smallholder farmers in the Free State province, South Africa.
Degree: DBA

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 17 August 2022 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 31 August 2023.
To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

[redacted]

Professor Dipane Hlalele (Chair)

/dd

Humanities and Social Sciences Research Ethics Committee
Postal Address: Private Bag X54001, Durban, 4000, South Africa
Telephone: +27 (0)31 260 8350/4557/3587 **Email:** hssrec@ukzn.ac.za **Website:** http://research.ukzn.ac.za/Research-Ethics
Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

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