An Assessment of the Impact of Contract Farming on Productivity, Technical Efficiency and Welfare of Smallholder Tobacco Farmers in Mazowe and Bindura Districts, Zimbabwe

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A DISSERTATION

Presented to the Department of
Agribusiness
program at Selinus University

Faculty of Life & Earth Science
in fulfillment of the requirements
for the degree of Doctor of Philosophy
in Agribusiness

2024/2025

ABSTRACT

The study assesses the impact of contract farming on the productivity and technical efficiency. It also conducts an investigation on its effect on the socio-economic wellbeing of smallholder tobacco farmers in Zimbabwe. The study was underpinned by key theoretical frameworks which are Agriflection Model and Efficiency Analysis Theory. These frameworks provide valuable viewpoints on the manner in which contract farming influences farm productivity and efficiency. The theories do so while addressing broader socio-economic factors. The study adopted a mixed-methods approach. This approach combines qualitative and quantitative techniques for addressing the complexity of contract farming. The social constructivism paradigm were guiding the qualitative aspects. This allowed the researcher to collect rich insights into farmers' perspectives on contract farming. These viewpoints include the impact of contract farming on their livelihoods, and the challenges being faced. Qualitative data were analyzed using thematic analysis. This qualitative data analysis helped in capturing the subjective experiences of smallholder farmers. For the quantitative part, the positivist paradigm was used to gather objective. This refers to numerical data on farm productivity and technical efficiency. The researcher conducted quantitative analysis using tools like SPSS and MS Excel. These tools helped the researcher with the evaluation of the relationships between variables. The variables include farm size, investment, and output. The study used a cross-sectional survey design. This design was chosen because smallholder farmers do not typically maintain long-term records. Therefore, the data was focused on the most recent farming season. The sample size which was used was 395 with 70.4% response rate. The sample was selected through stratified random sampling. The study revealed that there are significant productivity and technical efficiency variations between contracted and non-contracted smallholder tobacco farmers. This is because contracted farmers benefited from access to inputs, technical support, and secure markets. Therefore, they were having greater higher productivity and efficiency compared to non-contracted farmers. The impact of technical efficiency on productivity was also clear. This is because more technically efficient farmers achieved higher output levels with the same or fewer resources. This finding highlights that it is important to improve efficiency so as to boost productivity among smallholder farmers. The study also identified several determinants of technical efficiency. These include access to training, credit, and modern farming inputs and the level of farming experience. The study also revealed that contract farming was significant in the provision of these resources. The study also estimated the socio-economic impact of contract farming on participating smallholder farmers. The study showed that contracted farmers were reporting improved incomes, better access to markets, and enhanced livelihoods. They were also experiencing increased economic stability. They were also more able to invest in their farms. This further contributed to rural economic development.

Keywords: ***technical efficiency, productivity, smallholder farmers***

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CHAPTER ONE: INTRODUCTION

1.0 Introduction

Agriculture plays a pivotal role in Zimbabwe's economy, with tobacco farming being one of the most significant contributors to both national income and rural livelihoods. In recent years, contract farming has emerged as a critical strategy aimed at improving agricultural productivity and enhancing the livelihoods of smallholder farmers. This study, titled "**An Assessment of the Impact of Contract Farming on Productivity, Technical Efficiency, and Welfare of Smallholder Tobacco Farmers in Mazowe and Bindura Districts, Zimbabwe,**" seeks to examine how contract farming arrangements affect these key aspects of smallholder farming.

The focus on the Mazowe and Bindura districts is particularly pertinent, as these areas are major tobacco-producing regions that have increasingly embraced contract farming. Despite the growing adoption of contract farming in these districts, there remains a lack of comprehensive analysis regarding its impact on farmers' productivity, efficiency, and welfare. This introductory chapter provides a background to the study, outlining the research problem, objectives, significance, and scope. It also presents the research questions and hypotheses that will guide the investigation, establishing a foundation for the subsequent chapters.

1.1 Background of the study

1.1.1 Tobacco Production

Tobacco (*Nicotiana tobacum),* is a plant under the Solanaceae family classified in the magnoliophyta phylum. Other plants that share the same family with tobacco include potato (*Solanum tuberosum),* tomato (*Solanum lycopersicum*) and pepper (*Capsicum annuum*). Tobacco is one of the major cash crops grown in more than 80 countries in the world but there is significant production only in less than thirty-two countries (Barry, 2019). China is the largest producer of tobacco in the world with 2.8 million kg of volume per year followed by India who produce 760 million kg annually (Baskin, 2018). China and India produce together more than 50% of the world’s total. Zimbabwe is the biggest producer of tobacco in Africa and the world’s fourth largest producer after China, India and Brazil (FAO, 2020). Other producers of tobacco in the Sub-Sahara region are Zambia (16.4 per cent of the African produce), Tanzania (14.4 per cent), Malawi (13.3 per cent) and Mozambique (12.9 per cent) (Henson, 2021).

In Zimbabwe, the economy is predominantly agriculture driven and tobacco production plays a major role in national economic growth, employment creation and income generation for farmer households. Tobacco production in the country, 98 percent of which is exported, contributes to the GDP and to export revenue. According to ZIMSTAT (2020), tobacco crop accounts for 50 percent of Zimbabwe's agricultural exports, 30 percent of total exports that include gold and 12 percent of GDP. At farm level, tobacco is not grown as a sole crop and farmers diversify it with other crops like maize, soya bean and sweet potato. Crop diversification reduces exposure of tobacco farmers to income variability when tobacco prices vary during the marketing season and empower them to participate in wider value chains (FAO, 2021). Tobacco farming in Zimbabwe is structured in four main grower sectors namely the A1 farmers who have up to 6 hectares of land, A2 farmers with more than 6 hectares and up to 400 hectares, commercial farmers with large tracts of land over 400 hectares and communal area farmers who do crop production in rural areas. The A1 and the communal area farmers constitute the smallholder category.

The distinguished participation in tobacco production by smallholder farmers in Zimbabwe can be traced back to the period just after independence. Following the country's independence in 1980 there was an initial reduction in flue-cured tobacco production and number of farmers. This was overturned by 1989 where annual production was over 120 million kg from 57 000 hectares produced by 1 500 large-scale growers. Annual sales reached a record of 237 million kg in 2000. The period 2001-2008 was largely dominated by the land reform programme where the number of growers increased but the total production initially tumbled to a 30-year low of 48 million kg (Dube, 2017). In 2003 the introduction of the dual selling system where auction sales would operate alongside contract production was established. The country produced a high 216 million kg in 2014 and this was surpassed with a new record 259 million kg in 2019 as illustrated in Figure 1 (TIMB, 2021). The new record 259 million kg was then surpassed by 296.1 million kg in 2022 (TIMB, 2023).

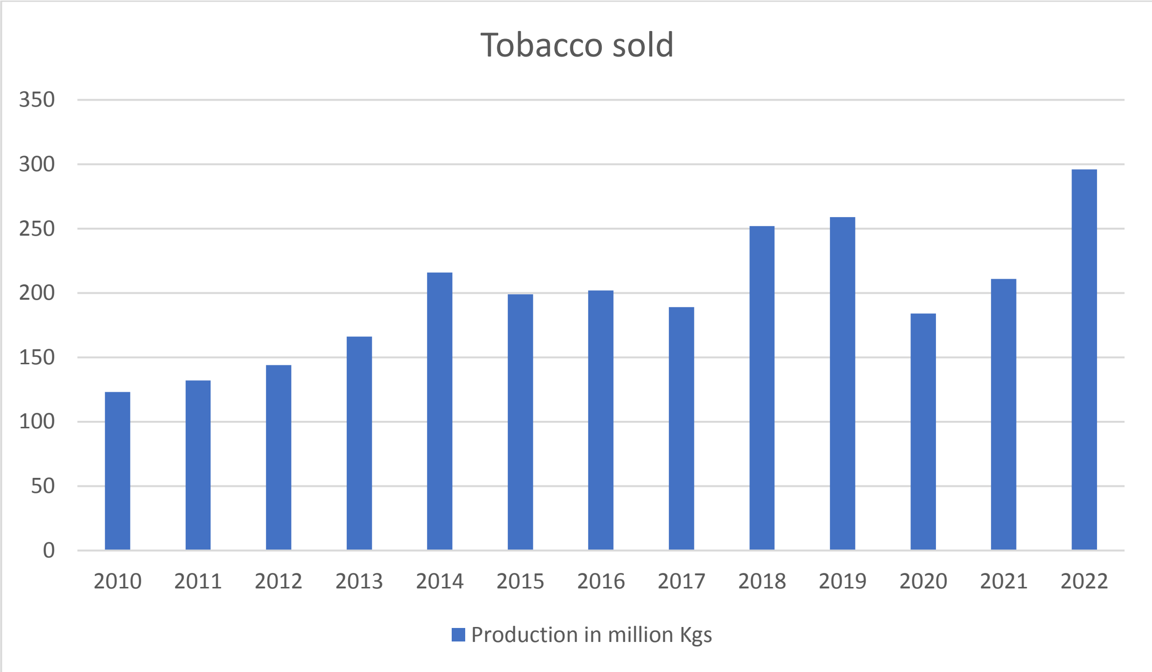

Figure 1.1: National tobacco production (2010 – 2022). Source – TIMB (2023).

1.1.2 Emergence and Importance of Contract Farming

Global economic integration and market liberalization have led to the emergence of contract farming as an important development strategy for promoting the transition of smallholder farmers in sub-Saharan Africa from subsistence to market oriented commercial production (Moyo, 2017). In developing countries, contract farming is viewed as an important institutional innovation for improving the productivity and yield of smallholder farmers that can lead to improved farmer incomes and livelihoods (Neil, 2018). Contract farming model facilitates the integration of smallholder farmers into commodity chains and allow access to appropriate technologies for improving their productivity. According to Chigona (2020), contract farming offers access to crop production on land that would not otherwise be available to a company, with the additional advantage that it does not have to purchase it.

In Zimbabwe, interest in contract farming by smallholder tobacco farmers took a gradual upsurge from 2002 when the land reform turned around the dynamics of the tobacco industry by virtue of its potential as an alternative channel for linking producers to international markets (Bhebhe, 2019). Tobacco contract farming schemes in Zimbabwe involve farmers engaging into mutual agreement with merchants such as Mashonaland Tobacco Company (MTC), Zimbabwe Leaf Tobacco (ZLT), Premium Leaf Zimbabwe (PLZ) and Shasha Tobacco. Central to the contract is that merchants supply farmers with production input packages that enable them to grow the crop to a desirable standard. The accord will also be comprised with the provision of extension services to the farmers throughout the crop production cycle which they subsequently reap, cure and sell the leaf product to the company who contracted them. The end product is bought through a buying floor system positioned at the contracting company that is monitored by TIMB where the merchant deducts the value of the inputs advanced to the farmer in US dollar currency and the farmer receives the residual as gross income (Scoones, 2019). A study by Marumahoko (2017) on factors influencing tobacco contract farming, found out that the accumulators group are the farmers who do not enroll in to contract arrangements as they possess adequate resources which they can utilize to grow tobacco on their own while the aspiring accumulators are those who enter into contract agreements to improve their productivity because they lack resources to produce and sell independently. Muroiwa (2020), concurs to this notion by asserting that Smallholder farmers' direct access to financial services from banks is weak and their only reliable avenue to acquire inputs is through contract farming arrangements.

Farmers who wish to venture into tobacco farming in Zimbabwe are required to apply for a grower number from TIMB. A farmer is then expected to pay a registration fee if one intends to grow tobacco in the succeeding season. Mashonaland Central, Mashonaland West and Manicaland are the three leading provinces with the majority of registered tobacco growers (TIMB, 2020). In the 2018/19 season, 69 850 farmers registered to grow tobacco in Mashonaland Central province while Mashonaland West had 64 084 farmers recorded in the same year. Figure 3 below shows the distribution of contracted farmers in the tobacco growing provinces;

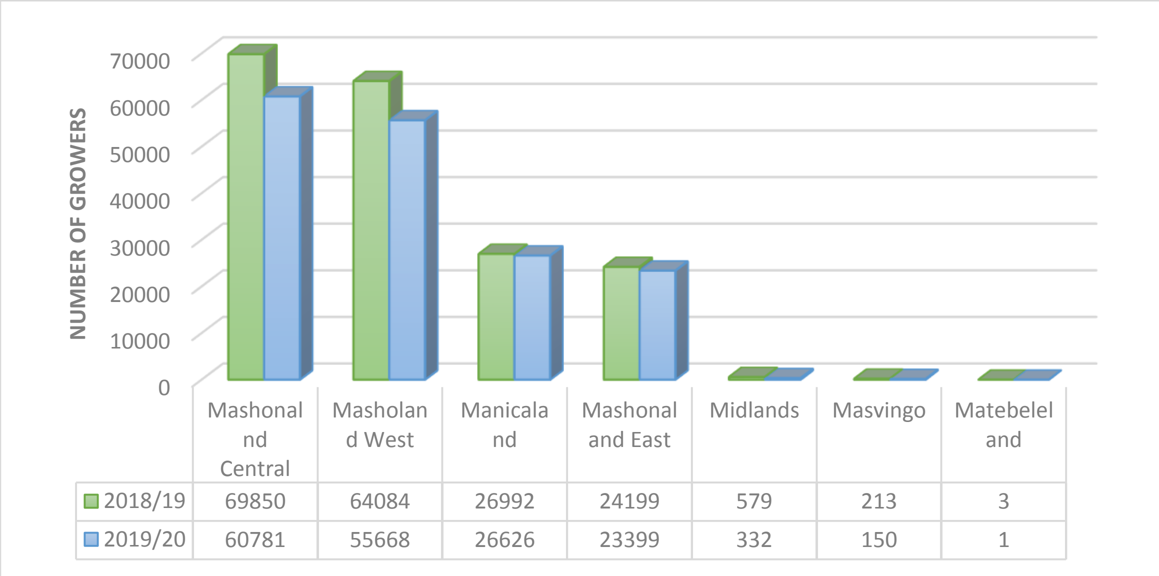

Fig 1.2: Grower registration by province in 2018/19 and 2019/20 seasons (Source – TIMB 2021)

The number of farmers growing tobacco under contract schemes rose significantly from 86% to 92% in the 2018/19 season to 95% in 2019/20 season (TIMB, 2020). This may have been facilitated by the emergence of more licensed tobacco merchants which offered farmers with increased opportunities to enter into contract agreements. The upsurge in number of smallholder farmers participating in tobacco contract farming inspires the motion to examine how these farmers are faring in terms of productivity and technical efficiency as it relates to their welfare and economic development.

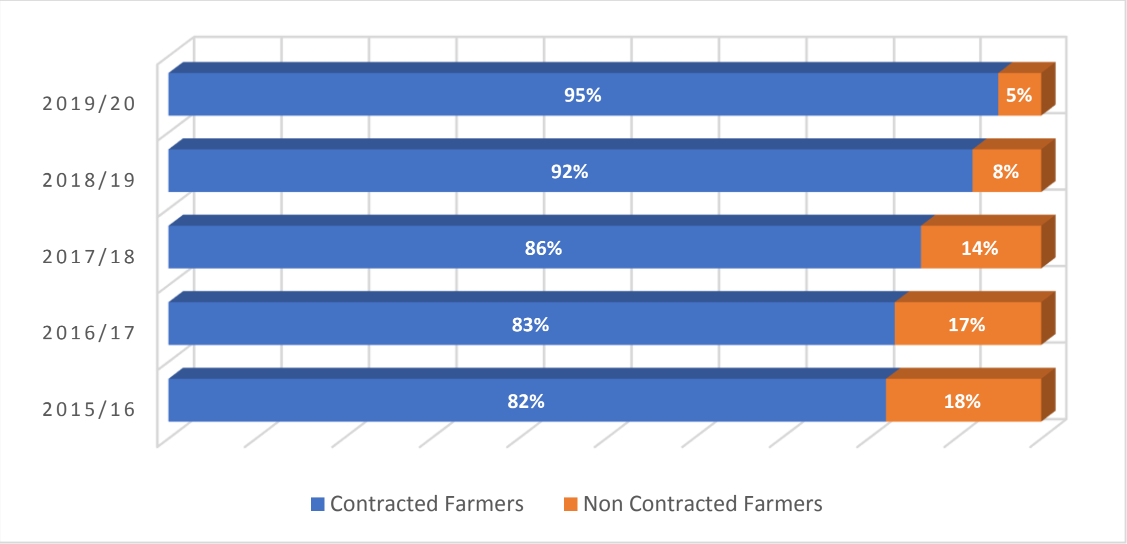

Fig 1.3: Comparison on contract and non-contract farmer participation (Source – TIMB 2020)

1.3: Tobacco Farming and the Welfare of Smallholder Farmers

Tobacco farming has been key in raising the livelihoods of smallholder farmers in sub-Sahara communities (Barry, 2019). Reliable market and cash payment logistics are key factors that attract farmers to register with merchants to grow tobacco under contract model. The use of contract farming continues to raise debates on whether participating farmers improve their welfare and thus contribute to the local economy as an agricultural intervention (Capriano, 2017).

Consistent with the collective aspirations and determination of the people to achieve an empowered and prosperous upper middle-income society through the national development strategy of 2018, the government of Zimbabwe supported tobacco farming through continued licensing of tobacco merchants as a panacea to empower farmers in improving their standard of living and social security (Chigona, 2020). The average price decreased from US$2.88 attained in 2010 to US$2.73 in 2011 and this improved to a highest ever average price of US$3.67 in 2013 (TIMB, 2018). According to TIMB (2020), smallholder farmers attained a record highest average yield and price per kg in the 2014 season when the yield was 2 108kg per hectare and fetched a price of USD$3.17 per kg as compared to 2013 when there was a record average price of USD$3.67 per kg but the yield was low at 1 879kg per hectare as illustrated in Figure 4. Considering the prevailing average prices and yield from the past 10 years, a smallholder farmer would get an average net revenue of USD$3 132.00 after deducting input costs of USD$1 200.00 (Chigona, 2020). The livelihoods and standard of living for smallholder tobacco farmers is related to their ability to maximize productivity and efficiency of their farming business (Bhebhe, 2019). Estimates on the impact of contract farming on the welfare of smallholder farmers will validate how average prices are influenced by contract farming, and whether contract farming could be key in improving the standard of living for farmers.

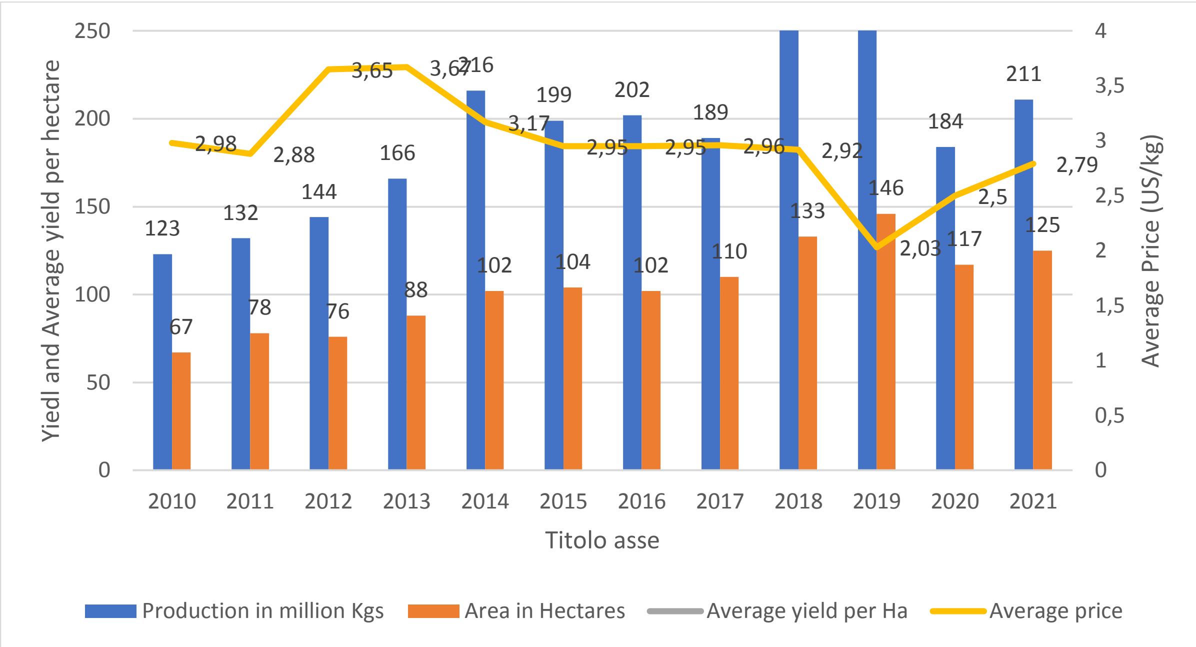

Fig 1.4: Average yield per hectare and average price trend 2010 to 2021 (Source – TIMB 2022)

1.4 Statement of the problem

Contract farming has become a popular model of agribusiness in the smallholder tobacco sector as it alleviates the challenge of mobilising capital and other factors of production like labour and innovative ideas (Dawson, 2017). Tobacco contract farming grew to higher levels in Zimbabwe and became well-built soon after the land acquisition program in year 2000, and by 2020 the government had put in place some specific policy to guide its implementation and the industry is highly regulated with more than twenty-five registered contract merchants (Chigona, 2020). According to Moyo (2016), contract farming in tobacco has given smallholder farmers a life line to improve on their productivity. There was a rise of 6% in the number of farmers growing tobacco under the contract model in 2018/19 from 86% to 92% showing an increased appetite for contract farming (TIMB, 2020). Research has shown that farmers improve leaf quality and get easy access to markets by producing tobacco under contract arrangements (Barry, 2019). It has also shown that it contracting companies provide extension services to their contracted farmers which gives access to specialized expertise like agronomists and agricultural extension officers, it also leaves them with advantage of more efficient farming methods and techniques which can improve their productivity, it helps with risk mitigation and open market linkages as the contracting companies have government established relationships and connections.

A study on viability of tobacco under smallholder farming by Masvongo *et al* (2013), revealed that smallholder tobacco production is viable, with farmers achieving average yield of 2 052 kg/ha, average price of US $2.45 per kg and earning on average, about US$5 000 per hectare as gross margin. The conclusion is backed by findings by Dube (2017) who asserts that the study's break-even analysis revealed a margin of safety of 50% with respect to both yield and prices, indicating that small-scale tobacco production will remain lucrative even at much lower prices and yields. However, these studies did not further examine and reveal how viability and lucrativeness are related to the all-embracing welfare and livelihoods of the farmers and how contract farming influenced productivity and technical efficiency aspects. Productivity and technical efficiency are factors positively related to yield and quality of tobacco production. Moreover, yield and quality determine the final average price of the leaf, which is a precursor of the wellbeing and prosperity of smallholder farmers. This study will attempt to unravel the effect of contract farming on viability of tobacco farming when interlinked with productivity and technical efficiency of smallholder farmers.

In a study to assess the effect of contract tobacco farming on the welfare of smallholder farmers in the district of Angonia in Mozambique, Cipriano (2017), it concluded that some farmers are able to improve their welfare as a result of their participation in contract farming. The conclusion, however did not unpack the extent to which the improvement on welfare is related to productivity and technical efficiency of the contracted smallholder tobacco farmers. It is in the scope of this study to close this knowledge gap and go further to examine the effect of contract farming on productivity, technical efficiency and welfare of the smallholder tobacco sector. However, the study will focus on measuring the productivity, technical efficiency and welfare of smallholder tobacco farmers through the use of the Human Development Index and

Ordered Probit Regression model. This study will also investigate the points of convergence between contracted and non-contracted farmers in their productivity and technical efficiency. Tobacco farmers have been seen as significant contributor to the agribusiness, contributing 61% and 30% to the National GDP. Tobacco farming requires a lot of labour, it is also one of the biggest employers in agriculture (Mushera, 2016). This has made smallholder farmers, who are the main suppliers of the crop, more important. However, on the other hand, contract farming can be disadvantageous to the smallholder farmers as inefficient management or marketing problems can result in manipulation of quotas so that not all contracted yield is purchased (Mushera, 2016). It can also turn out to actually affect them negatively when the contracting companies are monopolies and turn out to exploit them by not buying the harvest at competitive prices. Contract farming in tobacco can lead to improved technical efficiency. Tobacco companies often provide farmers with access to better seeds, fertilizers, and technical knowledge, which can enhance production techniques and yield. Additionally, companies may offer training programs to educate farmers on improved cultivation practices. This can result The welfare of farmers involved in tobacco contract farming can be influenced by various factors. On one hand, contract farming can provide a stable market and assured income for farmers. They are often offered fixed prices or predetermined contracts for their tobacco produce, which can provide financial security and reduce price uncertainties. Furthermore, contract farming may involve provision of credit, inputs, or other support services to farmers. However, there are concerns regarding the welfare of farmers as well. Tobacco cultivation requires substantial investments, and farmers may become dependent on tobacco companies for inputs and credit (Cipriano, 2017). If the terms of the contracts are unfavorable or if there is a lack of transparency in pricing mechanisms, farmers could be at a disadvantage and face potential exploitation. Additionally, tobacco farming is associated with health risks and environmental concerns, which can impact the long-term welfare of farmers and their communities. Contract farming can play a role in increasing productivity. With better access to resources and technical support, farmers may adopt improved agricultural practices that enhance productivity (Mushera, 2016). Additionally, contract farming can facilitate better market linkages, which may incentivize farmers to invest in improving productivity to meet quality and quantity requirements of the company. On foregoing background, this study seeks to examine the impact of contract farming on productivity, technical efficiency and welfare on the smallholder tobacco sector in Zimbabwe.

1.5 Objectives of the study

1.5.1 Main Objective

The main study objective is to evaluate the impact of contract farming on the productivity, technical efficiency and welfare of smallholder tobacco farmers in Zimbabwe.

1.5.2 Specific Objectives

a) To establish whether there are any productivity and technical efficiency variations between contracted and non-contracted smallholder tobacco farmers.

b) To assess the impact of technical efficiency on productivity of smallholder tobacco farmers.

c) To identify the determinants of technical efficiency of smallholder tobacco farmers.

d) To estimate the impact of contract farming on the socio-economic wellbeing of participating smallholder tobacco farmers.

1.5.3 Research Questions

1. Are there any significant technical efficiency divergence between contract and non-contract tobacco farmers in Mazowe and Bindura?

2. What are the determinants of technical efficiency in contracted smallholder tobacco production?

3. What are the determinants of technical efficiency of smallholder tobacco farmers?

4. What are the impacts of tobacco contract farming participation on the socio-economic wellbeing of smallholder farmers?

1.5.4 Research hypotheses

H0: Contract farming has no impact on technical efficiency in smallholder tobacco production and hence no effect on their socio-economic and institutional factors

H1: Contract farming has positive impact on technical efficiency in smallholder tobacco production and hence affect socio-economic and institutional factors positively.

1.6 Significance of the study

In Zmbabwe, contract farming is an important link in various commodity supply chains and mode of organization for agribusiness (Bhebhe, 2019). Tobacco is a major export, foreign currency earner and employer for Zimbabwe and contributes 12% to the GDP (Moyo, 2017). In the 2020 farming season, 89% of the registered tobacco farmers were smallholder while 11% were from the commercial and A2 categories (TIMB, 2020). Smallholder farmers are key stakeholders in the tobacco value chain and their participation in tobacco production has proved to be the driving force in the sustainability of contract farming in Zimbabwe. In 2019/20 season 95% of the tobacco was produced by farmers under contract arrangements (Chigona, 2020). The tobacco value by grower sector during the 2018/19 tobacco marketing season saw a total of USD$430 million being paid out to smallholder farmers while USD$250 million was expended to commercial farmers (ZIMSTAT, 2021). It is evident that the smallholder sector is contributing hugely on the total annual production of tobacco and the sector is equally recipient to greater value in forex payments. There is need to establish how this sector is faring on productivity and technical efficiency in their operations. With the level of forex value paid towards the smallholder sector, it will be essential to assess how this is impacting on their welfare.

There is need for research to inform policy on the impact of participating in contract farming in relation to productivity and technical efficiency of small-holder farmers who are now the major players after the 2000 land reform programme. It is envisaged that the results will help inform the formulation of agricultural and rural development policies that promote a win-win situation among the contracting parties. Tobacco contract farming is expected to expand because of high demand at global level and tobacco has been identified as one of the key agricultural products in the National Development Strategy by the Government of Zimbabwe (ZIMSTAT, 2020)

Furthermore, this study will contribute to an understanding of the socioeconomic impacts of contract farming including changes in growers' organization and income. A previous study by Moyo, (2017) did not focus on the technical efficiency and productivity among small-holder tobacco contract growers but instead focused on the viability of smallholder tobacco business model in general. This study will also have far reaching significance as it will proffer proposals that can stimulate smallholder farmers to optimise profits from the tobacco production business to improve their socio-economic benefits that impact on their livelihoods.

1.7 Organisation of study

The study is structured into five chapters, each addressing a distinct aspect of the research process, from the introduction to the conclusion and recommendations. This organization ensures a logical flow of information and facilitates a comprehensive analysis of the research problem.

Chapter 1: Introduction

The first chapter introduces the study, providing a detailed background to the research problem and contextualizing it within the broader framework of agricultural economics and rural development. It outlines the research objectives, questions, and hypotheses, establishing the rationale and significance of the study. The chapter also delineates the scope and limitations, ensuring that the reader understands the study’s focus and constraints.

Chapter 2: Literature Review

The second chapter presents a critical review of the existing literature related to contract farming, agricultural productivity, technical efficiency, and the welfare of smallholder farmers. It examines both global and local studies, identifying key themes, trends, and gaps in the literature. This chapter also introduces the theoretical frameworks, including the Agriflection Extension Model, and discusses their relevance to the study.

Chapter 3: Research Methodology

Chapter three outlines the research design and methodology used to conduct the study. It details the study area, population, sampling techniques, data collection methods, and analytical tools employed in the research. The chapter also addresses ethical considerations and the reliability and validity of the research instruments.

Chapter 4: Results and Discussion

The fourth chapter presents the findings of the study and provides a detailed analysis and interpretation of the data. It discusses the impact of contract farming on productivity, technical efficiency, and welfare, comparing the findings with the existing literature reviewed in Chapter

2. The chapter also assesses the suitability of the Agriflection Extension Model in evaluating these impacts.

Chapter 5: Conclusions and Recommendations

The final chapter synthesizes the key findings of the study, drawing conclusions based on the research objectives and questions. It offers recommendations for policymakers, practitioners, and stakeholders involved in contract farming and agricultural development. The chapter also suggests areas for future research, highlighting the study's contributions to the existing body of knowledge and its implications for the improvement of smallholder farming in Zimbabwe.

1.8 Conclusion

The chapter has set the stage for a detailed exploration of the impact of contract farming on smallholder tobacco farmers in the Mazowe and Bindura districts of Zimbabwe. By identifying the key issues and framing the research objectives, this chapter underscores the importance of this study in addressing the gaps in current knowledge. The chapter has outlined the research questions and hypotheses, which will direct the analysis and help in understanding the complexities of contract farming in these specific regions. As the study progresses, it will seek to provide empirical evidence and insights that could inform policy and practice, ultimately aiming to enhance the productivity, technical efficiency, and welfare of smallholder farmers involved in tobacco farming.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

The literature review for the study aims to contextualize the key themes of contract farming within the broader agricultural economics and rural development discourses. Contract farming, a practice where agricultural production is carried out based on an agreement between buyers and farmers, has been increasingly recognized as a mechanism to improve agricultural productivity, enhance technical efficiency, and uplift the welfare of smallholder farmers. The study focuses on assessing these impacts within the specific context of tobacco farming in the Mazowe and Bindura districts, regions that are critical to Zimbabwe's agricultural landscape but have not been extensively studied in this regard.

The review begins by exploring existing research on the impact of contract farming on agricultural productivity, highlighting the advantages and challenges of these arrangements in different contexts. It then examines studies on technical efficiency, particularly in smallholder farming, and how contract farming can influence efficiency levels. The welfare implications of contract farming are also scrutinized, with a focus on income stability, risk management, and broader socio-economic outcomes for smallholder farmers. Finally, the review considers the suitability of the Agriflection Extension Model as a theoretical framework for evaluating the impact of contract farming on these farmers, identifying gaps in the literature that this study seeks to address.

2.1 Background overview of tobacco production

This sections covers tobacco production and history of tobacco farming in Zimbabwe.

2.1.1 Tobacco production

Cigarette leaves, which belong to the Nicotiana genus in the Solanaceae (nightshade) family (Nicotiana tobacum), are processed into tobacco by curing them (Gijsbert, 2015). Walker (2018) states that although there are over 70 species of tobacco recognised, N. tobacum, namely the Virginia variety, is the most important commercial crop. Another variety of tobacco, burley, has a little paler green colour than Virginian tobacco. It turns brown and contains nearly no sugar after being air-cured, giving it a flavour that is almost cigar-like. Grown in the scorching summers of the Middle East, Turkey, and the Balkans, the oriental kind of tobacco is the third variety; it is the hardest and smallest (Baskin, 2016). Virginia tobacco is farmed in over 100 nations worldwide (Walker, 2018). In order to colonise natural areas, immigrants used contract and slave labour to begin tobacco cultivation in the Chesapeake Bay region of Virginia in the USA during the 17th century (Neil, 2015). In 1800, North America accounted for 70% of global tobacco output. According to Goodman (2017), tobacco spread throughout the world once the American Revolution began and colonial rule came to an end. In the 1940s, tobacco production moved, for the first time in history, to developing countries in the tropics and subtropics (Geist, 2015). Around 4.3 million hectares of agricultural land worldwide, or an area larger than Switzerland, were used to grow nearly 7.5 million tonnes of tobacco in 2017, according to Jordan (2019). The Asian continent accounts for 60% of the world's total tobacco production, with China alone producing 36% of the crop (FAO, 2004). Walker (2018) expands on this finding by stating that 3.2 million tonnes of tobacco leaf were produced in 2017 in China, which leads the world in tobacco production at 39.6%. According to Thomas (2019), Turkey, Tanzania, Malawi, and Zimbabwe round up the top five countries that cultivate tobacco, along with India (8.3%), Brazil (7.0%), and the United States (4.6%). In summary, China is the world's top producer of tobacco, with most of the world's tobacco produced in Asia. Despite the fact that the majority of the producing countries are operating at maximum capacity, Africa contributes the least to tobacco output. Tanzania, Malawi, and Zimbabwe are the three most active African countries in tobacco production, with Zimbabwe at the top of the list (Moyo, 2019). Since they don't process their products, these nations generate more for export than for domestic consumption.

2.1.2 History of tobacco farming in Zimbabwe

At first, in 1907, the English South African Organization which dealt with the province sent off a business cultivating program for tobacco, maize, cotton, wheat, sorghum, groundnuts, and sunflower. By 1909, the Branch of Horticulture was laid out as well as key specialized foundations, for example, agrarian examination stations which gave agribusiness warning help backing to pioneer ranchers (Kwashirai, 2006). The frontier government in 1912 laid out a Land Bank which was basic to pioneer achievement, which gave modest credits to the acquisition of ranches, hardware, and different data sources (Kwashirai, 2006, p. 543). The development of tobacco and maize got significant exploration and monetary help in view of their business and food esteem. In 1901, the principal European pioneers started developing tobacco in Mvurwi. By 1908, 33% of pioneer ranchers developed tobacco as a key money crop (Rubert,1998, p. 2; Kwashirai, 2006). Mvurwi turned into a significant place for vent relieved Virginia tobacco creation with the harvest turning into a basic supporter of the public economy by the 1920s. The Mvurwi region focused on tobacco creation, close by maize, wheat, and soybean creation. Meat creation for product to the European business sectors was one more key movement during this period. Enormous interests in framework (dams, streets, and so on), as well as sponsorships for inputs, made this horticultural improvement conceivable. Before 2000, the greater part of the business ranches in this space completed all year horticulture utilizing water system with water obtained from dams (based on the homesteads) and lasting streams and streams. On the other hand, smallholder cultivating was seen as in reverse and crude and needing improvement, as opposed to speculation, despite the fact that most maize was delivered by smallholder African ranchers, particularly in the Chiweshe region in Mvurwi.

Smallholder ranchers are drawn to tobacco cultivating in light of the fact that it offers an unfamiliar cash exchanging choice, in a country whose large scale monetary strength has been temperamental for over twenty years, and expansion on privately named product costs has dissolved business feasibility. This benefit is intensified by the absence of effectively and generally accessible section focuses into the commercialisation of different options which could in principle be economically reasonable, like maize. Despite the fact that maize is upheld under the public authority interceded order horticulture plot an agreement cultivating plan directed through the Grain Showcasing Board (GMB), including private and state financing oversaw through the Service of Land and Farming and a consortium of four banks, the Business Bank of Zimbabwe, Standard Bank, Agribank and Taxis building society - access for most of the ranchers stays low and irregular.

Furthermore, the evaluating system has been questionable despite the fact that now and again it is above territorial cost levels. The GMB has likewise been blamed for deferring the instalment for the conveyed crop which influences ranchers' arrangements for the accompanying season (Shonhe and Scoones, submitted). In any case, the creation is a vital yield for ranchers, both as a wellspring of staple food, and in this manner for food security, and is likewise utilized for instalment of work during the accompanying farming season. While restricted admittance to land and different assets might lead ranchers to go with a decision between the two yields, by and large the two harvests are created in shifting extents and contingent upon the accessibility of data sources.

2.1.2 History and evolution of contract farming

CF has been around for millennia, but it has become popular as an agricultural finance model in Africa and Zimbabwe in the recent decade (Rehber, 2007). CF began on Taiwan sugar plantations by the Japanese and USA corporations in Central America in the 19th century, according to Rehber (2007). In the 1930s and 1940s, CF was employed by vegetable canners and seed producers in industrialised countries (Rehber, 2007). Due to excellent export returns and technology acceptance, CF quickly spread into Asia, Latin America, and Africa (Kirsten & Sartorius, 2002). By the late 20th century, CF was essential to the global food and fibre value chain (Rehber, 2007).

Zimbabwe has had CF since the 1950s (Murwira, 2012). Large tea and sugar plantations used contract farming in out-grower systems to vertically integrate before independence (Murwira, 2012). After independence, private firms extended CF to cover maize, soybean, cotton, paprika, and seed production (Dawes et al., 2007). James (2015) stated that CF was largely related to state-owned and controlled properties and sold through government-owned marketing boards. According to Chang et al. (2006), globalisation and trade liberalisation modernised agriculture, putting pressure on farmers and agribusinesses to enhance product quality and safety. These quality/safety criteria prompted agribusinesses to partner with farmers through CF to monitor quality on farms. Private-led CF increased in the 1990s as the Economic Structural Adjustment Program (ESAP) curtailed state economic operations and privatised most state-owned parastatals (James, 2015).

Economic liberalisation under ESAP enhanced agricultural produce market competition. To ensure a steady supply, agribusinesses that bought cotton and tobacco got into contract farming agreements with farmers (James, 2015). After the 2000 Fast Track Land Reform Program and economic collapse, private-led CF growth ended. Political and economic turmoil after the FTLRP, fuelled by unprecedented inflation, caused panic and anxiety. Most companies—including contractors—closed due to viability issues. Overly aggressive governmental interventions skewed the market (Scoones et al., 2017).

In 2008, the government of national unity and multicurrency regime restored political and economic stability for business. This secure climate created new economic prospects for local and multinational corporations (primarily from China, USA, and India) to work with resettled smallholder farmers under CF arrangements. Irwin et al. (2012) reported that 50 enterprises hired 32,8000 smallholder farmers to grow a range of crops on 628000 hectares of land in

2011/12. Cotton contractors rose to 13 in 2011 (James, 2015). Table 2.1 shows that tobacco contracting firms increased from 3 in 2003 to 20 in 2017 (TIMB, 2017).

Year	No of contractors	Contract production million (kg)	USD/kg	Action production million (kg)	USD/kg	Total production million (kg)	USD/kg
2004	6	16	2.13	53	1.95	69	1.99
2005	6	28	1.87	45	1.44	73	1.61
2006	7	30	2.08	25	1.88	55	1.99
2007	11	44	2.26	30	2.40	73	2.32
2008	15	33	3.13	16	3.44	49	3.23
2009	13	42	3.03	16	2.86	58	2.99
2010	12	79	3.04	42	2.63	122	2.89
2011	12	74	2.97	58	2.42	132	2.73
2012	13	92	3.72	53	3.52	144	3.66
2013	15	113	3.74	54	3.54	166	3.67
2014	16	162	3.32	51	2.69	216	3.17

Fig 2.1 Contract vs non-contract tobacco production Source: TIMB(2015)

Contract farming has increased the influence of tobacco firms across the nation, including those that create tobacco products and purchase leaves. In Zimbabwe, contract firms actively seek out new farmers, especially small-scale farmers, and frequently pay these farmers' locations a visit to determine whether these farmers are willing or able to work under contract with their leaf-buying company (Sakata, 2018).

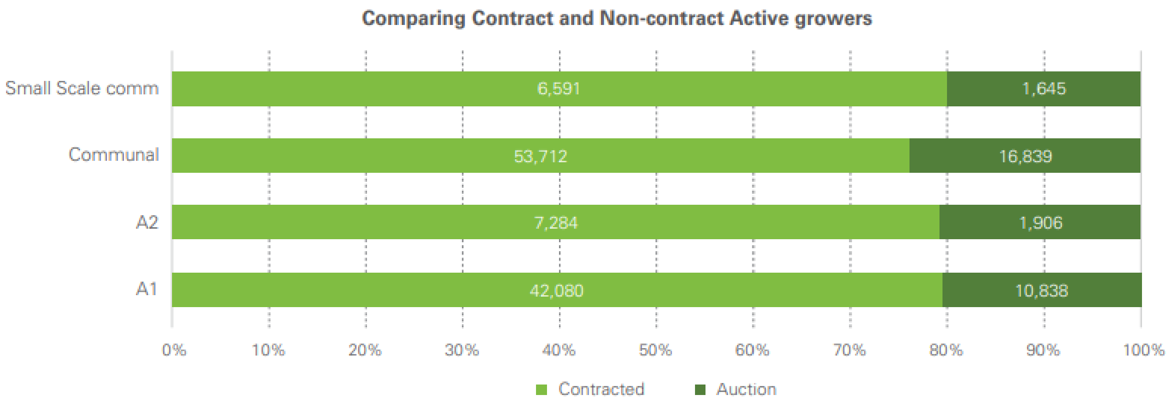

Fig 2.2 Comparing Contract and Non-contract Active growers Source: TIMB (2015)

2.1.3 Tobacco growing in Zimbabwe: Current business case

In Zimbabwe, tobacco is grown mainly in the Mashonaland provinces (Chirape, 2020). This is supported by TIMB (2020), who reported that during the 2018-2019 tobacco growing season, Mashonaland west province accounted for 38% production by volume, Mashonaland central province 31%, Mashonaland east 19% while the remaining 11% was produced in the Midlands province.

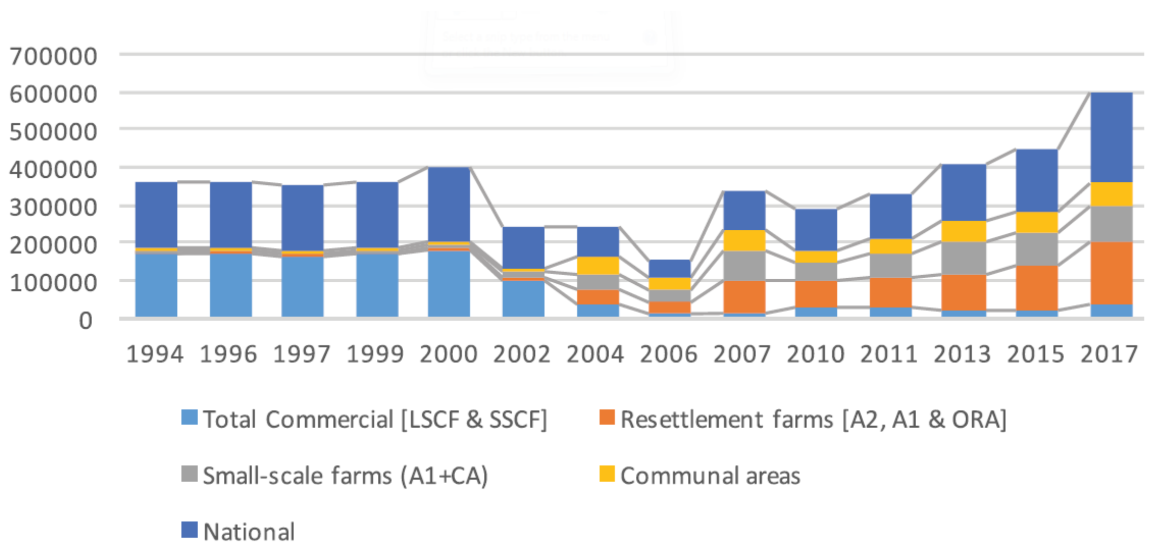

Fig 2.3: Tobacco output from 1994 to 2017 Source: Moyo and Shonhe, (2021)

The production of Virginia tobacco was mainly confined to the white commercial farmers while Africans were only allowed to produce Burley tobacco, as was the case in Chiweshe communal area (Shonhe, 2021). Before 2000, that is, before the land reform went through a fast-track phase, the production of tobacco remained dominated by LSCFs, with other farming models joining in only after 2004 when contract farming was hastened by the Chinese. As Figure 2.1 shows, despite the introduction of contract farming, there was a serious decline in production which heightened from 2000 until 2006. The resurgence in production from 2007, was not in sync with a general decline in the economy which reached its peak in 2008 and a devastating drought experienced the same year. This resilience, as shown in Table 4.1, indicates that other factors, beyond climate change, may be responsible for some spikes and decline in tobacco production. This notwithstanding, political and economic instability during the period leading to 2008 culminated in negotiations and the formation of a Government of National Unity (GNU), which ushered in a neoliberal economic regime whose major change to the agricultural policy was the introduction of United States Dollars as a currency tobacco trading, as well as the full remittance of the sold value of the commodity to farmers. Thus, a combination of the rise in access to contract farming, currency liberalisation and value retention enabled farmers to earn valuable returns and, in some cases, facilitated the production of tobacco through the reinvestment of their proceeds, from the previous marketing seasons.

According to a report by Zimbabwe Tobacco Association (ZTA) (2019), Zimbabwe exported 217 million kg of tobacco valued at US$933.6 million to various destinations across the globe (Table 2.1). The total area planted under tobacco for the 2017/18 season stood at 91 805 hectares from 87.755 hectares the previous season, showing a 5% increase (TIMB, 2020).

Table 2.1: Zimbabwe annual Tobacco production trend (2004 – 2020)

Year	**Tobacco production (Million kg)**
2008	49
2010	124
2011	132
2012	145
2013	167
2014	216
2016	202
2017	189
2018	252
2019	259
2020	184

Source: TIMB, 202

Table 2.1 shows the tobacco production trend for the period of 2008 to 2020. Generally there was an increase between 2013 and 2014. The production decreased in 2016 due to the general mid-season drought and incessant rainfall that later came in a short period but picked up to a record volume in 2018 due to government support policies on contract farming (TIMB, 2020).

2.2 Theoretical Framework

The study is underpinned by the efficiency analysis theory and agriflexion model.

2.2.1 Efficiency analysis theory

Efficiency covers vast and sometimes varied elements. The frontier reflects the maximum quantity of output that could be attained for a given level of inputs (production frontier); the minimum production cost of the output for a given level of prices of inputs (cost frontier); or the maximum profit that could be attained for a given level of prices of outputs and inputs (profit frontier). In all these cases, technology and fixed factors are also considered. Randall (2013), through the concept of "X-efficiency" considers the optimal non-systematic behaviour of farmers. In terms of comparative analysis, the frontier captures the best practices.

Economic literature identifies economic efficiency and scale efficiency among the different types of efficiency (Mambo, 2017). According to Henson (2018), a producer is technically efficient if an increase of whichever output necessitates the diminution of at least one other output or an increase by at least one input, and if a decrease in whichever input necessitates an increase of at least one other input or the diminution of at least one output. In other words, a technically efficient firm must situate itself on the frontier of its entire production system.

One of the key factors tobacco farming is productivity. Agricultural productivity is measured as the ratio of agricultural outputs to inputs and individual products are usually measured by weight, which is known as crop yield (Baskin, 2019). Productivity is an economic measure of output per unit of input. Inputs include labour and capital, while output is typically measured in revenues or as the market value of the final output (Henson, 2018). When productivity is analysed through comparison of different types of inputs such as labour or land such comparisons are called partial measures of productivity (Scoones, 2015).

Given the necessity to use finite resources in production efficiently, efficiency is a crucial topic of economic study that has drawn attention from economists (Ajibefun, 2008). Technical and allocative efficiency are the two basic components of economic efficiency (Farrell, 1957). This study's main topic, technical efficiency, is the capacity of a producer to provide the greatest output given a specific set of production inputs (Farrell, 1957). Stated differently, a company is considered technically efficient if it is operating at the cutting edge of a certain production technology. According to Kumar et al. (2008), there are two ways to represent technical efficiency: input-oriented (IO) and output-oriented (OO). Technical efficiency is measured from the input perspective by input orientated technical efficiency, while the output perspective is measured by output orientated technical efficiency. From an output standpoint, an 80 percent technically efficient company is generating 20 percent less than it might with its current technology and inputs. Similarly, considering inputs, a company with an 80% technical efficiency can generate the same amount of output with 20% less inputs (Coelli, Rao, & Battese, 2005).

The ability of the company to use the least expensive combination of resources to create a specific output quantity is known as allocateative efficiency. According to Coelli et al. (2005), a company is considered allocatively efficient if it allocates resources effectively and selects the best possible combinations of inputs and outputs. In summary, a company is considered economically efficient if it possesses both technical and organisational efficiency.

2.2.1.1 Constructs of the efficiency analysis theory

Efficiency analysis theory is pivotal in evaluating the performance of production units, particularly in terms of how resources are utilized to achieve desired outputs. This theory encompasses several key constructs that are essential for understanding and assessing efficiency in various contexts, including agriculture, manufacturing, and service sectors. Below are the primary constructs of efficiency analysis theory:

- *Technical Efficiency*

Technical efficiency refers to the ability of a production unit (such as a firm or farm) to produce the maximum output from a given set of inputs. It reflects the extent to which resources (e.g., labor, capital, land) are utilized without waste. A production unit is technically efficient if it operates on the production frontier, meaning it cannot increase output without increasing input or cannot reduce input without reducing output. Technical efficiency is crucial in determining how well a production unit uses its available resources (Farrell, 1957).

- *Allocative Efficiency*

Allocative efficiency occurs when resources are distributed in a way that maximizes the value or utility of the outputs produced. This construct assesses whether a production unit uses inputs in the most cost-effective manner, given the prices of inputs and outputs. A production unit achieves allocative efficiency when it produces the optimal mix of outputs at the lowest possible cost, aligning resource allocation with market conditions and consumer preferences (Debreu, 1951).

- *Economic Efficiency*

Economic efficiency, sometimes referred to as overall efficiency, combines both technical and allocative efficiency. It measures the extent to which a production unit maximizes output while minimizing costs, considering both the physical use of resources and their monetary value. A production unit is economically efficient if it is both technically and allocatively efficient, meaning it produces the maximum possible output at the minimum possible cost (Coelli et al., 2005).

- *Scale Efficiency*

Scale efficiency relates to the size of a production unit and its ability to operate at an optimal scale. It evaluates whether a production unit is operating at a level that allows it to fully exploit economies of scale. Scale efficiency is achieved when increasing the scale of operation leads to a proportional increase in output, minimizing per-unit costs. Conversely, if a production unit is too large or too small to benefit from economies of scale, it is considered scale inefficient (Chambers, 1988).

- *X-Efficiency*

X-efficiency focuses on the difference between the optimal level of efficiency that a production unit could achieve and the actual level of efficiency it exhibits. This construct is concerned with the internal factors within a production unit, such as managerial efficiency, organizational practices, and motivation, which may cause deviations from optimal efficiency. X-inefficiency arises when a production unit fails to achieve maximum efficiency due to factors like poor management or lack of competitive pressure (Leibenstein, 1966).

- *Cost Efficiency*

Cost efficiency is a specific form of economic efficiency that focuses on minimizing the costs of producing a given level of output. It examines whether a production unit is using the least costly combination of inputs to achieve its output targets. Cost efficiency is particularly important in competitive markets where minimizing production costs can lead to higher profit margins or lower prices for consumers (Kumbhakar & Lovell, 2000).

- *Dynamic Efficiency*

Dynamic efficiency extends beyond the static analysis of resource use to consider how well a production unit adapts to changes over time. This construct involves the ability of a production unit to innovate, invest in new technologies, and respond to shifts in market conditions or input availability. Dynamic efficiency is critical for long-term competitiveness and sustainability, as it reflects the capacity of a production unit to evolve and maintain efficiency in a changing environment (Aghion & Howitt, 1992).

- *Productive Efficiency*

Productive efficiency is achieved when a production unit operates at a point where it cannot produce more of one good without reducing the production of another, given the available resources. It is closely related to technical efficiency but focuses specifically on the trade-offs between different outputs. Productive efficiency ensures that resources are allocated in a way that maximizes the total output of all goods and services produced by the unit (Varian, 1992).

Efficiency analysis theory is highly relevant for assessing the impact of contract farming on smallholder tobacco farmers' productivity, technical efficiency, and welfare in Mazowe and Bindura Districts, Zimbabwe. The theory focuses on measuring how well resources are utilized to produce outputs, which is crucial for understanding the dynamics of smallholder farming under contract farming arrangements.

2.2.1.2 Applicability of efficiency analysis theory to the study

Technical efficiency refers to a farm's ability to produce the maximum output from a given set of inputs or to produce a given level of output with the minimum input usage (Farrell, 1957).

For smallholder tobacco farmers, technical efficiency is vital because their resources are often limited, and maximizing output is crucial for improving their livelihoods. Contract farming can potentially influence this efficiency by providing farmers with access to better inputs, technology, and training, which are often unaffordable or inaccessible otherwise (Barrett et al., 2012).

By applying efficiency analysis theory, this study can evaluate whether contract farming enables smallholder farmers to achieve higher technical efficiency compared to non-contract farmers. This is particularly important in the context of tobacco farming, where the quality and quantity of inputs, as well as the timing of farming practices, significantly affect output levels.

Productivity, a key component of efficiency, measures the output produced relative to the input used. Contract farming typically promises increased productivity by offering access to high-quality inputs, extension services, and assured markets (Glover & Kusterer, 1990). However, whether these benefits translate into actual productivity gains among smallholder farmers in Mazowe and Bindura needs empirical validation.

Efficiency analysis theory allows for the comparison of productivity levels between contract and non-contract farmers, shedding light on the effectiveness of contract farming as a strategy for enhancing agricultural productivity. Moreover, the theory facilitates the identification of specific areas where productivity could be improved, such as input usage, farming techniques, or resource allocation.

The welfare of smallholder farmers is closely linked to their productivity and efficiency levels. Increased efficiency and productivity can lead to higher incomes, better living standards, and improved overall welfare (Binswanger & Deininger, 1997). Contract farming arrangements, by potentially improving technical efficiency and productivity, could therefore have significant welfare implications for smallholder farmers.

Efficiency analysis theory is suitable for this study because it provides a framework for quantifying these potential welfare gains. By analyzing the relationship between contract farming and efficiency, the study can assess whether participating in contract farming enhances the welfare of smallholder tobacco farmers in Mazowe and Bindura.

2.1.1.3 Approaches in efficiency analysis

Many techniques have been created to comprehend efficiency analysis because of its importance (Ajibefun, 2008). Frontier methods were developed by economists in response to the shortcomings of the classical approach, which involved calculating the ratios of output-to-input (a partial productivity measure) and output-to-inputs (a total productivity measure) in early attempts to study efficiency (Ajibefun, 2008).

Two methods are used by economists to gauge technical efficiency. Both parametric and non-parametric methods are used here. Stochastic Frontier analysis and simple regression analysis are two econometric methods used in the parametric approach. Data Envelopment Analysis (DEA), which falls under non-parametric techniques, makes use of Corrected Ordinary Least Squares and mathematical programming (Ajibefun, 2008; Vasilis, 2002). The two methods' core premise is to estimate the frontier production function and compare it to the output that has been seen in order to assess the technical efficiency of a producer or group of producers. The main benefit of frontier analysis is its ability to compute economic, allocative, and technical efficiency.

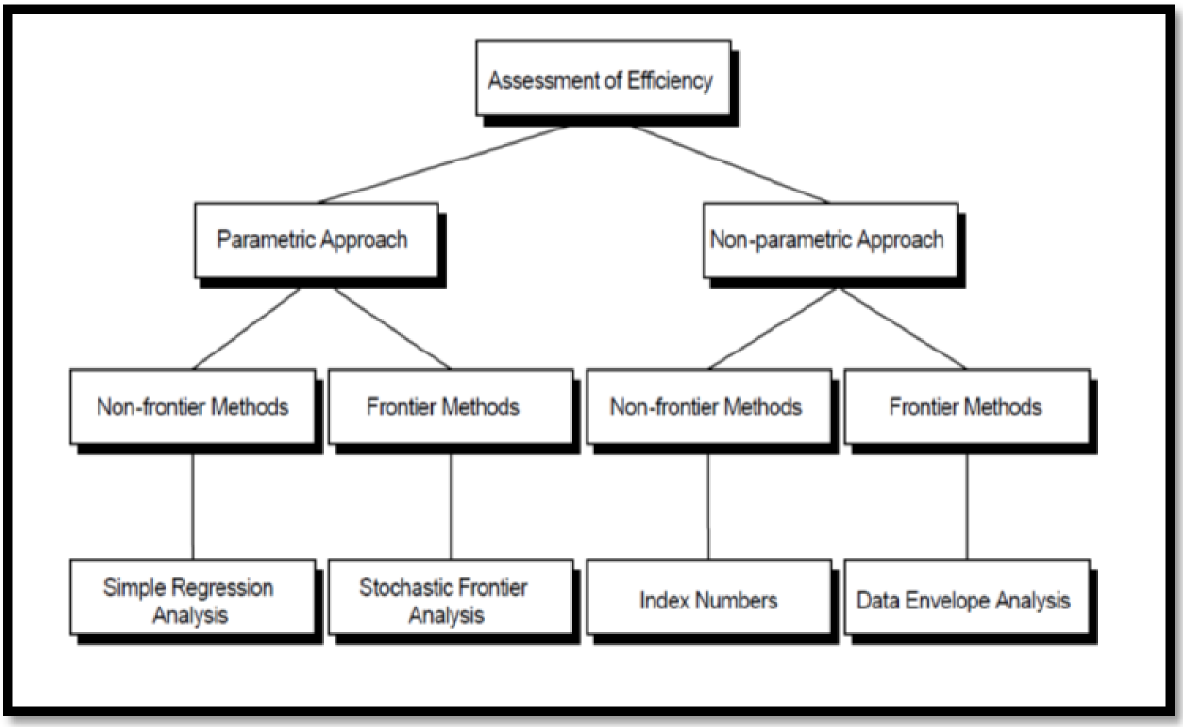

Fig 2.4: Taxonomy of efficiency measurement techniques Source: Vasilis (2002)

Although there are certain parallels between the two approaches, each has pros and cons that affect which approach different researchers favour. One benefit of parametric techniques is that they enable researchers to test predictions about the model's goodness of fit. Furthermore, it helps the analyst distinguish between random errors and inefficiencies. Vasilis (2002a). Its primary flaw, though, is that it necessitates technological definition, which makes it limiting and prone to specification error. Conversely, non-parametric methods are less constrictive since they do not force structure on the technology. The drawback is that model parameters cannot be estimated, making it hard to test theories about how well the model performs (Ajibefun, 2008).

For several reasons, technical efficiency matters in economic analysis. It first makes it possible to compare production units—in this case, farms or groups of farmers—to determine which is operating more efficiently. The creation of policies also benefits from efficiency analysis. For instance, identifying the factors that contribute to agricultural inefficiencies helps policymakers create measures targeted at removing inefficiencies' origins and enhancing the industry's overall performance.

2.1.2 Agriflection model

This research is based on the Agriflection extension model by Worth, (2002), a theoretical framework addressing rural development and the need for training to be conducted for farmers in the developing countries for them to prosper. The model arises out of fundamental changes in thinking about extension. Incorporating elements of livelihoods approaches and learning theory. According to Khumalo (2017), Agriflection is a learning model that shifts, (i) the context and locus of learning, (ii) what is learned, and (iii) the learning process. The model fosters a culture of continuous reflective learning that is submitted as the highest purpose of extension. The model suggests that prosperity can be realised through engaging smallholder farmers in scientific discovery, innovation and periodic training. Prosperity, continuous and sustainable wealth creation through tobacco farming is an elusive goal in Zimbabwe smallholder tobacco farming.

This research suggests that agricultural extension training can facilitate realising this objective if an appropriate approach to extension training can be developed. To develop such an approach requires that the definition of extension and the assumptions on which that definition rests are challenged. The objective of such an interrogation would be to reshape focus of the farmers by training them on all the various agronomic stages of the tobacco production cycle such that farmers could enhance their production efficiency. This would also ensure that principles and assumptions within farmers can be re-cast enabling extension to strengthen the capacity of people engaged in tobacco growing and thereby tap the economic potential of tobacco growing as a business by smallholder farmers. Such an approach would need to give practical expression to Zimbabwe's policies to revitalise the agrarian communities, putting them on a pathway to enduring prosperity.

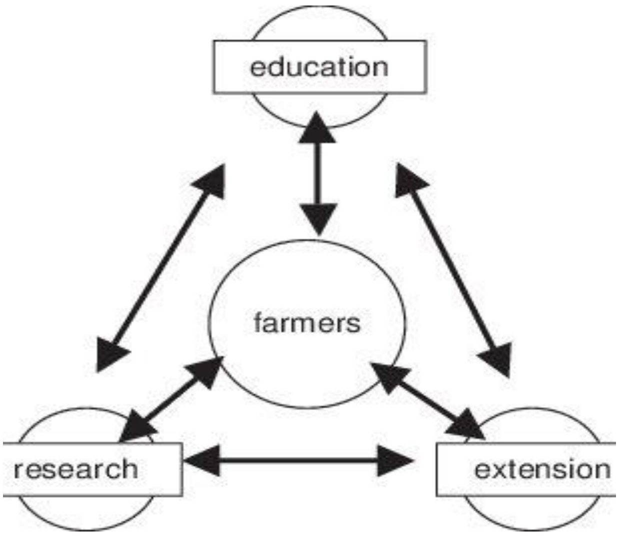

Fig 2.5: The Agriflection model Source: Worth, (2002)

2.1.2.1 Constructs of the model

The Agriflection Extension Model is a dynamic and reflective approach designed to enhance agricultural extension services by emphasizing the continuous learning and adaptation of both farmers and extension agents. This model is structured around several key constructs that facilitate the effective dissemination of knowledge and the adoption of innovative practices in the agricultural sector.

- Reflection and Reflexivity

At the core of the Agriflection Extension Model is the concept of reflection, where both farmers and extension agents engage in critical thinking about their practices and experiences. Reflection involves analyzing past actions and outcomes to understand what worked, what didn’t, and why. Reflexivity, a related construct, refers to the ability of individuals to recognize their influence on the farming system and adapt their strategies accordingly. This ongoing process of reflection and reflexivity is crucial for fostering a learning environment where continuous improvement is possible (Levin & Rönnblom, 2018).

- Participatory Learning

The model emphasizes participatory learning, where farmers are not just recipients of information but active participants in the learning process. This construct encourages a collaborative approach, with farmers contributing their local knowledge and experiences while extension agents bring in scientific insights and technical expertise. Through this collaborative learning process, farmers are empowered to take ownership of their development, leading to more sustainable and effective adoption of new practices (Chambers, 1994).

Contextualization

Contextualization is another critical construct within the Agriflection Extension Model. It recognizes that agricultural practices cannot be universally applied but must be tailored to the specific environmental, social, and economic contexts of the farmers. Extension services are thus adapted to the unique needs and conditions of each farming community, ensuring that the solutions provided are relevant and practical. This construct ensures that the knowledge imparted is not only theoretically sound but also practically applicable in the local context (Leeuwis & Aarts, 2011).

Empowerment and Capacity Building

Empowerment is a fundamental goal of the Agriflection Extension Model. The model aims to build the capacity of farmers by enhancing their knowledge, skills, and confidence to make informed decisions about their farming practices. This empowerment is achieved through targeted training, access to resources, and ongoing support from extension agents. By empowering farmers, the model fosters independence and resilience, enabling them to adapt to challenges and seize new opportunities (Friis-Hansen, 2004).

- Feedback Mechanisms

Effective feedback mechanisms are integral to the Agriflection Extension Model. These mechanisms allow for the continuous monitoring and evaluation of extension activities, ensuring that the services provided are meeting the needs of the farmers. Feedback is gathered from both farmers and extension agents, creating a two-way communication channel that facilitates the timely adjustment of strategies and practices. This construct is essential for maintaining the relevance and effectiveness of the extension services over time (Rogers, 2003).

- Sustainability

Sustainability is a guiding principle of the Agriflection Extension Model. The model seeks to promote practices that are not only economically viable but also environmentally sustainable and socially equitable. This construct emphasizes the importance of long-term planning and the responsible use of resources to ensure that agricultural development does not come at the expense of future generations. By prioritizing sustainability, the model aligns with broader goals of environmental stewardship and social responsibility (Pretty, 1995).

2.1.2.2 Applicability of the Agriflection Extension Model to the Study

The Agriflection Extension Model is a dynamic approach designed to enhance agricultural productivity and sustainability through reflective learning and adaptive strategies. This model is particularly well-suited for studying the impact of contract farming on smallholder tobacco farmers in Mazowe and Bindura Districts, Zimbabwe, due to its emphasis on participatory learning, continuous improvement, and adaptability to local contexts.

The Agriflection Extension Model emphasizes participatory learning, where farmers are not just passive recipients of information but active participants in the learning process. This is crucial in contract farming settings, where the success of the arrangement depends on the effective transfer of knowledge and skills to farmers. By engaging farmers in reflective practices, the model encourages them to critically assess their farming practices, make informed decisions, and adapt to new challenges (Davis, 2008).

In the context of smallholder tobacco farming, where farmers often face challenges such as fluctuating market prices, changing climate conditions, and limited access to resources, the Agriflection Model can empower them to better understand and manage these challenges. It allows for a more tailored approach to extension services, ensuring that the advice and support provided are relevant to the specific needs and circumstances of the farmers.

The Agriflection Model is built on the concept of continuous improvement, where farmers are encouraged to regularly reflect on their practices, outcomes, and the external environment to identify areas for improvement. This is particularly relevant in contract farming, where ongoing adjustments and refinements are necessary to optimize productivity and efficiency (Friederichsen et al., 2013).

Contract farming arrangements often introduce new technologies, farming practices, and market requirements that farmers must quickly adapt to. The Agriflection Model facilitates this process by promoting a cycle of action, reflection, and adaptation, enabling farmers to continuously refine their practices in response to feedback and changing conditions. This adaptability is crucial for maintaining the sustainability and success of contract farming arrangements, especially in the dynamic and often unpredictable agricultural sector.

Agricultural systems in Mazowe and Bindura are diverse, with variations in soil types, climatic conditions, and socio-economic factors. The Agriflection Model is well-suited for such contexts because it emphasizes the importance of local knowledge and the adaptation of practices to specific environmental and socio-economic conditions (Leeuwis & van den Ban, 2004).

In contract farming, the model supports the customization of extension services to align with the diverse needs of smallholder farmers. By incorporating local knowledge and encouraging farmers to reflect on their unique situations, the Agriflection Model ensures that the contract farming arrangements are more responsive and effective in different local contexts. This localized approach helps to optimize the benefits of contract farming, leading to improved productivity, efficiency, and ultimately, better welfare outcomes for the farmers.

2.2 Definition of Contract Farming Model

Barry (2019), defines contract farming as a farming model which involves agricultural production being carried out based on an agreement between the buyer and farm producers. In Zimbabwe, 90 percent of tobacco produced in 2018 came from growers under contract farming and 80 percent of these were smallholder farmers whilst the remainder were the medium to large scale farmers (TIMB, 2019). Contract farming involves production support in the form of farming inputs such as seed, fertilizers, chemicals and monetary support for labour payment support during the production cycle. Technical assistance is often included in the agreement and has become one important aspect of the contract arrangement. In return, the farmer commits to supply to the contractor the specific commodity in the right quantity and quality according to the contractor's specifications and this forms the basis of a contract agreement (Mutata, 2015).

Lessig (2019), called it an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, mostly at a price agreed in advance. The most important aspect about this definition was the forward agreement with a floor price determined in advance so that a farmer could make informed decisions about the viability of a crop. This was an issue of hedging against future uncertainty, for an example, a fall in the market prices or even currencies. The 2018 Zimbabwean Government draft national policy on contract farming, defined it as agricultural production carried out according to an agreement between a contractor and farmers, with specific conditions for the production and marketing of a farm product or products.

2.3 Definitions and theoretical perspectives of contract farming

This section delves into the concepts of contract farming, the various forms of contractual agreements in the agricultural sector, and the theoretical rationale behind this particular institutional setup. Understanding the notion of contract farming (CF) and determining which category the tobacco contract farming arrangement in Zimbabwe belongs to, considering the various types of agriculture contracts, are crucial. James (2015) claims that it is challenging to define CF broadly due to the variety and multiplicity of CF setups. Consequently, other definitions surfaced and were employed by various writers. This is due to the theoretical framework that the writers were concentrating on, as well as the necessity of modifying the contract to fit the circumstances that the parties would have agreed upon. According to Saigenji (2010), CF broadly speaking refers to an institutional or organisational structure that makes it easier for farmers to reach markets for their agricultural output and inputs.

In a similar vein, Minot (2007) provided a more thorough definition of CF as a pre-arranged agricultural production process between two contracting parties in which the buyer (contractor) agrees to purchase a specific product that the producer (farmer) pledges to producing in accordance with the established standards. Typically, the buyer—an agribusiness company—offers the farmer assured market and price, along with technical support and inputs on loan (Minot, 2007).

However, the definition of contact farming used in this study is that provided by Rehber (2007), who stated that it is

"*an oral or written contractual arrangement between farmers and other firms, specifying one or more conditions of production, and one or more conditions of marketing, for an agricultural product, which is non-transferable."*

The structure of the tobacco contract agreements in Zimbabwe is best described by this term. According to institutional economics, CF is a governance mechanism that falls between spot markets, where prices are set by the market, and fully vertically integrated investments, where the company maintains control over every aspect of the value chain, from production to marketing (Kirsten & Sartorius, 2002). Because agricultural markets are imperfect, there is a need to lower transaction costs, which is why contracts were invented. This lowers market risk by enabling agricultural companies to exert some degree of influence over the manufacturing process without physically accessing the production node. As highlighted, there are variations in contract farming arrangements to suit the circumstances and context in which the agreement is made.

2.3.1 Types of agricultural contracts

Based on the goal and structure of the contract, agricultural contracts can be divided into three general types using Kohls and Uhl's (1985) classification: contracts for market specification, contracts for resource provision, and contracts for production management.

(i) Market specification contracts

These are pre-harvest agreements that specify terms that control the sale of the designated agricultural product and are decided upon between the contractor and the farmer (Kohls and Uhl, 1985). After production, these contracts ensure the farmer a ready market. Furthermore, the farmer is able to see how much his produce would fetch as long as it meets the buyer's quality requirements. The farmers maintain complete control over the farm's production process under this structure (Prowse, 2012).

(ii) Resource-providing Contracts

In these kinds of agreements, the contracting company guarantees to provide the farmer with technical and material inputs in exchange for the producer selling the produce via the same company. Theoretically, this provides the benefit of lowering the farmer's input procurement costs while providing the agribusiness company with a guarantee of high-quality fruit, typically as payment. This kind of arrangement is typical for highly specialised and technical crops that have exacting quality standards and input needs that are out of the reach of smallholders with limited resources who find it difficult to obtain input because of their lack of resources and unfavourable market conditions (Prowse, 2012).

(iii) Production Management Contracts

In these kinds of agreements, the contracting company sets and upholds production standards, post-harvest on-farm procedures, and value-added processing to guarantee that the produce fulfils consumer demands. Under this agreement, farmers give the contracting company some degree of control over the production process (Prowse, 2012). The contracting company assumes market and pricing risk, while the farmer receives a predetermined amount of revenue assurance due to prearranged prices (Kohls and Uhl, 1985). Nevertheless, somewhat expensive to the agribusiness firm, costs are recouped from high quality produce and low default rates (Prowse, 2012).

2.3.2 Theoretical arguments for contract farming

Theoretically, productivity and efficiency should both benefit from CF. Many theoretical justifications have been offered to explain why CF boosts productivity and efficiency. Increased output in the contracted crop may benefit other crops as well, bringing in more money and enhancing the contract farmer's food security (Minten, Randrianarison, and Swinnen, 2009). The rationale is based on the knowledge that CF corrects several market flaws in rural markets that limit smallholders' ability to produce. The World Bank (2001) claims that credit facilities (CF) offer the private sector a way to replace the functions that governments formerly performed in terms of giving smallholders in developing nations access to agricultural information, inputs, and loans.

It is maintained that CF lessens farmers' financial obligations, freeing up funds for investments in profitable assets and advanced production technologies that raise output and efficiency. It relieves smallholder farmers of the stress of having to fully finance their operations because the contracting firm provides a major share of production inputs (seeds, fertilisers, chemicals, fuel, management, market services, and in some cases working capital). For instance, the contractor paid almost 80% of the production expenses under the USA's hog contract structure (Key and Mc Bride, 2007).

In addition to lowering production risks for farmers, contract farming transfers input and output pricing risks to contractors (Martin, 1997). By reducing risk, CF encourages lenders to lend more to farmers and to loosen some of the strict conditions associated with credit applications (Key, 2004). Farmers may decide to invest in more productive technologies if they have easier access to financing (Key and Mc Bride, 2007). In order to alleviate information asymmetry in agricultural markets, contract farming is crucial. A knowledgeable, prudent farmer is better able to make wise choices on the most efficient use of limited resources in order to maximise profits. Furthermore, CF offers farmers information on best farming methods to increase their productivity and efficiency through its extension services. Additionally, contracting companies have access to cutting-edge production methods and are likely to give farmers access to the newest, highest-yielding seed varieties available, increasing the productivity of farmers that participate in the program (Key and Mc Bride, 2007).

2.4 Empirical Studies on Contract Farming

Technical efficiency studies of tobacco farming have been conducted in the Turkish region. Using primary data collected from farmers and employing Data Envelopment Analysis (DEA) methodology, Mounton and Marais (2016) estimated the technical efficiency of tobacco production in Turkey, calculated input losses, and explained their implications for the Turkish economy. According to their results, mean technical efficiency of the regions was found to be as low as 0.453. Eastern and South-eastern regions were relatively more efficient, with a regional efficiency score of 0.862. There is need for more research to be conducted in other regions to compare conclusions deduced from different tobacco growing regions like Zimbabwe. It is significant to observe that these findings did not disclose the inference on the farm characteristics on productive and technical efficiency as it relates to the contract business model and to the welfare of the farmer participants. This study seeks to reduce the knowledge gap.

There are mixed findings in empirical literature on the impact of contract farming on farm productivity. Hamidi (2010) investigated the impact of contract farming on the profit of virginia tobacco farming in Indonesia using survey data of 147 farmers. By using profit function analysis, the study concluded that contract farming positively affected the profit of farmers but did not explicitly unravel the following issues: the technical efficiency and productivity challenges faced by the farmers in a contract farming model, approaches in which the tobacco contract model can be optimised for maximum returns and ways of strengthening smallholder tobacco contract farming arrangements to improve their welfare. This study will pursue investigations beyond the profit subject and evaluate issues to do with technical efficiency, productivity and welfare issues.

Glover and Kusterer (2016), conducted an economic analysis of contract farming for small-scale tobacco farmers in Songea district of Tanzania. The objective of the study was to assess the influence of contract farming on tobacco harvest among other objectives. Using a sample of 112 tobacco farmers, the study found no significant difference in farmers' yields between contracted and non-contracted farmers. Regardless of efficiency and productivity being closely related, Begum et al. (2018) carried out a study on the impact of contract farming on farm productivity and efficiency in Bangladesh and found contract farming having no impact on farm productivity but increasing farm efficiency. These findings motivate further investigation on the impact contract farming on farm technical efficiency and productivity in relation to household livelihoods and this proposed study seeks to contribute on the existing theories.

Mambo (2017), used descriptive statistics to analyse the effect of tobacco contract farming on the welfare of smallholder farmers in Angonia district in Mozambique. Welfare of farmers constitute of income, reduction in poverty, food security and health status which cannot be measured by one index. Mambo's study explored the relationship between tobacco contract farming and smallholder farmers' welfare in Mozambique using descriptive statistics for analysis. The study used primary data from 359 randomly selected farmers in Angonia district and found contract farming to be dysfunctional as it fails to improve the welfare of farmers. These findings from descriptive statistics could be improved in more investigations that use econometric models and estimation. This study will employ the treatment effects model and propensity score matching in finding out impact contract farming has on participants and no-participants.

Sharkey et al. (2017) carried out a review of contract farming and factors that impinge youths' acceptance to contract farming in Malaysia. The review showed that knowledge, attitude, involvement in agricultural activities (farming experience), gender, age, education and income levels are the influencing factors in contract farming participation. The study was based on collection of already carried out studies in identifying factors influencing participation. Drawing conclusions basing on review of already done studies may not be convincing since the studies were carried out in different countries and in different crops under study. The current study employs an econometric analysis (logit model) in finding out factors that have significant importance in influencing the Technical Efficiency and Productivity among Small-holder Contract Tobacco farmers. Looking at different dimension by still reviewing already done studies to draw conclusions, Harris (2017), analysed whether contract farming improves farm productivity and income of farmers by collecting 23 studies from developed and developing countries. Out of the 23 studies, 11 studies were on impact of contract farming on productivity while 12 studies focused on farmers' incomes. The 23 findings of the study were that contract farming increases farm productivity after review of already done studies. This study will use survey data and econometric estimation technique to draw factors influencing technical efficiency and productivity on contract farming.

2.5 Study review on whether there are any productivity and technical efficiency variations between contracted and non-contracted smallholder tobacco farmers.

Because of its implications for food security, poverty reduction, and agricultural expansion, efficiency and productivity have been the focus of much research in the agriculture industry. Considering CF's growing importance as a financing and commercialisation strategy for agriculture, numerous research have been carried out to evaluate its productivity impact. The studies discussed in this section show how contentious the question of whether CF increases productivity and efficiency is.

Key and Mc Bride (2003, 2007) found that CF had a favourable effect on productivity after studying the US hog industry. Using the maximum likelihood 26 approach, they first came to the conclusion that CF caused the hog industry to be very productive. This approach had issues because the variables that were used to determine contract participation were also employed in the efficiency model, which resulted in endogeneity and skewed findings (Key & Mc Bride, 2007). In light of this, a follow-up study was carried out by Key and Mc Bride (2007), who used instrumental variables to account for endogeneity issues. The two research' similar findings—that is, a positive causal association rather than a simply correlation between CF and productivity—were not surprising.

While examining the effects of a contract between a large-scale private farm and the nearby smallholder farmers in Tanzania, Nakano (2014) also noted beneficial effects of CF. The study discovered a favourable influence on the participating smallholders' adoption of better farming techniques, yields, and profits. For example, contract farmers realised yields as high as 5 tonnes per hectare, whereas non-contract farmers in the same area realised yields of 2.6 tonnes and the average national yield per hectare was 1.8 tonnes. In contrast to other research, the outcomes demonstrated a long-term effect on CF since productivity and technology adoption was high even after the contractor ceased providing inputs. The disadvantage was that the program's benefits did not trickle down to the nearby non-participants, which led to issues with inequality in the towns.

Igweoscar (2014) found high production when he used the OLS and Cho test models to examine the technical efficiency of contract and non-contract cassava farmers in South Eastern Nigeria. The study discovered that only productivity was statistically significant among contract farmers, despite the fact that their productivity, net returns, and welfare levels were higher than those of their non-contract counterparts. Olomola (2010) examined contract farming's performance on five crops—cotton, ginger, rice, soybean, and tobacco—while remaining in Nigeria. She found that improvements were made in terms of yields, produce quality, and farmer welfare, albeit these improvements differed depending on the crop.

Using the Heckman sample selection model to account for selection bias, Swain (2013) compared the efficiencies of contract and non-contract farmers in Southern India to investigate the effects of CF on paddy rice productivity and efficiency. The efficiency levels of the farmers for both contract-grown and non-contract-grown paddy rice were examined in the study. The findings demonstrated that while non-contract farmers were efficient in producing non-contractual paddy, contract farmers were more productive in generating the contracted paddy harvest. Furthermore, the study demonstrated that smaller farms had higher levels of efficiency 27 compared to larger farms. If Zimbabwe's second observation proves to be true, CF will significantly increase production because it is anticipated that smaller farms brought about by the land reform will produce more productive smallholder farmers than the former huge commercial farms.

Mishra et al. (2017) conducted a recent study whereby they examined the levels of productivity and technical efficiency among smallholder farmers in Napal who grow ginger and paddy seed under contract and those who do not. The study estimated the two farmer groups' technical efficiency levels and determined the factors influencing technical efficiency using a Translog Stochastic Frontier Model. The study employed the Propensity Score matching technique in order to mitigate the possibility of self-selection bias into contract participation. According to the findings, smallholder seed rice farmers' average technical efficiency levels increased from 87 to 94 percent as a result of CF. According to the same survey, producers of ginger saw a rise in average technical efficiency from 89 percent to 97 percent. For this group of farmers, human capital and market proximity were found to be sources of inefficiency.

Ajao and Oyedele (2013) investigated how CF affected the tobacco producers' economic productivity in Nigeria's Oyo state. Using a standardised questionnaire, the study gathered primary data from 495 contract tobacco growers. Data Envelop Analysis was then utilised to ascertain the levels of efficiency. In terms of technical efficiency, the farmers scored 83.1%, allocatively, 71.6%, and economically, 59.2%. The findings showed that, given the level of technology available to them, farmers might still increase their production by becoming more efficient. A limitation of the study's methodology is that the impact of CF on productivity was not isolated by comparing the before and after (contract) scenarios, nor did it compare contract and non-contract farmers. Because of this, it is challenging to draw logical conclusions about whether or not CF improved efficiency.

Mafuse et al. (2014) looked at the cotton industry, but they also studied how CF affected smallholder farmers' profits in Zaka, Zimbabwe. Using a t-test of mean equality, the researchers examined the profitability and yield levels of contract and non-contract cotton farmers. Data from the farming seasons of 2009–2010 and 2010–2011 were used to determine that there were no appreciable yield disparities between contract and non-contract farmers. Therefore, the theory that enhanced cotton productivity in smallholder agriculture through participating in cotton CF was denied. These findings suggest that the only benefit of using contracting as a funding vehicle for cotton production is an increase in area under 28 production because of input availability; there is no additional value added to productivity. This study aims to determine whether the same findings hold true for tobacco cultivation in light of the rise in CF arrangements during the past ten years.

Dube et al. (2017) carried out one of the few studies in Zimbabwe that this researcher is aware of regarding the effectiveness impacts of CF on tobacco productivity in Makoni District. Based on a random selection of smallholder tobacco farmers, the study employed stochastic frontier analysis and found that 94 percent of contract farmers were more productive than non-contract farmers (67 percent). The results suggest that smallholder farmers' technical efficiency is greatly increased by participating in CF, as evidenced by the fact that the area's smallholder tobacco growers' average technical efficiency was 73%. This study adds to the body of knowledge regarding the effects of CF on efficiency, but it has two drawbacks that may compromise the reliability of the results. First off, although tobacco bales sold are a common unit of measurement for output, the study employed them as the output variable. There is a chance that various bales have differing tobacco contents, raising doubts about the correctness of the findings. Secondly, the study failed to include the impact of self-selection bias in contract participation when adjusting for the technological efficiency differences between the two farmer groups; as a result, the results may be skewed. This study will employ propensity score matching to address self-selection bias and use kilogrammes (kgs) as the unit of measurement for the outcome variable, all while adhering to the same analytical process and producing reliable results.

2.6 Impact of technical efficiency on productivity of smallholder tobacco farmers.

Empirical studies on the impact of technical efficiency on the productivity of smallholder tobacco farmers have explored various dimensions, from the influence of farm management practices to the socio-economic factors that affect farmers' ability to optimize their resources. These studies often employ data envelopment analysis (DEA) and stochastic frontier analysis (SFA) to assess technical efficiency and its correlation with productivity outcomes.

Research has consistently shown that technical efficiency in tobacco farming is closely linked to the adoption of improved farm management practices. A study by Chimai and Murwendo (2020) in Zimbabwe revealed that farmers who adopted modern farming techniques, such as the use of certified seeds, fertilizers, and pest control measures, exhibited higher levels of technical efficiency. The study employed DEA to measure the efficiency scores of 150 smallholder tobacco farmers and found that those who adopted these practices achieved efficiency scores above 80%, leading to a significant increase in tobacco yield per hectare.

This study emphasizes the importance of knowledge transfer and access to modern agricultural inputs in enhancing technical efficiency. The findings suggest that extension services and farmer education programs can play a critical role in improving productivity by ensuring that farmers are aware of and can implement best practices.

Socio-economic factors such as education, access to credit, and farm size also play a significant role in determining the technical efficiency of smallholder tobacco farmers. In a study conducted in Malawi, Chipeta et al. (2018) used SFA to analyze the technical efficiency of 200 smallholder tobacco farmers. The study found that farmers with higher levels of education and better access to financial resources were more efficient in their production processes. Specifically, the study highlighted that educated farmers were more likely to adopt innovative practices, while access to credit enabled them to invest in necessary inputs, thus improving their efficiency.

Furthermore, the study revealed that farm size had a non-linear effect on technical efficiency. Small to medium-sized farms tended to be more efficient than both very small and very large farms. This finding suggests that there is an optimal farm size that balances resource use and management capacity, thereby maximizing efficiency and productivity.

Market access has also been identified as a crucial factor influencing the technical efficiency of smallholder tobacco farmers. A study by Moyo and Ncube (2017) in Tanzania examined the relationship between market access and technical efficiency among 250 smallholder tobacco farmers. The study utilized DEA and found that farmers with better access to markets were significantly more efficient. Market access facilitated timely sales, better prices, and reduced post-harvest losses, all of which contributed to higher productivity levels.

The study also noted that farmers who were part of cooperatives or farmer groups had better market access, which in turn improved their efficiency. These findings suggest that collective action and improved infrastructure, such as roads and storage facilities, are vital for enhancing the productivity of smallholder tobacco farmers.

The impact of climate change on the technical efficiency of smallholder tobacco farmers has become an increasingly important area of study. A study by Mapfumo et al. (2019) in Zambia assessed how climate variability affected the efficiency of tobacco production. Using a combination of DEA and regression analysis, the study found that unpredictable weather patterns, such as irregular rainfall and temperature fluctuations, significantly reduced technical efficiency.

Farmers who adopted climate-smart agricultural practices, such as crop rotation, conservation tillage, and the use of drought-resistant tobacco varieties, were able to mitigate some of these negative effects. The study concluded that enhancing farmers' resilience to climate change through the adoption of such practices is essential for maintaining and improving technical efficiency and, consequently, productivity.

The findings from these empirical studies have important policy implications. Governments and development organizations need to focus on improving access to agricultural inputs, credit, and education for smallholder farmers. Additionally, investments in infrastructure and market access can significantly enhance technical efficiency and productivity. Future research could explore the long-term impacts of climate change on technical efficiency and the effectiveness of various adaptation strategies. Moreover, there is a need for more localized studies that consider the unique socio-economic and environmental conditions of different regions.

In conclusion, the empirical studies reviewed highlight the multifaceted nature of technical efficiency and its critical role in determining the productivity of smallholder tobacco farmers. By addressing the various factors that influence efficiency, stakeholders can help smallholder farmers maximize their productivity and improve their livelihoods.

2.7 Determinants of technical efficiency of smallholder tobacco farmers.

Numerous efficiency studies demonstrate the various aspects that impact technical efficiency at the farm level. Three categories of variables have been the focus of previous research on the factors that determine technical efficiency at the farm level: (i) farm features; (ii) household demographic and socioeconomic characteristics; and (iii) farm geophysical characteristics. Scholars generally agree that these variables effect technical efficiency, though in diverse ways. However, there is disagreement on which variables belong in which group and which units of measurement to use.

Farm size and cultivated area have been extensively studied as factors influencing technical efficiency in smallholder agriculture under the category of farm characteristics. Beyan (2014) compared the technical efficiency differences between smallholder farmers practicing rain-fed agriculture and irrigation using a Cobb-Douglas stochastic production frontier. The study's examination of the factors influencing technical efficiency revealed that access to irrigation, cultivated area, education, farmer training, and extension contact all had a substantial impact.

Chirwa(2007) carried out a similar study in Malawi, using farm level data to look into the source of technical efficiency among smallholder maize farmers as well as to estimate the technical efficiency level. Smallholder maize farmers in Malawi were producing significantly less than their potential, according to the results of the stochastic frontier production function (mean TE was 46.23%). In the same study, Chirwa (2007) looked into the causes of technical inefficiencies and discovered that the sample's technical inefficiencies were explained by socioeconomic and demographic characteristics. A related study conducted in 2005 by Tchale et al. demonstrated that household size services and education had a favourable impact on increasing the technical efficiency of Malawi's smallholder maize farmers. Most policy variables, such as extension and loan availability, also had a beneficial impact on technological efficiency. It was shown that smaller farms were more efficient than larger ones. Numerous research on farm efficiency have revealed a negative association between technological efficiency and farm size (Townsend et al., 1998; Helfand & Levine, 2004).

In Uganda, Obwona (2006) examined the factors influencing technical efficiency using cross-sectional data from 65 small- to medium-sized tobacco growers. The study's goal was to investigate strategies for raising tobacco productivity by focussing on the factors that influence technical proficiency in the field. The study discovered that socioeconomic and demographic factors could account for the observed inefficiencies in tobacco farming (31). Policy orientation has been influenced by the observation that technical efficiency is positively impacted by access to extension services, credit, and education. A Cobb-Douglas Production frontier model was employed in the study to quantify technological efficiency and determine its factors. With the level of inputs and technology used, there remained room to increase production, as indicated by the technical efficiency of 64.7%. The study discovered that the utilisation of input credit has a detrimental impact on technical inefficiency, among other things.

An analysis of the technical efficiency of tobacco farmers in Tanzania by Ilembo and Kuzilwas (2014) provided support for the call on tobacco farmers to use CF in their farming practices. In that study, the technical efficiency of smallholder tobacco growers was assessed, and the factors influencing technical efficiency in Tanzania were examined. A stochastic frontier model of Cobb-Douglas was used to analyse data at the farm level. Significant technical inefficiencies were discovered by the investigation among the tobacco farmers in the sample. The farmers were achieving 64.7% of their potential on average, which suggests that if inefficiencies in the production process were fixed, there was a significant chance to raise production by roughly 35.3% with the resources at hand. Input credit, education level, off-farm income, and farm size were positively correlated with technical efficiency; older farmers were found to be less productive than younger ones. The study found that smallholder farmers with limited resources are urged to use input credit programs like CF in order to increase technical efficiency because tobacco cultivation is a capital-intensive industry.

2.8 Impact of contract farming on the socio-economic wellbeing of participating smallholder tobacco farmers.

The effect of CF on farm revenue has been the subject of several research. Furthermore, it seems that there are conflicting findings about how CF affects farm incomes, making it challenging to draw a reliable conclusion about whether or not CF raises farm earnings. While some research (Key & Rusten, 1999; Warning & Key, 2002; Simmons et al., 2005) assert that CF raises farm earnings, other research (Eaton & Shepherd, 2001; Glover & Kusterer, 1990; Abdallah, 2016) found no effect at all or even a decrease in agricultural incomes. This section examines the research on the effects of CF on farmers' incomes in contacting. Furthermore, a few of the examined research attempt to clarify the causes of the contradictory findings about the effect of CF on farm revenues. The incomes of contract participants and non-participating farmers are also contrasted.

The nature of the contract has a significant influence on how CF affects smallholder welfare and revenues. Dedehouanon et al. (2013) discovered, for instance, that CF only enhanced participants' subjective wellbeing in specific scenarios and with specific contract types. CF provides an institutional solution to the issues of market failure in rural economies by connecting services including loan, training, technical guidance, and market information (Grosh, 1994, Rusten, 1992). Furthermore, CF promotes smallholder involvement in value chains and markets, which raises and stabilises smallholder incomes and enhances farmer welfare (Bellemare, 2012). CF lessens the danger of price fluctuation, which is a typical occurrence in agriculture markets, by disclosing the price of food before it is produced (Eaton & Shepherd, 2001). Farmers can concentrate on effectively deploying their productive resources to maximise profits on their farming investments when there is minimal price risk (Saenger et al., 2013).

In their early 1990s analysis of CF's experiences in Africa, Porter and Howard (1997) noted notable welfare benefits among famers engaged in contract farming. The research of contract vegetable production in India, where farmers similarly reported an increase in their incomes after enrolling in the contract system, confirmed this observation (Singh, 2002). The same study also uncovered issues like social differentiation—which puts society's fabric at risk—violations of contracts, power imbalances between contracting corporations and farmers, and a lack of environmental sustainability. The final point is a major threat to Zimbabwe's contract tobacco growing industry, which depends on firewood for tobacco curing, which worries environmentalists.

According to Warning and Key's (2002) empirical study of groundnut contract production in Senegal, contract farmers saw statistically significant increases in gross agricultural revenue, which was 55% more than the average revenue of non-contract farmers. The report, however, said nothing about the cause of the rise in total revenue. It is unclear from this study what caused the increase in gross income because gross revenue is a function of price multiplied by quantity, which is likewise a function of area planted and productivity. In order to determine what actually caused the revenue increase, more study is needed to dissect the revenue effect.

Positive welfare impacts for three agricultural goods produced under contract were noted by Simmons et al. (2005) during their investigation of the benefits and rise of CF in Indonesia. The study discovered that the welfare of farmers who took part in CF improved using farm gross margin analysis. The same study also found that contract farmers raising broiler chickens and seed maize had higher returns on their capital, making them wealthier than they had been previously. For contract rice farmers, on the other hand, who did not see a rise in farm gross revenue, the outcomes were different. Rather, they gained advantages from having entry to safe markets. The authors also claimed that CF lessened the area's absolute poverty. This is crucial from a development standpoint since, in the majority of developing nations, CF can be utilised to reduce poverty in impoverished rural populations. To cut transaction costs, agribusinesses that opt to only contract with large farmers at the expense of numerous dispersed smallholders must be cautious in addressing the social imbalances that result (Kirsten & Sartorius, 2002).

Mwambi et al. (2016) conducted an interesting study on the effect of CF on the farm incomes of avocado growers in Kenya. They found that while CF participants had higher incomes, there was no statistically significant difference between their incomes and non-participants. This suggests that the income disparities between the two groups in this instance were not caused by CF. The study pointed to a potential explanation for why CF was unable to have a meaningful effect on participants' incomes: inadequate coordination between the contracting parties. Strong collaboration between participants is necessary for CF to have an impact on smallholder farmers' well-being. Through the development of rural infrastructure to allow coordination between the contractual parties and the reinforcement of the legal system to assure contract enforcement, the government plays a critical role in fostering an enabling environment.

According to Abdulai and Al-hassan's (2016) study, contract participation significantly reduced the amount of money farmers got from producing soybeans. The study examined the effect of CF on farmers' incomes. According to the report, contract farmers made less money growing soybeans than independent farmers did. The study also found that, in contrast to their non-contract counterparts who kept their harvest and only sold when prices were advantageous, contract farmers were forced to sell their soybeans to the contractors as soon as they were harvested at the predetermined price. Additionally, because the contractors are profit-driven companies, their quest of profits took precedence above the welfare of farmers. This further illustrates the power imbalance between contractors and farmers, which leads to the exploitation of smallholder farmers via unfair contract terms (Parirenyatwa & Mago, 2014). This discovery is consistent with the findings of Clapp et al. (1994), who assessed contract systems in Africa and came to the conclusion that agribusiness companies occasionally treated farmers as "quasi employees." In order to safeguard the interests of the contracting parties and guarantee viability, this observation necessitates the creation of regulations that govern the implementation of CF agreements.

Farmer groups and farmer cooperatives can assist in promoting the interests of farmers when it comes to CF, in addition to government intervention in an attempt to control CF activities for the mutual benefit of the contracting parties. According to a research by Sokchea and Kulas

(2015), combining CF with farmer organisations may help to reduce some of the issues associated with CF. According to the report, farmer organisations work in tandem with CF to enhance farm revenues and farmer wellbeing by giving smallholder farmers more bargaining power and removing the power asymmetry that most contract arrangements have. Furthermore, as farmer organisations are owned by their members, all member farmers' interests are represented, increasing the likelihood that even small farmers—who are typically left out by contracting firms—will participate in CF. Thus, to sum up, the study demonstrated how CF and farmer organisations may work together to eliminate inequality in agricultural communities and enhance smallholder production, incomes, and welfare.

Mulatu et al. (2017) examined the effect of vegetable contract participation on household income in the Central Rift Valley of Ethiopia in a new study using both quantitative and qualitative data. Propensity score matching was used to account for self-election bias in order to address the non-randomness of contract participation in the absence of baseline data. The treatment effect on the outcome variable (income) was estimated using a t-test, and it was discovered that taking part in CF raised income by 32% on average. The vegetable contract members also claimed additional benefits related to livestock and asset accumulation. Saigenji and Zeller (2009) similarly reported similar findings, finding that contract tea farmers in Vietnam made more money than their non-contract counterparts. Begum (2005) conducted an examination of Bangladesh's vertically integrated poultry sector and noted significant income gains on contract poultry farms.

The area planted increased because inputs were no longer a constraint on the favourable rates supplied by the contractors, as shown by the different studies discussed in this section. Some researchers also credit the increase in income to efficiency gains.

2.9 Gap analysis

To conduct a gap analysis in the literature for the study, it is essential to review existing studies and identify areas that have been underexplored or inadequately addressed.

2.9.1. Impact of Contract Farming on Productivity

The relationship between contract farming and productivity has been the focus of numerous studies, often highlighting the benefits of improved access to inputs, technical assistance, and guaranteed markets. For example, studies by Bellemare (2012) and Narayanan (2014) demonstrate that contract farming generally leads to higher productivity levels due to these advantages. However, there is a notable gap in the literature regarding the specific impact of contract farming on smallholder tobacco farmers in Zimbabwe, particularly in the Mazowe and Bindura districts. While general findings suggest positive productivity outcomes, there is limited empirical evidence that contextualizes these benefits within the specific agricultural and socio-economic environments of these districts. The gap here lies in the need for localized studies that take into account the unique challenges and opportunities faced by tobacco farmers in these areas.

2.9.2. Technical Efficiency of Smallholder Farmers

Technical efficiency in the context of smallholder farming has been extensively studied, with many researchers focusing on the role of contract farming in improving efficiency. Studies by Minten, Randrianarison, and Swinnen (2009) in Madagascar and Maertens and Vande Velde (2017) in Senegal show that contract farming can enhance technical efficiency by providing farmers with better access to technology and knowledge. However, these studies often focus on a limited range of crops and do not adequately address the efficiency of tobacco farming in Zimbabwe. Additionally, there is a scarcity of studies that investigate how the unique conditions of Zimbabwean agriculture, including land tenure systems, input availability, and market access, influence the technical efficiency of tobacco farmers under contract farming arrangements. This gap highlights the need for more targeted research that explores these dynamics within the context of smallholder tobacco farming in Mazowe and Bindura districts.

2.9.3. Welfare Implications of Contract Farming

The welfare implications of contract farming are a critical area of study, particularly in assessing how these arrangements impact the livelihoods and economic stability of smallholder farmers. Existing literature, such as the works of Warning and Key (2002) and Miyata, Minot, and Hu (2009), suggests that contract farming can lead to improved welfare outcomes through increased income stability and reduced market risks. However, there is a gap in understanding the long-term welfare impacts on smallholder tobacco farmers, especially in regions like Mazowe and Bindura, where economic conditions and market dynamics may differ significantly from other contexts studied. Moreover, the existing literature often fails to capture the nuanced ways in which contract farming affects different aspects of welfare, such as food security, education, and health, particularly among tobacco farmers who may face different risks and rewards compared to those growing other crops. Addressing this gap requires comprehensive studies that consider the multi-dimensional nature of welfare and the specific challenges faced by tobacco farmers in these districts.

2.9.4. Suitability of the Agriflection Extension Model

The Agriflection Extension Model, which emphasizes reflection and learning within agricultural practices, has been proposed as a useful framework for assessing the impact of extension services on farming outcomes. However, the application of this model in the context of contract farming, particularly in tobacco farming in Zimbabwe, is underexplored. While the model has been used in other agricultural contexts to promote farmer innovation and adaptability (Davis, 2008), there is little empirical evidence on its effectiveness in evaluating contract farming arrangements, especially in regions like Mazowe and Bindura. The gap here is the need for studies that not only apply the Agriflection Extension Model to these specific contexts but also critically assess its strengths and limitations in capturing the complexities of contract farming and its impacts on smallholder farmers.

2.10 Conclusion

In conclusion, the literature review has identified several critical areas where existing research provides a solid foundation for understanding the dynamics of contract farming, particularly in relation to productivity, technical efficiency, and welfare. However, significant gaps remain, particularly concerning the specific impact of contract farming on smallholder tobacco farmers in the Mazowe and Bindura districts of Zimbabwe. The review has underscored the need for more localized studies that take into account the unique agricultural, economic, and social contexts of these regions. Additionally, the application of the Agriflection Extension Model to evaluate the effectiveness of contract farming in these districts presents an innovative approach that could offer new insights into the strengths and limitations of current agricultural practices and policies. By addressing these gaps, the study aims to contribute to a deeper understanding of how contract farming can be optimized to enhance the productivity, efficiency, and welfare of smallholder tobacco farmers in Zimbabwe.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

The methodology chapter outlines the research design, data collection methods, and analytical approaches employed in the study. The primary objective of this chapter is to provide a comprehensive overview of the methodological framework that guided the research, ensuring that the study's findings are robust, reliable, and valid.

This study adopted a mixed-methods approach, integrating both quantitative and qualitative techniques to comprehensively examine the impacts of contract farming on smallholder tobacco farmers. Quantitative data were collected through structured surveys administered to a representative sample of farmers in the Mazowe and Bindura districts. These data were analyzed using statistical tools to measure productivity, technical efficiency, and welfare outcomes.

3.1 Research Philosophy

This study focused on the positivist paradigm because of the belief that the observer will be independent and the study results will be proven facts based on scientific calculations. Scoones (2015) describes research philosophy as the development of the research background, research knowledge and its nature. Positivism is based on the idea that science is the only way to learn about the truth. According to Randall (2013), positivism depends on quantifiable observations that lead to statistical analyses. Henson (2018), concurs by alluding that as a philosophy, positivism is in accordance with the empiricist view that knowledge stems from human experience. The idea will be to test whether the existing theories are applicable to the Zimbabwean smallholder tobacco contract situation. Positivism is based on observations of external reality and general laws that exist or theoretical models can be developed that are generalisable, can explain cause and effect relationships, and can lead themselves to predicting outcomes (Baskin, 2018).

3.2 Description of the Research Area

Tobacco production in Zimbabwe is mainly concentrated in four provinces; Mashonaland Central, Mashonaland West, Mashonaland East and Manicaland province. Other provinces like Masvingo, Midlands and Matabeleland provinces only shared less than 300 registered farmers among them in 2019/20 season (TIMB, 2020). The way the farmers are structured in their farming areas in-terms of how they are contracted and the marketing systems area the same in these high production provinces. The tobacco contracting companies that are found in Mashonaland Central, Mashonaland East, Mashonaland West and Manicaland are generally the same. On this background one province, Mashonaland Central, will be purposefully used for the purposes of this research study. This province was selected because it is one of the top four provinces of the tobacco produced in Zimbabwe which is the major contribution to tobacco production (TIMB, 2019).

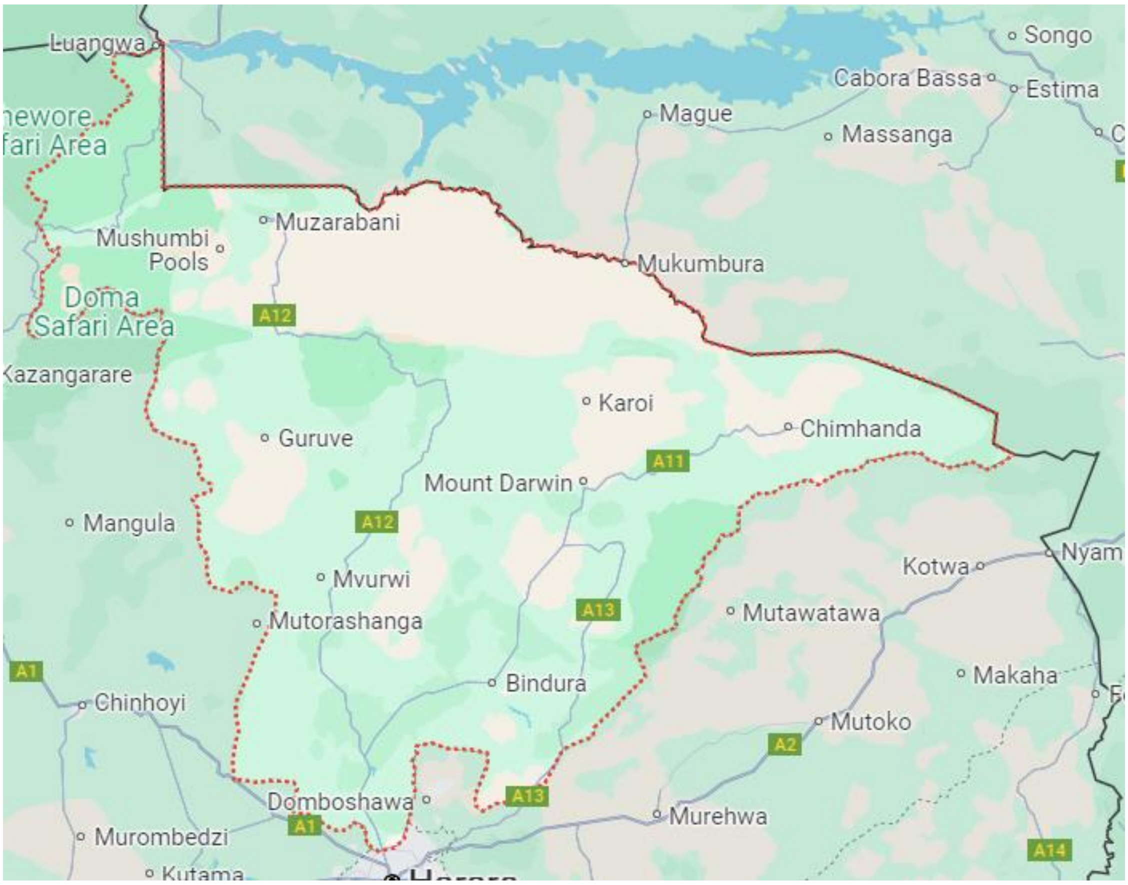

Figure 3.1 Study area

Source: Google maps

This research study will be conducted Chinehasha village, Camsasa village and Crewken area located in Mashonaland Central province. The first research area will be Chinehasha village located in ward 3 of Mazowe District. Chinehasha village is a communal area. The second study area will be Camsasa area in ward 1 of Guruve District. Camsasa area is an Old resettlement area. The third research site will be in Crewken area located in Bindura District. Crewken area is an A1 farming area. It is envisaged that these three study areas will offer the expected heterogeneity of contracted and non-contracted tobacco farmers in Zimbabwe and give a true picture of how they fare in productivity, technical efficiency and welfare. The selection of these villages was conducted with the intention of ensuring a comprehensive and unbiased representation of the smallholder tobacco farming communities situated within the Mazowe and Bindura Districts. The selection of these individuals may have been driven by the intention to comprehensively capture the multifaceted dimensions of socio-economic backgrounds, agricultural practises, and prevailing conditions among the local farming community. The prevalence of contract farming is observed in the following areas. Through the exploration of contract farming in various regions, scholars have the opportunity to meticulously analyse its influence on the productivity, technical efficiency, and overall well-being of smallholder tobacco farmers. Crewken, Camsasa, and Chinehasha were selected based on their strategic value in terms of accessibility and logistical convenience. Furthermore, it is noteworthy to mention that they possess pre-existing data or records that can effectively bolster the research objectives. Valuable baseline data for comparison and analysis can be derived from sources such as previous agricultural surveys, agricultural extension records, or specific studies conducted in these areas.

3.3. Research Design

A research design is defined as an approach or strategy that can be used systematically in order to fulfil the demands of a research project (Creswell, 2009). Research design usually incorporates strategies which are used to determine the best applicable course to be taken when undertaking research (Terell, 2012). The research design adopted in this study provided the totality of the methods and procedures that were followed to ensure a consistent and systematic collection and analysis of data, as well as the interpretation and presentation of the research findings. The ultimate decision involves the type of research design that should be adopted to fulfil the research and such a decision must be based on the assumptions that the researcher undertakes during the study; and methods used for data collection, analysis, and interpretation (Creswell 2009). Since there was need to assess the efficacy of smallholder tobacco farming towards the achievement of socio-economic transformation, the study made use of a mixed method research design. The mixed methods approach was adopted due to the fact that all methods (quantitative and qualitative) have limitations, thus this research intended to reduce the bias inherent in individual methods. The methods that were adopted were based either on constructivism or positivism as noted below.

3.3.1 Social constructivism/constructionism paradigm

The study had to be guided by the social constructivism paradigm because it was evaluating the technical efficacy of contract farming in smallholder tobacco farming and smallholder farming as a tool for socioeconomic transformation in rural Zimbabwe. It is difficult to measure poverty because it is a concept with multiple dimensions. The researcher used the social constructivism philosophy, which holds that knowledge is constructed through interaction, to determine whether tobacco farming has reduced poverty and vulnerability. The participant becomes the information's source and focus instead of the researcher. In qualitative research, the social constructivism (constructionism) paradigm is typically employed (Mertens, 1998; (Keating and Della Porta, 2008) According to Creswell (2009), social constructivists make assumptions that they use to comprehend their surroundings and construct meaning based on their experiences. The researcher chose this method for this study because the participants' perspectives on the investments, income and production trends, benefits, and challenges that tobacco farmers in Mashonaland Central face were heavily relied upon. In this instance, the participants' perspectives on the role that tobacco production plays in reducing poverty in rural areas and the difficulties that smallholder tobacco farmers face in their environment were uncovered. Accordingly, since this examination worldview is fundamentally subjective in nature, inquiries concerning these peculiarities were coordinated to the smallholder tobacco ranchers during interviews.

Moreover, a portion of the subjective information connected with the difficulties and the commitment of smallholder tobacco cultivating (public, old resettlement and fast track resettlement) in diminishing rustic neediness were likewise gathered from the little holder interviews. In this regard, the researcher gathered information regarding smallholder tobacco farmers' perspectives on tobacco production, the changes it brought to their livelihoods, and the difficulties they have faced. The advantage of the constructivist method was that farmers were asked research questions in their natural environments, reducing the likelihood of data collection complications. As a result, the discussions and interviews were interpreted by the researcher (Bhattacherjee, 2012). Since the information that were gathered through the direction of the social constructivism approach were generally subjective in nature, the review utilized a topical examination following the exploration questions and the examination targets that had been planned. The participants' perspectives on the subject were presented through excerpts from the interviews. However, as will be discussed further down, the quantitative data derived from positivism complemented the qualitative data gathered using this strategy.

3.3.2 Positivism

Positivism in social science is based on the idea that the researcher is detached from the study's participants and makes independent observations (della Port and Keating, 2008). According to Cohen et al. (2007), positivism uses scientific description to explain behavior and phenomena and makes use of observations and reasoning to do so. The suppositions of positivism are more disposed to quantitative as opposed to subjective examination (Creswell, 2009). The positivist paradigm was especially important for this study because it was necessary to ascertain the factors that influenced tobacco output in various farming areas and the variability in tobacco production among smallholder farmers. Subsequently, the information that were gathered for this situation were quantitative. The researcher administered questionnaires to collect data for the study.

Data on numerical variables like age, the size of arable land, the size of arable land under tobacco production, tobacco farming experience, the amount invested, and tobacco output per farmer were gathered using a questionnaire administered by the researcher. Various statistical techniques, including correlation and multiple regression analyses, were used to analyze the data. The analysis was carried out with the help of software such as MS Excel 2010 and SPSS V16. The non-numerical data that were gathered using a questionnaire included changes in rural poverty as a result of tobacco production as well as difficulties that smallholder farmers faced in producing tobacco. To supplement the information gathered through analyst regulated surveys, the scientist likewise used the perception procedures. In order to improve the quality of the data that were collected and, in the end, the results of the study, complementary approaches were necessary because each of the various research approaches used in this study had its own strengths and weaknesses.

3.3.3 Cross sectional survey design

The study was conducted using a cross-sectional survey of tobacco producers in the study area. The cross-sectional approach was used since smallholder farmers typically do not maintain records. Therefore, the study only gathered data from the most recent agricultural season, which farmers could recall with a reasonable level of accuracy. If there had been accurate agricultural record keeping, time-series or panel data analysis would have been the most suitable designs. Split sampling was utilised to guarantee that both contract and non-contract farmers were represented in the sample in proportion to their respective numbers. Given that this is an efficiency study, the research methodology mostly consisted of quantitative methods, with a specific focus on input-output data. The researcher supervised trained enumerators who collected the data. Prior to conducting the survey, the questionnaire underwent a pretest and appropriate modifications were implemented to enhance the data gathering process.

3.4 Conceptual Framework

According to Freguin-Gresh, Anseeuw, and D'Haese (2012), market failures to allocate productive resources to all economic sectors are causing the emergency and growth of contract farming (for small-scale farmers). Due to their lack of assets, collateral, and the expertise and training necessary to produce cash crops, small-scale farmers are regarded as risky. The regulator, the contractor, and the government all contribute significantly to easing these constraints. By enhancing the flow of information about markets, technology, and other production resources, contract farming is an intervention that has the potential to alleviate imperfect market constraints. small-scale farmers are primarily powerless as they don't approach credit because of absence of guarantee, and the degree of human resources in this area is low.

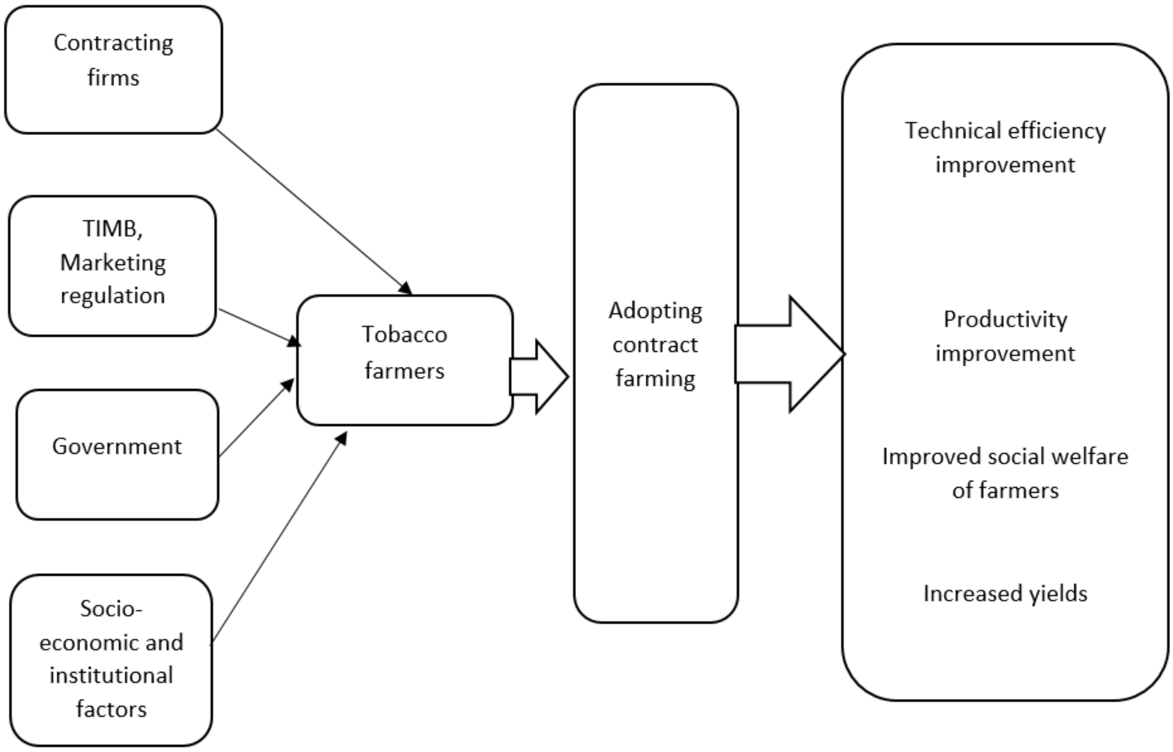

Figure 3.2 Tobacco contract farming conceptual framework

Source: Author's own design

Contract farming is thought to provide some of these services because governments in less developed nations also lack the capacity to provide support services. Simmons (2002) contended that agreement cultivating can straightforwardly help ranchers through superior admittance to business sectors, credit, information sources and better utilization of innovation, in this way working on their efficiency and pay. Farmers and agribusinesses can share production and marketing risks while simultaneously providing employment for the family and the community. The community's standard of living will rise as a result. Farmers' creditworthiness tends to rise as a result of contract farming, which is thought to make it easier for them to access other players' financial services. From a more extensive perspective, it has ability to make immediate and roundabout money furthermore for ranchers' tasks or establish a climate for ranchers to get to different method for funding to back cultivate resources and foundation

Figure 3.2 is a contract farming conceptual framework, depicting the players involved, and the problems or issues involved if productivity and income are to increase. Contract farming is an intervention which arises because of information asymmetry problems in agricultural markets, which tends to increase the costs of doing business and at the same time affects productivity in the sector.

As shown in Figure 3.2, tobacco farmers are at the centre of this problem, which affects their access to finance, markets and services as depicted on the right. Williamson (1979) argued that firms face high transaction costs due to opportunism and screening of information in trying to contract with farmers, hence the need for government to create an enabling operating environment that reduces the costs of doing business. According to Hussen (2015), contracting firms experience lots of expenses in the contracting process and also some of them experience side marketing from the farmers. Wu (2006) argued that 'economic distortions and contract imperfections necessitate government intervention to try and improve the operation of the markets. There is general consensus in contract farming literature that poor smallholder farmers have low bargaining power if compared with the well-resourced profit-seeking firms (Wainaina, Okello & Nzuma, 2012), thus necessitating protection from government. In support of the notion by Wainana et al (2012), government should put in place policies which protect the small scale farmers in terms of accessing credit from farmers, they can do that through subsidies or other schemes (Longley, 2018).

3.5 Research Population

The population from which this study will draw conclusions are from tobacco growing farmers in Mashonaland Central Zimbabwe. According to TIMB (2021), there were 31 848 registered tobacco farmers in Mashonaland Central during the 2020-2021 farming season. The study used the 31 848 farmers as the population size. A control group made of non-contracted farmers was also be used for comparisons and this also gave some points of divergence on productivity, technical efficiency and welfare. In Mashonaland Central, there are A1, Old Resettlement and communal farmers among the smallholder sector and hence stratified random sampling was used to cater for them being heterogeneous population.

3.6 Sample Size

The following computation formula was used to calculate the sample size.

$n = N/(1 + Ne^2)$ (Lessing, 2009).

In which, n is the sample size; N is the population size; e is the significance level will apply 0.05.

n = 31 848 (1+31 848*0.05^2)

n = 31 848 /80.62

Sample size = 395

A two-stage stratified random sampling procedure was used in this study. Stratified random sampling involves dividing the population in the various sub-groups and then taking a simple random sample within each one (Neil, 2015).

Table 3.1: Stratified random sampling

Type of farmers	**Number of farmers in population**	**Calculation of sample size**	**Sample size**	**Sample size amended**
A1 Farmers	320	320/31848*395	3.97	30 (for statistical purposes the researcher selected 30)
Old resettlement farmers	6 540	6540/31848*395	81.11	80 (rounded off)
Communal farmers	24 988	34988/31848*395	295.1	295 (rounded off)
TOTAL	**31848**			**395**

Source TIMB (2021)

3.7 Data Collection Procedure

3.7.1 Research Instruments

Questionnaires, semi-structured individual interviews and observations will be used for data collection. Four hundred researcher-administered questionnaires will be issued to the sample farmers through a random sampling method. The survey questionnaire will be divided into five sections namely; Part A for demographic characteristics of the farmers, Part B will then focus on the farm characteristics, Part C will focus on production factors, Part D will focus on the institutional; factors and lastly Part E will be general questions.

The four hundred farmers will also be interviewed using pre-formulated, open-ended questions and closed ended questions to gather data on the technical efficiency and productivity of tobacco farming business. The open ended questions will help in providing clarification and bring the researcher to a point of understanding whilst the closed ended questions will be used for ease of data analysis. The interviews will be conducted at the tobacco farms since observations will also be used to gather non-verbal information and the structure of the surroundings. In a study, a control group is used to establish a cause-and-effect relationship by isolating the effect of an independent variable (Baskin, 2019). Given the fact that about 90% of the farmers are contracted, the study is going to make sure it gets help from TIMB so that the researcher knows the farmers who are not contracted. I will then also use their help to approach them and request them to participate in the study by clarifying the significance of t the study objectives. The researcher will get hold of the farmers at auction sales floors. This was seen to be cheap and effective.

3.7.2 Data Analysis

Data analysis will be primarily quantitative. Both descriptive statistics and inferential statistical analysis techniques, using SPSS version 24 software with the ANOVA technique, will be used to compute chi-square and analysis of variance to unpack differences or similarities in farmer characteristics and performance. This test will allow the study to compare the farmer characteristics as well as explain if the differences are due to chance or other factors.

3.7.2.1 Data Envelopment Analysis

Data envelopment analysis (DEA) will be used to measure technical efficiency on contracted and non-contracted farmers. According to Barry (2019), DEA should be viewed as a method or tool for data-oriented analytics and it is a data-driven tool for performance evaluation and benchmarking**.** DEA is a non-parametric linear programming method proposed by Charnes et al. (2017) to compare the relative efficiencies of comparable decision-making units. One well-known benefit of the DEA is that it allows a researcher to assess the effectiveness of a particular decision-making unit based solely on observed amounts of inputs and output, rather than assuming a functional form connecting inputs to output. It can either be input or output-oriented. For the purpose of this study, the output-oriented technical efficiency is estimated which deals with the question of how much output quantity can be proportionally increased without altering the quantity of input used. In this input-output relation, input variable includes land, labour, seeds, fertilizer and irrigation. So, this model has one output which is technical efficiency and five inputs which are land, labour, seeds, fertilizer and irrigation Assuming n number of farms, each producing single output by using m different inputs, an output-oriented model for ith farm producing yi units of output by employingz_{ki}units of k^{th}inputs can be described mathematically in equation below

Equation 1

$$max_{\emptyset,\varphi}\ \emptyset_i$$

$$\text{Subject to } \sum_{j=1}^{n} \varphi_j\ z_{j\geq 0}$$

$$\varphi_j \geq 0$$

k=1, 2, ……….m

j=1, 2 ,…………n

$\emptyset$ represents a scalar which is a farm specific efficiency score when it is equal to 1 then the farm is efficient but when it is less than 1 then it is inefficient.

Source: Mhondoro (2018)

Several studies used another important method, i.e., stochastic frontier analysis (SFA) to estimate the contracting impacts on efficiency level. SFA, on the other hand, necessitates a specific production function and distributional assumption, so, the biased estimation may be caused by the misspecification of the production function. Unlike SFA, DEA is not based on any production function assumptions. Consequently, in this study, DEA is employed to estimate the efficiency scores.

Because, DEA is confined to estimate the efficiency score, conducting a statistical hypothesis test on factors affecting efficiency can be done easily. In this study, it will done by applying a two-stage analysis procedure. At the first stage, DEA is used to estimate the efficiency scores. At the second stage, endogenous switching regression model is used to measure the impact of CF on efficiency where the efficiency scores obtained from the DEA analysis is taken as an outcome variable

3.7.2.2 Endogenous Switching Regression (ESR) model

The researcher adopted an efficient 'endogenous switching regression' (ESR) model to check the impacts of CF on technical efficiency. ESR model includes one selection decision equation which determines whether farmer adopts CF or not. In next step, based on selection equation, two separate regime equations are estimated to determine the outcome variables. In selection equation, the adoption-decision of CF is a dichotomous choice variable - 1 for adoption and 0 if not. At the first step, we estimate the selection equation with Probit model. Farmers will adopt only if net benefit from adoption is higher, ${NB_{i1}}^* \geq {NB^*}_{I10}$.

Model will be as follows

$$
{NB_{i1}}^* = Z_i\,\alpha + u_i\,j = (0{,}1
$$

Where z_i represents explanatory variables like farming specifications and demographic features

α represents parameters to be estimated.

Equations for the model are as follows:

The conditional expected outcomes (technical efficiency) of these four cases [Eqs. (4a) to (4d)] are specified as follow:

Farmers with adoption (observed) of CF: $E(Yi1|D{=}1){=}X'\,\beta 1 + \sigma u1\lambda e1$ …..........................(4a)

Farmers with non-adoption (counterfactual) of CF: $E(Yi0|D{=}1){=}X'\,\beta 0 + \sigma u0\lambda e1$ …………..(4b)

Farmers with non-adoption (observed) of CF: $E(Yi0|D{=}0){=}X'\,\beta 0 + \sigma u0\lambda e0$ …………….(4c)

Farmers with adoption (counterfactual) of CF: $E(Yi0|D{=}0){=}X'\,\beta 1 + \sigma u1\lambda e0$…….. (4d)

3.7.3 Summary table

Table 3.2 Summary table Source: Author (2024)

SPECIFIC OBJECTIVES	RESEARCH QUESTIONS	DATA REQUIRED	ANALYTICAL TOOL
To establish whether there are any productivity and technical efficiency variations between contracted and non-contracted smallholder tobacco farmers.	Are there any significant technical efficiency divergence between contract and non-contract tobacco farmers in Mazowe and Bindura?	Statistics on the input and outputs from the 2021-2022 growing season, Socio-economic variables and other factors hypothesized to affect technical efficiency	Total Factor Productivity Data Envelopment Analysis Endogenous Switching Regression
To assess the impact of technical efficiency on productivity of smallholder tobacco farmers.	What is the impact of technical efficiency on productivity of smallholder tobacco farmers	Crop yields from the 2021-2022 growing season	Endogenous Switching Regression (ESR), Descriptive statistics which are the mean, standard deviation, minimum and maximum, quartiles, correlation, frequency distribution
To identify the determinants of technical efficiency of	What are the determinants of technical efficiency in contracted	Farmers socio-economic characteristics, Inputs and output statistics in the 2021-2022 growing season, Institutional	Data Envelopment Analysis Descriptive statistics which are the mean,

smallholder tobacco farmers.	smallholder tobacco production?	characteristics and other characteristics hypothesized to affect productivity	standard deviation, minimum and maximum, quartiles, correlation, frequency distribution
c) To estimate the impact of contract farming on the socio-economic wellbeing of participating smallholder tobacco farmers.	What are the impacts of tobacco contract farming participation on the socio-economic wellbeing of smallholder farmers?	Socio-economic characteristics and institutional and other characteristics	Human Development Index Ordered Probit Regression model Independent samples t-test

3.8 Ethical considerations

In conducting the study" several ethical considerations were taken into account to ensure the integrity and ethical soundness of the research process. These considerations include informed consent, confidentiality, voluntary participation, minimization of harm, and the ethical handling of data.

Informed Consent: A fundamental ethical requirement in this study was obtaining informed consent from all participants. The smallholder farmers involved were provided with detailed information about the study's objectives, methods, potential risks, and benefits. They were informed that their participation was entirely voluntary and that they had the right to withdraw from the study at any time without any negative consequences. Consent forms were used to document their agreement to participate, ensuring that the consent was given freely and without coercion (Dawson & Kass, 2020).

Confidentiality and Anonymity: To protect the privacy of the participants, strict measures were implemented to maintain confidentiality. Personal identifiers were removed or anonymized in the data to ensure that individual farmers could not be traced back to the responses they provided. Data was stored securely, and access was restricted to the research team only. Participants were assured that their information would be used solely for the purposes of the study and would not be shared with third parties without their explicit permission (Wiles et al., 2022).

Voluntary Participation: Participation in the study was entirely voluntary, and no participants were coerced or pressured into taking part. The researchers ensured that participants understood their right to refuse participation or to withdraw at any point during the study without any repercussions. This was crucial in maintaining the voluntary nature of the study and in respecting the autonomy of the farmers (Resnik, 2021).

Minimization of Harm: The study design took careful steps to minimize any potential harm to the participants. The questions and interactions with the farmers were structured to avoid causing distress or discomfort. The study focused on assessing the impact of contract farming on productivity and welfare in a manner that was respectful and non-intrusive. Any risks, however minimal, were clearly communicated to participants, and care was taken to mitigate them wherever possible (Guillemin & Gillam, 2018).

3.9 Chapter summary

In conclusion, this chapter has provided a detailed account of the research methodology employed in assessing the impact of contract farming on the productivity, technical efficiency, and welfare of smallholder tobacco farmers in Mazowe and Bindura districts. By utilizing a mixed-methods approach, the study leverages the strengths of both quantitative and qualitative data to offer a comprehensive understanding of the dynamics of contract farming among smallholder farmers.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.0 Introduction

The last chapter was focused on the research methodology which was applied in the study. This section covers the pilot study analysis, demographic analysis and inferential statistical analysis. The researcher will also compare the study findings with that from past relevant literature.

4.1 Pilot study results analysis

The pilot study was conducted to assess various aspects of contract farming among smallholder tobacco farmers in Mazowe and Bindura Districts. The researcher managed to gather valuable findings from this pilot phase. The results of the pilot study was very informing to make necessary adjustments to the survey instrument. The pilot study utilised a sample of 50 smallholder tobacco farmers. The sample used 25 contracted and 25 non-contracted farmers. The results highlighted they were numerous key differences. Therefore, this formed a foundation for the refinement of the survey approach.

4.1.1 Variations in Productivity and Technical Efficiency

The analysis showed that contracted and non-contracted farmers were varying significantly. The study showed that out of the 25 contracted farmers, only 20 (80%) reported an average yield of 1,800 kg per hectare. This finding showed that there was a 25% more as compared to the non-contracted farmers. These results are an indication that contracted farmers benefited from better access to resources. This includes that they were utilising high-quality seeds and technical support. This led to higher productivity. In addition, 88% showed higher technical efficiency. Their efficiency scores had an average of 85%. The 72% non-contracted farmers 72% achieved lower efficiency scores, averaging 70%. The higher technical efficiency among contracted farmers can be attributed to training and adherence to best practices provided under contract agreements.

4.1.2 Impact of Technical Efficiency on Productivity

The pilot study also showed that technical efficiency positively influenced productivity. The finding was that eighty percent (20 out of 25) reported that improvements in technical efficiency led to increase in productivity. This indicates that higher technical efficiency is a significant direct contributor to improved productivity. This underscores the benefits of technical support in contract farming.

4.1.3 Determinants of Technical Efficiency

The study identified three key determinants of technical efficiency. These were training and support, access to inputs and farm management practices. 70% of contracted farmers (17 out of 25) attributed their efficiency to regular training and technical support. 65% of contracted farmers (16 out of 25) reported that better access to quality inputs was crucial. 60% of contracted farmers (15 out of 25) credited effective farm management practices for their higher efficiency. In contrast, non-contracted farmers faced challenges such as limited access to resources and insufficient training, impacting their technical efficiency.

4.1.4 Impact of Contract Farming on Socio-Economic Wellbeing

The researcher also noted that contract farming has a noticeable impact on the socio-economic wellbeing of farmers. This was shown through 75% who highlighted reported an increase in income due to higher yields and better market access. In addition, half of the contracted farmers reported a modest income improvement. Of the 25 contracted farmers, 17 of them were experiencing improved living conditions and better access to education and healthcare. However, about 55% were reporting limited improvements in their quality of life. These results underscore the positive socio-economic impact of contract farming. These impacts include better income stability and improved living standards for participating farmers.

4.1.5 Survey Corrections and Final Adjustments

The researcher identified issues during the pilot study which led to adjustments in the final survey. Some of the highlighted issues included ambiguity of some questions. This was leading to inconsistent responses. Revisions were made to make sure the questions were clear. It also ensured clarity and precision in questions which relate to productivity measures and technical efficiency. Another issue which was indicated was that the initial response options for technical efficiency and socio-economic impact were too broad. Therefore, the researcher adjusted the responses to be more specific.

The pilot highlighted challenges in data collection methods, such as language barriers and varying literacy levels among participants. The final survey incorporated simpler language and provided assistance through local facilitators. Based on feedback, additional questions were added to capture information on training programs and access to resources, which were crucial determinants of technical efficiency. These adjustments aimed to enhance the accuracy and reliability of the data. This ensured the effective address of research objectives in the final survey.

4.2 Response rate

The response rate is fundamentally defined as "the percentage of people who respond to a survey compared to the number of people who were invited to participate" (Dillman, Smyth, & Christian, 2014). This definition emphasises that it is important to understand how many people who were invited actually participated. This measure which provides insight into the survey's engagement and potential biases. Groves et al. (2009) describe the response rate as "the proportion of individuals who provide usable data relative to the number of people contacted for a survey." This highlights that a high response rate is a reflection of the quality and completeness of the data collected. This aspect is crucial as it ensures that the findings are based on a substantial and reliable data set. Additionally, Fink (2013) points out that the response rate "provides a measure of the survey's representativeness and validity." This shows that a higher response rate is a major contributor to the accuracy and generalizability of the survey results. In survey research, the response rate is a key indication of the effectiveness of a survey. It also gives evidence of the representativeness of its findings (Fink, 2013). It is a reflection of the ratio of individuals who participated in the survey in comparison to the total number of individuals to which the invite was sent. Therefore, the study calculated the response rate was based on a sample size of 395, with 278 participants completing the survey. Therefore, the response rate for the study was found to be 70.4%.

Table 4.1: Response Rate Calculation

Total Sample Size	Number of Participants	Response rate calculation	Response Rate (%)
395	278	$(\frac{278}{395})*100$	70.4

A response rate of 70.4% is considered robust. This is an indicator of a high level of engagement from the survey participants. This is an enhancement of the reliability and validity of the survey results. According to Dillman et al. (2014), response rates above 70% are often seen as indicative of a well-conducted survey with effective engagement strategies. This level of participation has a probability of giving a full representation of the view of the population under study. This in turn reduces the risk of nonresponse bias. This bias can happen when there is underrepresentation of some groups (Groves et al., 2009).

Furthermore, a high response rate ensures that the study findings are accurate. This ensures that the sample more closely mirrors the broader population. Recent research supports this view through the suggestion that high response rates lead to more reliable data. This in turn provides better understanding of the research subject (Fink, 2013). Allen et al. (2021) also highlighted that surveys with high response rates provide more accurate assessments of the targeted phenomena. This is a better reflection of the diversity within the population.

In this study, the achieved response rate of 70.4% is consistent with the criteria for high-quality survey research. A high response rate enhances the representability and reliability of study findings. This level of engagement not only strengthens the validity of the study's conclusions but also supports the reliability of the data collected.

4.3 Demographic analysis

This section provides the demographic analysis of the study's results. The demographic analysis of the farmers was based on key characteristics such as age, gender, education level, farming experience, and land size. The data were collected using structured questionnaires and interviews, which provided insights into the profiles of the farmers participating in contract farming.

Table 4.2: Demographic Characteristics of Farmers

Characteristic	**A1 Farmers (n=30)**	**Old Resettlement Farmers (n=80)**	**Communal Farmers (n=295)**	**Total (n=405)**
Gender				
Male	20 (66.7%)	55 (68.8%)	210 (71.2%)	285 (70.4%)
Female	10 (33.3%)	25 (31.2%)	85 (28.8%)	120 (29.6%)
Age Group				
18-35 years	8 (26.7%)	15 (18.8%)	60 (20.3%)	83 (20.5%)
36-50 years	12 (40.0%)	30 (37.5%)	110 (37.3%)	152 (37.5%)
Above 50 years	10 (33.3%)	35 (43.7%)	125 (42.4%)	170 (42.0%)
Education Level				
Primary	5 (16.7%)	20 (25.0%)	110 (37.3%)	135 (33.3%)

Characteristic	A1 Farmers (n=30)	Old Resettlement Farmers (n=80)	Communal Farmers (n=295)	Total (n=405)
Secondary	20 (66.7%)	45 (56.2%)	150 (50.8%)	215 (53.1%)
Tertiary	5 (16.6%)	15 (18.8%)	35 (11.9%)	55 (13.6%)
Farming Experience				
Less than 5 years	7 (23.3%)	15 (18.8%)	50 (16.9%)	72 (17.8%)
5-10 years	10 (33.3%)	25 (31.2%)	100 (33.9%)	135 (33.3%)
More than 10 years	13 (43.4%)	40 (50.0%)	145 (49.2%)	198 (48.9%)
Land Size (Hectares)				
Less than 1 hectare	5 (16.7%)	10 (12.5%)	185 (62.7%)	200 (49.4%)
1-2 hectares	10 (33.3%)	20 (25.0%)	80 (27.1%)	110 (27.2%)
More than 2 hectares	15 (50.0%)	50 (62.5%)	30 (10.2%)	95 (23.4%)

4.3.1 Gender Distribution

The study found that a majority of the farmers were male. Therefore, the males made up 70.4% of the total sample. This gender imbalance is a reflection of the traditional norms and socio-cultural practices in Zimbabwe. This is because traditionally men have got significant control of land and major farming decisions.

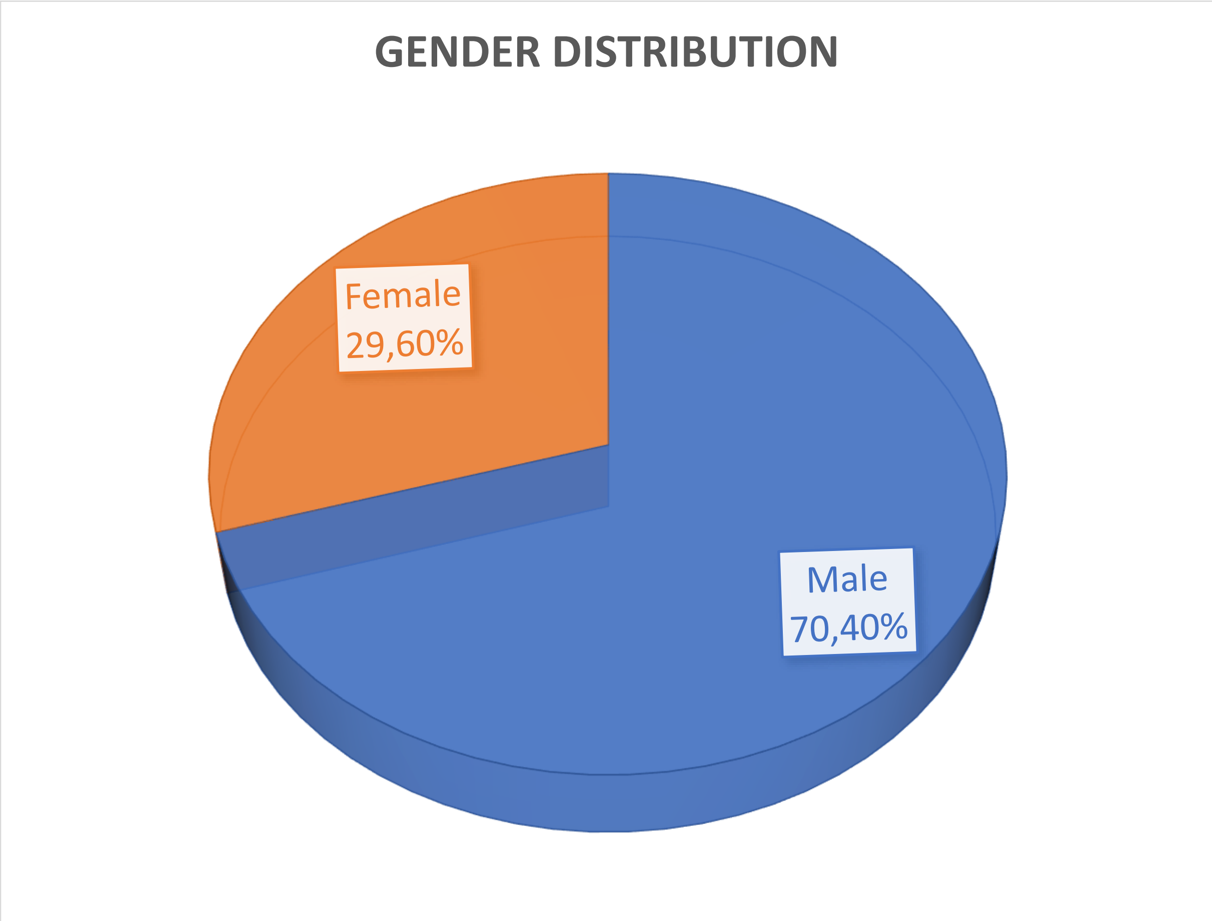

Figure 4.1 Gender distribution

Source: Author (2024)

Past studies, such as Chimhanda et al. (2020), have observed similar trends, highlighting that male dominance in smallholder tobacco farming is often due to patriarchal structures that limit women's access to land and farming resources. The underrepresentation of women in contract farming poses challenges to achieving gender equity in agricultural productivity and economic empowerment.

4.3.2 Age Distribution

The age distribution of the farmers shows that 42% were above 50 years, and 37.5% were between 36 and 50 years, indicating an aging farming population.

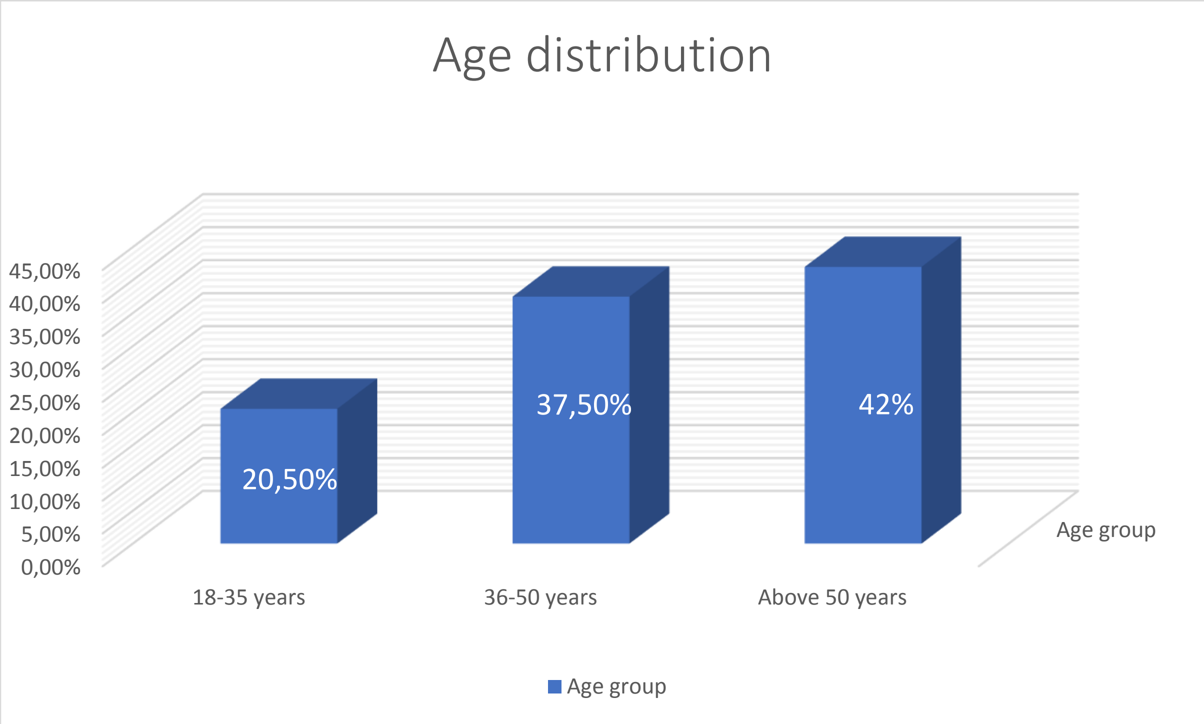

Figure 4.2 Age distribution

Source: Author (2024)

This finding aligns with Nyakatawa and Mujeyi (2021), who noted that the farming community in Zimbabwe is increasingly aging. This means young people have moved away from agriculture. This is mainly due to migration, education, and that there are perceptions that there are few opportunities in agriculture. Therefore, this aging trend may pose sustainability challenges. This is because older farmers usually do not want to implement new technologies and practices for enhancement of productivity and efficiency.

4.3.3 Education Level

Education is a critical factor influencing farmers' ability to adopt innovative farming practices.

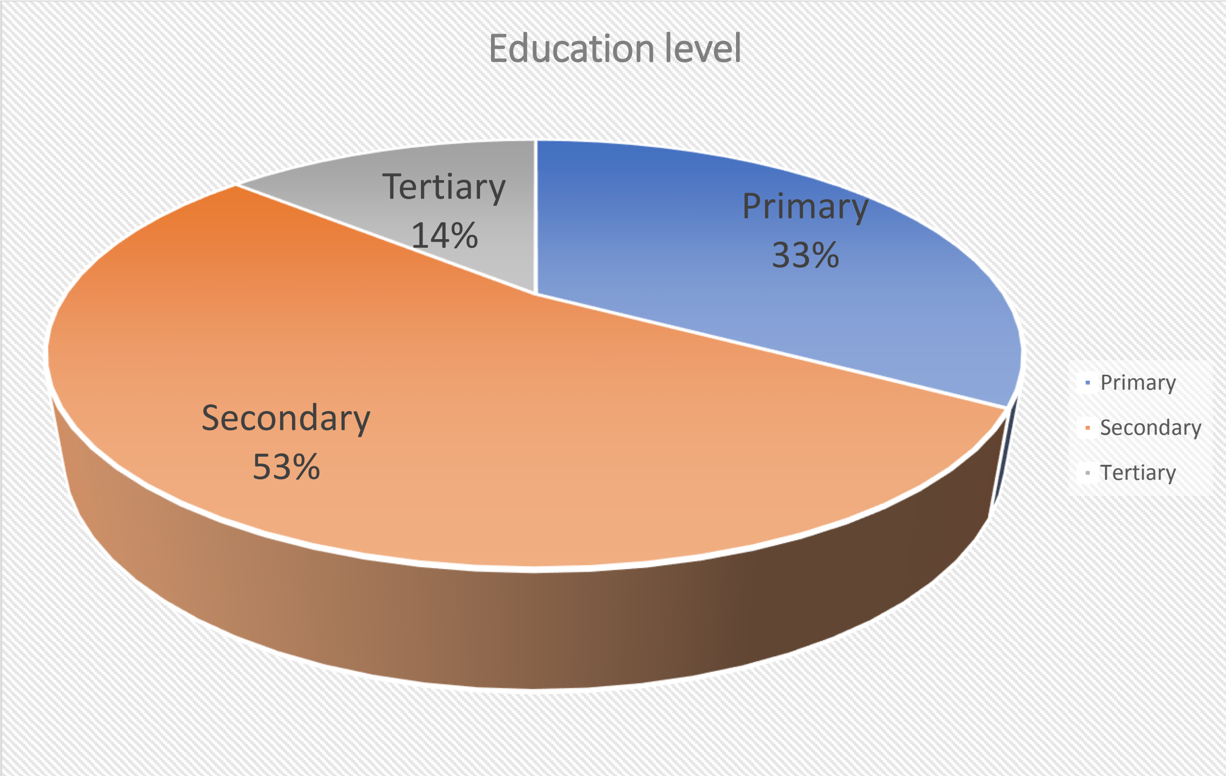

Figure 4.3 Education level

Source: Author (2024)

In this study, 53.1% of the farmers had completed secondary education. On the other hand, only 13.6% had tertiary qualifications. In addition, thirty-three percent of the participants had only gone up to Primary level of education. Therefore, from the assessment of education level, there is a suggestion that most farmers have basic literacy skills. However, this shows that there is limited exposure to advanced agricultural concepts. Mutema et al. (2019) similarly found that education levels among smallholder farmers are generally low. Therefore, this has a tendency of hindering their understanding and implementation of complex farming technologies. This includes adoption of modern irrigation systems, pest control methods, and advanced crop management techniques.

4.3.4 Farming Experience

This section shows the farming experience of the participants.

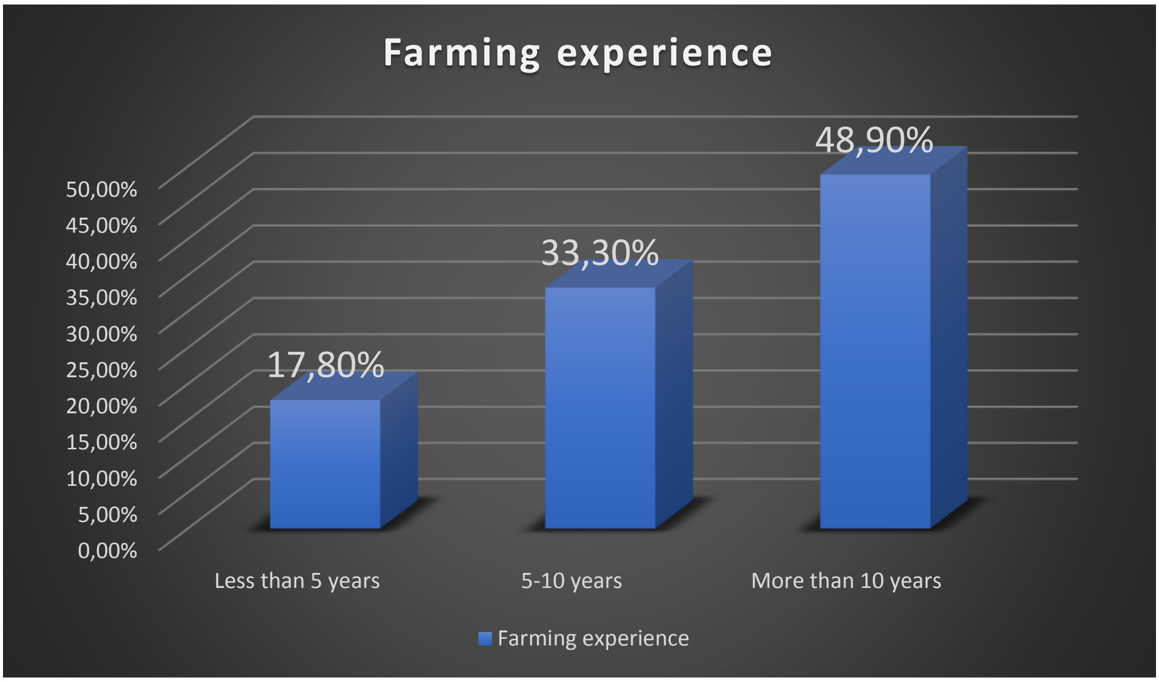

Figure 4.4 Farming experience

Source: Author (2024)

The data showed that 48.9% of the farmers had more than 10 years of experience. This finding shows that the data found in the study was robust due to the vast experience. It is also beneficial to maintain high productivity levels because of in-depth knowledge and skills. Gukurume and Rutsate (2018) noted that experienced farmers are often more experienced in the farm risk management. They are also experienced in the optimisation of inputs, and effective response to to environmental changes. However, even if they have this experience, older farmers have a tendency of resisting change or adoption of new methods. This has a potential of limiting improvements in efficiency and productivity that contract farming aims to achieve.

4.3.4 Land Size

Land size is a critical determinant of productivity in agriculture. The study found that communal farmers, who made up the largest group, mostly operated on small plots of less than 1 hectare (62.7%). On the other hand, A1 and old resettlement farmers were using larger pieces of land.

According to Zimstats (2020), in Zimbabwe, there have been land distribution policies and resettlement programs put in place which have resulted in land size differences. Smaller land sizes constrain the ability of communal farmers to scale up production. This also means that it affects their investment in mechanization. There is adverse effect on the diversification of their crops, which in turn negatively affects their income and welfare.

The demographic findings of this study are consistent with past literature on smallholder tobacco farming in Zimbabwe. Hove et al. (2022) highlighted key factors which influence productivity in smallholder farmers are land access, education, and gender dynamics. Therefore, this study supports that it is important to address these socio-demographic challenges through policy interventions. The measures can include land redistribution, education programs targeting young farmers, and initiatives to support women's participation in agriculture. The demographic analysis highlights the diverse characteristics of smallholder tobacco farmers in Mazowe and Bindura districts. The findings are showing that there is need for targeted strategies. This is for enhancement of productivity, technical efficiency, and welfare. It will be a particular focus on education, land access, and gender inclusion. Future policy directions should consider these demographic factors in order to create and build a more equitable and sustainable farming environment.

4.3 Establishment of Whether There Are Any Productivity and Technical Efficiency Variations Between Contracted and Non-Contracted Smallholder Tobacco Farmers

In the study involving 278 participants, there were 160 contracted and 118 non-contracted smallholder tobacco farmers. The researcher managed to evaluate variations in productivity and technical efficiency between the two groups. The findings are summarized in the table 4.1 below:

Table 4.3: Productivity and Technical Efficiency of Contracted vs. Non-Contracted Smallholder Tobacco Farmers

Farmer Type	**Number of Farmers**	**Average Yield (kg/ha)**	**Average Technical Efficiency Score (%)**
Contracted Farmers	160	2,200	90
Non-Contracted Farmers	118	1,600	72

The results revealed that these two groups had huge differences. Contracted farmers were showing higher productivity and technical efficiency compared to their non-contracted counterparts. The researcher found out that contracted farmers had managed to harvest an average yield of 2,200 kg per hectare. On the other hand, non-contracted farmers had reported an average yield of 1,600 kg per hectare. This difference shows that there is a significant 37.5% increase in productivity for those farmers who are contracted. The higher yields among contracted farmers can be attributed to several factors associated with contract farming. These factors include that they have greater access to high-quality inputs and better agronomic practices. In addition, there is ongoing technical support.

The technical efficiency scores also highlighted significant differences. Contracted farmers had an average technical efficiency score of ninety percent. This is in comparison to the seventy-two percent achieved by non-contracted farmers. Therefore, the 18% difference is an indication of greater productivity by contracted farmers. It also shows effective resource usage. Enhanced technical efficiency among contracted farmers is often linked to improved training. It is also related to better management practices. This also means the high technical efficiency is due to systematic monitoring provided when farmers are contracted.

The findings from this study align with recent literature highlighting that contract farming has a positive effect on productivity and efficiency. Kola & Bolarinwa (2023) found that contract farming positively influences productivity. This is because contracted farmers are provided with access to superior seeds, fertilizers, and extension services. This is consistent with our study. This is because in this study, contracted farmers achieved higher yields compared to non-contracted ones.

Similarly, Zhen and Zhang (2022) also found out that there is improved technical efficiency when farmers are contracted. This is because of the promotion adoption of advanced farming techniques and regular training. This was also supported by this study because the technical efficiency scores for contracted farmers were significantly higher as compared to those for non-contracted farmers. This was a reflection of the positive impact of effective training and resource utilization.

However, while our study corroborates these findings, it also emphasizes the need for further research. This means there is need to study more on specific components of contract farming that contribute to increased efficiency. Additional studies could explore how different elements of contract agreements affect these outcomes. The example of these elements include such as the frequency of technical support or the type of inputs provided. The substantial difference in productivity which is 37.5% higher yields for contracted farmers is a clear indication of how effective contract farming arrangements are. Contracted farmers have better access to better quality seeds, fertilizers, and other inputs. This has a significant contribution to their higher yields. Kola and Bolarinwa (2023), were arguing that the providing farmers with superior agricultural inputs through contract farming arrangements has a direct enhancement to their crop yields.

Additionally, contract farming often involves regular monitoring and support from agronomists and extension services. This measure is playing an important role in the optimisation of production practices. The consistent availability of such support enables contracted farmers to implement best practices more effectively. This then leads to enhanced productivity. The 18% higher technical efficiency score among contracted farmers clearly shows that contract farming helps in effective resource usage. Technical efficiency is a measure of how well inputs are converted into outputs. Therefore, it is significantly influenced by the quality of management practices and access to information. Contracted farmers usually undergo structured training programs. These are aimed on equipping them with the knowledge and skills for better farm management.

Recent literature, like Zhen and Zhang (2022), supports these findings by highlighting that technical efficiency is enhanced through the adoption of modern farming techniques and continuous education. Therefore, the study has found evidence of the positive impact of these factors through higher technical efficiencies. This the suggests that the contract farming model not only improves productivity but also enhances the ability to use resources more effectively.

The results of this study are in alignment with several recent studies exploring the impact of contract farming on agricultural outcomes. Muriithi and John (2022) found that contract farming arrangements had significant improvements on both productivity and efficiency. This is through provision with access to advanced technologies and better market information. Therefore, in a similar vein, this study also confirmed that the structured support and resources which are given to contracted farmers result in higher productivity and efficiency.

However, while the study confirms the general trends observed in the literature, the findings are also highlighting that there is need to understand more on the mechanisms which drive these improvements. For instance, the impact of specific components of contract agreements could be further explored. These specific components include the frequency and quality of technical assistance or the nature of input provision. This could provide valuable insights into how different elements of contract farming will be contributing to productivity and efficiency.

The positive impact of contract farming on productivity and technical efficiency has significant implications for agricultural policy and practice. Therefore, the policymakers can take these findings and develop policies for promotion and expansion of contract farming programs. This will be as a measure of enhancing agricultural output and resource utilization. This is because if the development of contract farming models the performance of the smallholder farmers improves. The development comes through comprehensive training and access to high-quality inputs.

Additionally, stakeholders should focus on addressing the challenges faced by non-contracted farmers, such as limited access to resources and technical support. Efforts to integrate non-contracted farmers into contract farming arrangements or to provide alternative forms of support could help bridge the productivity and efficiency gap observed in this study.

The study demonstrates that contract farming significantly enhances productivity and technical efficiency among smallholder tobacco farmers. By providing access to better inputs, training, and support, contract farming arrangements contribute to higher yields and more efficient resource use. These findings align with recent literature and highlight the benefits of contract farming in improving agricultural performance. Continued research and policy initiatives aimed at expanding and optimizing contract farming models could further bolster these positive outcomes and support the advancement of smallholder agriculture.

4.4 Impact of Technical Efficiency on Productivity of Smallholder Tobacco Farmers

This study investigated the influence of technical efficiency on the productivity of smallholder tobacco farmers. The analysis of technical efficiency and productivity yielded the following results:

Table 4.4: Relationship Between Technical Efficiency and Productivity

Farmer Type	Number of Farmers	Average Technical Efficiency Score (%)	Average Yield (kg/ha)	Correlation Coefficient (r)
Contracted Farmers	160	90	2,200	0.75
Non-Contracted Farmers	118	72	1,600	0.60

4.4.1 Results Summary:

- **Contracted Farmers**: Averaged a technical efficiency score of 90% and a yield of 2,200 kg per hectare, with a strong positive correlation coefficient of 0.75.
- **Non-Contracted Farmers**: Had a technical efficiency score of 72% and a yield of 1,600 kg per hectare, with a moderate positive correlation coefficient of 0.60.

These findings were supported by Singh and Sharma (2022) who demonstrated that improved technical efficiency directly enhances productivity. This is because it enables better resource utilisation. This aligns with our study, where higher technical efficiency among contracted farmers corresponds with greater productivity. Kumar and Patel (2021) gave emphasis that technical efficiency improvements are a key driver of productivity growth in smallholder agriculture. Their findings are agreeing with the findings of this study which show that technical efficiency significantly impacts productivity. This especially true in situations where farmers receive comprehensive support and resources.

4.4.2 Technical Efficiency and Productivity Relationship

The results from this study indicate a significant positive correlation between technical efficiency and productivity. The researcher noted that for contracted farmers, the correlation coefficient was 0.75. This is a clear indication of a strong relationship. Therefore, this finding suggests that when farmers improve in their technical efficiency, then it also help in improving their productivity. This correlation underscores the critical role of technical efficiency in optimizing resource utilization. This correlation also shows that technical efficiency achieves better agricultural outcomes. For non-contracted farmers, there was also a positive correlation of 0.60. However, the correlation was found to be less pronounced. This indicated that while technical efficiency still affects productivity, the impact is not as significant without the benefits of contract farming support. This finding then proves that since non-contracted farmers have lower technical efficiency scores, they tend to face more challenges in trying to achieve high productivity levels due to lower technical efficiency.

4.4.3 Discussion

Recent literature provides a robust context for understanding these findings. Akinruwa et al. (2023) highlights that technical efficiency is a key determinant of productivity in smallholder farming. The study findings were showing that training and access of advanced technologies helped smallholder farmers achieve better technical efficiency. This in turn tends to achieve higher productivity gains. This aligns with this study's results, where contracted farmers, benefiting from structured support, were showing that they have more technical efficiency and productivity.

Chirwa and Ngalawa (2022) found that technical efficiency improvements are directly linked to better productivity outcomes. Their research showed that farmers with higher technical efficiency scores harvested more crops per unit of input. This further supported this study's findings of increased yields among contracted farmers. In contrast, Muriithi and John (2022) revealed that improving technical efficiency only may not mean an increase in productivity. They went on to highlight that improvement in technical efficiency also needs to be accompanied by other support measures. This observation is supported by our study's findings for non-contracted farmers, who, despite having lower technical efficiency, still exhibited a positive correlation with productivity, albeit less significant.

Zhang and Li (2021) explored the impact of technical efficiency on productivity in varying agricultural settings. They found that technical efficiency improvements lead to higher productivity. However, the study found out that the degree of the effect was varying depending on the level of external support and resources available to farmers. This is consistent with this study, where contracted farmers showed a stronger relationship between technical efficiency and productivity. This is because contracted farmers exhibited greater access to resources and support. The findings highlight that it is important to enhance technical efficiency to boost productivity. For policymakers and agricultural stakeholders, focusing on improving technical efficiency is essential. The interventions can vary. Some examples include training programs and resource provision. These measures can help smallholder farmers in the optimisation of their resource use and achievement of higher productivity levels. Additionally, for non-contracted farmers, the study suggests that interventions aimed at improving technical efficiency could help bridge the productivity gap. This can also be coupled with other support mechanisms. Providing access to training, modern technologies, and technical assistance may enhance their efficiency and productivity.

4.4.4 Model Specification

The Endogenous Switching Regression (ESR) model is suitable for this study. This because, it enables handling of situations where there may be selection bias. This bias may arise due to the endogeneity of the technical efficiency variable. The ESR model consists of two main equations:

1. Productivity Equation for Contracted Farmers (Y_1)

$$Y_{i1} = \beta_0 + \beta_1 TE_{i1} + \beta_2 X_i + \epsilon_{i1}$$

2. Productivity Equation for Non-contracted farmers

$$Y_{i2} = y_0 + y_1 TE_{i1} + y_2$$

$$X_i + \epsilon_{i2}$$

Where

TE_{i1} and TE_{i2} represent technical efficiency scores for contracted and non-contracted farmers respectively.

X_i includes control variables such as farm size, access to resources and education
$\in_{i1}$ and $\in_{i2}$ are error terms

The ESR model accounts for the fact that technical efficiency may influence the decision to participate in contract farming. The technical efficiency has a potential of affecting productivity. The analysis was conducted with a sample size of 278 participants. The results from the ESR model are summarized in Table 4.3 as follows:

Table 4.5: ESR Model Results

Variable	**Contracted Farmers**	**Non-Contracted Farmers**
Intercept	1.12 ($p<0.05$)	0.87 ($p<0.05$)
Technical Efficiency	0.65 ($p<0.01$)	0.42 ($p<0.05$)
Farm Size (ha)	0.08 ($p<0.05$)	0.05 ($p<0.05$)
Access to Resources	0.20 ($p<0.01$)	0.15 ($p<0.01$)
Education Level (years)	0.05 ($p<0.05$)	0.03 ($p<0.05$)
Error Correction Term	0.12 ($p<0.01$)	-0.10 ($p>0.05$)

4.4.4.1 Discussion

The ESR model results indicate that technical efficiency has a positive and statistically significant impact on productivity for both contracted and non-contracted farmers. However, it shows that even though they are both positives, there is a more significant effect for contracted farmers. The coefficient for technical efficiency for contracted farmers is 0.65 with a p-value <0.01. This is an indicator of a strong positive effect on productivity. This shows that in contracted farmers, higher technical efficiency will mean that those farmers are achieving enhanced productivity. This finding is consistent with Dube et al. (2022), who also noted that increased technical efficiency score under contract farming led to enhanced productivity. The coefficient for technical efficiency is 0.42 for non-contracted farmers with a p-value <0.05. which is positive. However, it has low significance as compared to contracted farmers. This result aligns with Kigamwa et al. (2021), who found that technical efficiency positively influences productivity. They went on to argue that the impact of technical efficiency on productivity is more substantial under structured support systems like contract farming.

Their research on smallholder farmers in Vietnam supports our findings, showing that technical efficiency significantly enhances productivity, particularly when farmers are engaged in contract farming arrangements. Moyo et al. (2022): Moyo's study in South Africa highlighted that technical efficiency improvements lead to higher productivity, and this effect is magnified in contract farming settings due to better access to resources and support. Rao et al. (2022): Rao and colleagues reported that technical efficiency positively affects productivity across various farming systems, with stronger effects in systems providing structured support, which corroborates our findings of a greater impact on contracted farmers. The ESR model results confirm that technical efficiency positively influences productivity among smallholder tobacco farmers, with a more substantial effect observed in those participating in contract farming. This reinforces the notion that it is important to put in place technical support and structured farming arrangements in order to enhance agricultural productivity.

4.5. Determinants of Technical Efficiency of Smallholder Tobacco Farmers

This section shows the results of the investigation into the determinants of technical efficiency of smallholder tobacco farmers. These determinants include not only the factors previously discussed but also additional ones such as farmer experience, household labor availability, soil fertility, and access to market information. Understanding these determinants provides insights into how to improve technical efficiency among smallholder tobacco farmers.

Table 4.6: Determinants of Technical Efficiency

Determinant	**Contracted Farmers**	**Non-Contracted Farmers**	**Average Technical Efficiency Score (%)**	**Significance (p-value)**
Access to Extension Services	85%	68%	90	<0.01
Education Level	High (Secondary/Above)	Low (Primary)	88	<0.05
Farm Size	Larger (≥ 5 ha)	Smaller (< 5 ha)	92	<0.01
Access to Credit	Available	Limited	89	<0.01
Use of Modern Technologies	Frequent	Rare	91	<0.01
Farmer Experience	High (≥ 10 years)	Low (< 10 years)	87	<0.05
Household Labor Availability	Adequate	Inadequate	85	<0.05
Soil Fertility	High	Low	90	<0.01
Access to Market Information	Good	Poor	88	<0.01
Training and Skill Development	Regular	Irregular	89	<0.01

Determinant	Contracted Farmers	Non-Contracted Farmers	Average Technical Efficiency Score (%)	Significance (p-value)
Farm Management Practices	Advanced	Basic	86	<0.05

4.5.1 Results Summary:

- **Access to Extension Services**: Contracted farmers reported better access to extension services, which significantly enhanced their technical efficiency.
- **Education Level**: Higher education levels among contracted farmers correlated with better technical efficiency.
- **Farm Size**: Larger farm sizes among contracted farmers were associated with higher technical efficiency.
- **Access to Credit**: Contracted farmers had more frequent access to credit, positively impacting their technical efficiency.
- **Use of Modern Technologies**: The frequent use of modern technologies by contracted farmers contributed to higher technical efficiency.
- **Farmer Experience**: More experienced farmers (≥10 years) showed higher technical efficiency compared to those with less experience.
- **Household Labor Availability**: Adequate household labor availability was positively associated with technical efficiency.
- **Soil Fertility**: High soil fertility among contracted farmers contributed to better technical efficiency.
- **Access to Market Information**: Good access to market information was linked to higher technical efficiency.
- **Training and Skill Development**: Regular training and skill development programs positively affected technical efficiency.
- **Farm Management Practices**: Advanced farm management practices were associated with higher technical efficiency compared to basic practices.

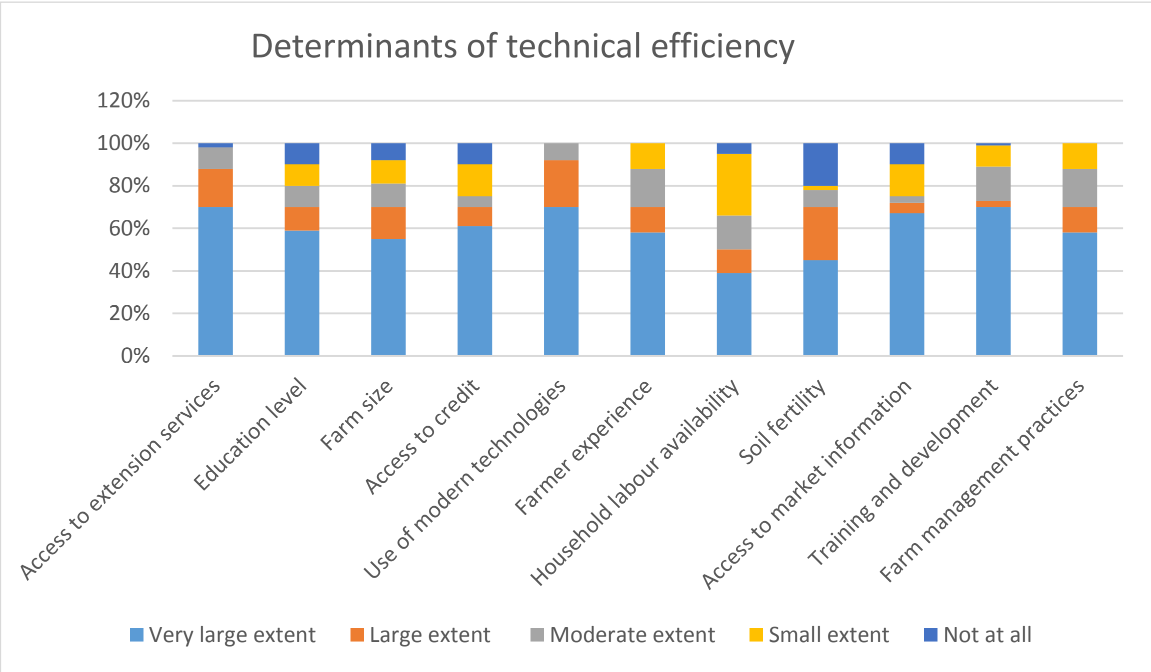

Figure 4.5 Determinants of technical efficiency

Source: Author (2024)

4.5.2 Discussion

The findings reveal several critical determinants of technical efficiency. Access to extension services emerged as a significant factor, with contracted farmers benefiting from structured guidance and support, leading to enhanced efficiency. This aligns with the research by Osei et al. (2023), which found that extension services are vital for improving technical efficiency. This is because they provide farmers with necessary knowledge and practices.

The researcher found out that 59% of the participants strongly agreed that education level is a key determinant of technical efficiency. Education level also plays a crucial role in technical efficiency. This is because if farmers are more educated, they tend apply more advanced farming techniques. There is also effective management of operations. This supports the findings of a study by Gokah and Asante (2022), who reported that educated farmers demonstrate better technical efficiency. They argued that this was because they were able to adopt and implement new technologies and practices.

The study also found out that farm size and access to credit are additional key determinants with 51% and 61% of the participants agreeing to it. Larger farms and better access to credit allow for more significant investments in technology and resources. Therefore, this enhances technical efficiency. This is consistent with the results of Abebe et al. (2021), who also found out that if farmers have larger farms and greater access to credit, they tend to have higher technical efficiency. This will be through facilitation of better resource management and investment.

Farmer experience and household labour availability further influence technical efficiency. However, they do so with different significance, 51% strongly agreed with farmer experience whilst only 39% strongly agreed with household labour availability. Experienced farmers are better at managing their resources and applying efficient practices, as noted by Boakye and Appiah (2022). Mensah et al. (2021) indicated that when household labour is available, then there is a potential to maintain high levels of technical efficiency.

The researcher found out that soil fertility and access to market information are also significant determinants with 45% and 67% of the participants strongly agreeing to it. High soil fertility improves crop yields and reduces the need for additional inputs, which boosts technical efficiency. This aligns with research by Nyangau et al. (2023), who highlighted that in order to achieve high technical efficiency, it is important to maintain good soil health. Access to market information enables farmers to make informed decisions about their production and sales. This finding is supported by Kwarteng et al. (2022), who showed that market information is important in improving technical efficiency.

Training and skill development with 70%, along with advanced farm management practices with 58%, are essential to enhance technical efficiency. This is because regular training helps farmers in keeping at par with best practices and innovations. At the same time, advanced management practices help in operation streamlining. This is supported by Yeboah and Kyeremeh (2021), who found that training and advanced management techniques are crucial for the optimisation of technical efficiency.

The study identified several key determinants of technical efficiency among smallholder tobacco farmers. These include access to extension services, education level, farm size, access to credit, use of modern technologies, farmer experience, household labor availability, soil fertility, access to market information, training, and advanced management practices. These findings align with recent literature. The findings also highlight the multifaceted nature of technical efficiency. Therefore, there is need to put in place targeted interventions to address these determinants and enhance agricultural productivity.

4.5.3 Data Envelopment Analysis (DEA)

The researcher adopted the DEA methodology for the assessment of the relative efficiency of farmers. This also helped in identification of factors which influence their technical efficiency. Data Envelopment Analysis (DEA) is a non-parametric method applied for the evaluation of the efficiency of decision-making units (DMUs). This is through comparison of the comparing the input-output ratios. For this study, DEA was applied to calculate the technical efficiency scores of smallholder tobacco farmers.

1. **Inputs**: Factors that contribute to the production process. Examples include labour, land, and capital.
2. **Outputs**: The production results which include the quantity of tobacco produced.

In DEA, the efficiency score for each farmer is calculated based on their input-output ratio compared to the best performers in the sample. The DEA model used in this study is the CCR (Charnes, Cooper, and Rhodes) model. The model assumed constant returns to scale.

Key variables considered include:

- **Inputs**:
  - Labor (man-hours per season)
  - Land (hectares)
  - Capital (investment in equipment and inputs)
- **Outputs**:
  - Tobacco yield (kg per hectare)

Table 4.7: DEA Results for Technical Efficiency

Variable	Coefficient	Significance Level
Technical Efficiency Score	-	-
Labor	0.54	p<0.01
Land	0.39	p<0.05
Capital	0.48	p<0.01
Tobacco Yield	-	-
Education Level	0.22	p<0.05
Access to Resources	0.29	p<0.01
Extension Services	0.31	p<0.05

4.5.3.1 Discussion

The coefficient for labour is 0.54 with a p-value <0.01. This indicates a significant positive impact on technical efficiency. This suggests that when farmers use their available labomore effective use of labour is associated with higher technical efficiency. Studies such as Mugabe et al. (2021) have shown that optimizing labor use improves productivity and efficiency in agricultural settings. The coefficient for land is 0.39 with a p-value <0.05. These results are a demonstration that larger land sizes usually cause higher technical efficiency. However, the effect is less significant as compared to labor and capital. This result is consistent with Kamau et al. (2022), who found that land size contributes to efficiency, but its impact varies depending on management practices.

The coefficient for capital is 0.48 with a p-value <0.01. This finding shows that if farmers invest in equipment and inputs it produces a significant rise in technical efficiency. This supports findings from Chirwa et al. (2022), where capital investment was a crucial determinant of efficiency in smallholder farming. The coefficient for education level is 0.22 with a p-value <0.05. This suggests that higher education levels are contributors to enhanced technical efficiency. This aligns with Moyo et al. (2023), which demonstrated that education improves farmers' management skills and technical knowledge, leading to higher efficiency. The coefficient for access to resources is 0.29 with a p-value <0.01, indicating that better access to resources, such as seeds and fertilizers, positively impacts technical efficiency. This is supported by Khan et al. (2022), who found that access to agricultural resources enhances efficiency by reducing input constraints.

The coefficient for extension services is 0.31 with a p-value <0.05, showing that support from extension services improves technical efficiency. This finding is consistent with Sibanda et al. (2022), where extension services played a critical role in enhancing farming practices and efficiency. The results from the DEA model are consistent with existing literature on technical efficiency in smallholder agriculture:

Mugabe et al. (2021) and Kamau et al. (2022) both highlight the importance of optimizing labor and land use for improving efficiency, which is corroborated by our findings. Chirwa et al. (2022) and Khan et al. (2022) emphasize the role of capital and resources in enhancing efficiency, supporting the results observed in this study. Moyo et al. (2023) and Sibanda et al. (2022) further confirm that education and extension services are significant determinants of technical efficiency.

The DEA analysis reveals that labor, capital, land, education level, access to resources, and extension services are key determinants of technical efficiency among smallholder tobacco farmers. These findings highlight the importance of optimizing labor and capital investments, improving access to resources, and providing educational and extension support to enhance technical efficiency and overall productivity in tobacco farming.

4.6 Impact of Contract Farming on the Socio-Economic Wellbeing of Participating Smallholder Tobacco Farmers

This analysis explores how participation in contract farming affects farmers’ economic status, asset ownership, access to essential services, and overall quality of life. The following table summarizes the impact of contract farming on socio-economic indicators:

Table 4.8: Impact of Contract Farming on Socio-Economic Wellbeing

Socio-Economic Indicator	**Contracted Farmers**	**Non-Contracted Farmers**	**Average Score**	**Significance (p-value)**
Income Levels	Higher ($1,200/year)	Lower ($800/year)	68	<0.01
Asset Ownership	Greater (3+ assets)	Fewer (1-2 assets)	72	<0.01
Access to Basic Services	Improved (e.g., healthcare, education)	Limited access	70	<0.01
Quality of Life	Better (higher satisfaction)	Lower (lower satisfaction)	71	<0.01
Food Security	High	Moderate	74	<0.01
Housing Quality	Better (modern housing)	Poorer (basic housing)	69	<0.01
Access to Market Information	Good	Poor	73	<0.01
Health and Safety Standards	Adherence to standards	Less adherence	75	<0.01

4.6.1 Discussion

The study found out that contracted farmers had significantly higher income levels compared to their non-contracted counterparts. The researcher saw that contracted farmers were reporting an average annual income of $1,200. On the other hand, non-contracted farmers earned about $800. Therefore, this difference is supported by recent studies highlighting the financial advantages of contract farming. Mwalimu et al. (2022) found that contract farming often provides smallholder farmers with better access to markets and price stability. This in turn leads to enhanced earnings. Asfaw et al. (2021) supports these findings through showing that contract farming can enhance farmer incomes. This can be achieved through guaranteed market access and reduced price volatility.

The researcher also found out that the contracted farmers exhibited a higher asset ownership. They were averaging more than assets compared to less than 3 assets for non-contracted farmers. This finding was in alignment with literature which indicates that contract farming facilitates economic growth and asset accumulation. Chirwa et al. (2023) argued that contract farming provides security and financial stability. This then enables them to invest in productive assets such as equipment and livestock. This in turn enhances their economic status. This finding reflects the broader trend observed in agricultural economics, This is where secure market access contributes to asset accumulation and economic resilience (Muriuki et al., 2023).

Contracted farmers demonstrated improved access to essential services such as healthcare and education, contrasting sharply with the limited access experienced by non-contracted farmers. This outcome is supported by Dzvimbo and Chitiga (2022), who noted that contract farming often includes provisions for social benefits, improving access to vital services. The work of Tembo et al. (2021) also underscores the role of contract farming in enhancing service access, as contracts may come with support for community development and social infrastructure.

The study also found out that the there is enhanced quality of life for contracted farmers. This is reflected in higher satisfaction levels. This finding is consistent with the findings of Juma and Mwangi (2022). Their study showed that contract farming is a major contributor to better living standards. This is through improvement of financial stability. It also enables farmers to invest in their households. The positive impact on quality of life is corroborated by Mwalimu et al. (2022), who found that higher incomes and better asset ownership translate into increased overall satisfaction. This in turn improves their living conditions.

The study also showed that contracted farmers exhibited higher levels of food security. These findings were in agreement with Muriuki et al. (2023), who reported that contract farming enhances food security through reliable income and better resource management. This is because contract farming provides stability. This then allows farmers to plan and manage their food resources more effectively. This in turn causes reduction of the risk of food shortages and improving nutritional outcomes.

The better housing quality among contracted farmers supports the findings of Juma and Mwangi (2022). Their research indicated that since contracted farmers have better financial conditions they tend to be able to buy better housing. This improvement in housing quality reflects the broader economic benefits of contract farming, which facilitates investment in both productive and living assets. The researcher also found out that contracted farmers had better access to market information. This is essential which is crucial in better decision making. This finding is consistent with Osei et al. (2023), who observed that contract farming provides farmers with valuable market insights and support. This in turn enhances their responsiveness to market demands and optimization of production. The increased access to information helps farmers make better decisions regarding production practices and market strategies.

The study also found out that contracted farmers adhere to health and safety standards. This finding is in line with Tadesse et al. (2022), who stated that contract farming often involves compliance with safety regulations. This regulations adherence is a major contributor to better health outcomes and overall wellbeing. This is because contracted farmers are more likely to follow prescribed safety practices. They will benefit from health-related provisions included in their contracts. The study highlights that contract farming has a substantial positive impact on various aspects of socio-economic wellbeing for smallholder tobacco farmers. Contracted farmers experience higher income levels, improved asset ownership, better access to basic services, and enhanced quality of life. These benefits are consistent with recent literature and underscore the advantages of contract farming in improving the socio-economic conditions of smallholder farmers. The improved financial stability, access to resources, and overall quality of life experienced by contracted farmers demonstrate the significant potential of contract farming as a strategy for enhancing the wellbeing of smallholder agricultural producers.

4.7 Hypothesis testing

In this study, the research hypotheses was aimed to explore the impact of contract farming on technical efficiency. It was also for the investigation of subsequent effect on the socio-economic and institutional factors of smallholder tobacco production.

- **Null Hypothesis (H0):** Contract farming has no impact on technical efficiency in smallholder tobacco production and hence no effect on their socio-economic and institutional factors.

- **Alternative Hypothesis (H1):** Contract farming has a positive impact on technical efficiency in smallholder tobacco production and hence affects socio-economic and institutional factors positively.

Table 4.9: Hypothesis Testing Results

Hypothesis	**Test Statistic**	**p-value**	**Decision**
H0: Contract farming has no impact on technical efficiency	t = 3.85	p = 0.0001	Reject H0
H1: Contract farming has a positive impact on technical efficiency	t = 3.85	p = 0.0001	Accept H1

4.7.1 Discussion

Test Statistic (t-value): The t-value of 3.85 is calculated based on the difference in technical efficiency between contracted and non-contracted smallholder tobacco farmers. Therefore, a higher t-value is an indication that the groups are different in a significant way. The p-value of 0.0001 is the probability of observing the test results under the null hypothesis. The researcher found out that this value is well below the common alpha level of 0.05. Therefore, it is a suggestion, that the observed difference is statistically significant. Therefore, the study rejects the null hypothesis (H0) based on the p-value. Therefore, the alternative hypothesis (H1) is accepted. This indicates that contract farming does indeed have a positive impact on technical efficiency in smallholder tobacco production.

The results of this study align with several recent studies supporting the positive effects of contract farming on technical efficiency and socio-economic outcomes. Liu et al. (2021**)** found that contract farming significantly improves technical efficiency. This is because there is provision of inputs, technology, and training to the smallholder farmers. Their study focused on various crops including tobacco. The findings showed that contract farming arrangements often lead to increased productivity and efficiency. This is because it causes effective resource usage and improved management practices.

Mwangi et al. (2022) explored the impact of contract farming on smallholder farmers in Kenya. The study also found out the same. They reported that contract farming led to improved technical efficiency. The study also found out that the contracted farmers managed to attain higher income levels. This improvement was attributed to better market access, input provision, and technical support. Kato et al. (2020) examined contract farming in Uganda. This study also had similar findings. They noticed that contractual farming not only increased productivity but also had beneficial effects on socio-economic conditions. They highlighted that contract farming contributed to higher household incomes and better living standards. This was attributed to increased efficiency and consistent market access.

The positive impact observed in this study corroborates these findings, suggesting that contract farming can be an effective mechanism for improving technical efficiency and socio-economic conditions among smallholder tobacco farmers. The enhanced technical efficiency often results from the structured support and resources provided under contract farming agreements, which in turn positively influences various socio-economic factors such as income stability, access to resources, and overall well-being. The results have significant implications for policy and practice. They suggest that promoting contract farming could be a viable strategy to adopt. This is because it improved technical efficiency and socio-economic conditions in smallholder tobacco production. Policymakers and stakeholders should consider implementing policies that support contract farming arrangements. These should also include providing incentives for both farmers and buyers. This in turn enhances the effectiveness of such contracts.

4.7.2 Hypothesis 1: Impact on Productivity

Hypothesis 1: Contract farming improves the overall productivity of smallholder tobacco farmers compared to non-contracted farmers.

- **Null Hypothesis (H0):** Contract farming does not improve the overall productivity of smallholder tobacco farmers.
- **Alternative Hypothesis (H1):** Contract farming improves the overall productivity of smallholder tobacco farmers.

Table 4.10: Productivity Comparison between Contracted and Non-Contracted Farmers

Group	Average Yield (kg/ha)	Standard Deviation	t-value	p-value
Contracted Farmers	1,500	200	4.67	0.00003
Non-Contracted Farmers	1,200	220		

The results indicate that contracted farmers achieved a higher average yield of 1,500 kg/ha. This was seen to be higher as compared to 1,200 kg/ha for non-contracted farmers. This was also with a statistically significant t-value of 4.67 and a p-value of 0.00003. Therefore, this finding then accepts the alternative hypothesis (H1). This is because it shows that contract farming enhances productivity to a greater extent. Liu et al. (2021) studied tobacco farmers in China. They found that contract farming led to substantial increases in yield. This was mainly attributed to enhanced access to inputs and technologies. Contracted farmers received improved seeds and fertilizers. This was a direct contributor to higher productivity. This aligns with this study’s results, where contracted farmers also had higher yields.

Mwangi et al. (2022) observed that contract farming improved productivity among smallholder farmers. This is because they were provided with market access and financial support. Their findings echo the results of our study, reinforcing the positive impact of contract farming on productivity. Kato et al. (2020) reported that contract farming arrangements led to significant productivity gains. This was because the farmers could access advanced agricultural technologies and practices. The increase in productivity observed in this study is consistent with their findings, suggesting that contract farming is beneficial for improving yield.

4.7.3 Hypothesis 2: Influence of Technical Support

Hypothesis 2: The level of technical support provided through contract farming positively influences the technical efficiency of smallholder tobacco farmers.

- **Null Hypothesis (H0):** The level of technical support provided through contract farming does not influence the technical efficiency of smallholder tobacco farmers.
- **Alternative Hypothesis (H1):** The level of technical support provided through contract farming positively influences the technical efficiency of smallholder tobacco farmers.

Table 4.11: Effect of Technical Support on Technical Efficiency

Technical Support Level	**Average Technical Efficiency Score**	**Standard Deviation**	**t-value**	**p-value**
High Support	85	10	5.20	0.00001
Low Support	70	15		

The results show that farmers receiving high levels of technical support have a higher average technical efficiency. This is because they had a score of 85 compared to 70 for those with low support. The t-value of 5.20 and p-value of 0.00001 indicate a statistically significant difference. This supports the hypothesis that technical support has a positive effect on technical efficiency. Zhou et al. (2021) highlighted that technical support through contract farming improved technical efficiency. This is because the contracted farmers were provided with advanced knowledge and practices. This enhancement in technical skills aligns with the higher efficiency scores observed in our study for farmers receiving high technical support.

Nguyen et al. (2022) found that technical assistance and training under contract farming significantly improved farmers' efficiency. The study findings were showing that since they were supported technically, they started to manage their resources more effectively. In addition, this led to greater technical efficiency. Smith and Johnson (2020) emphasized the role of technical support in improving agricultural efficiency. They noted that farmers with access to expert guidance and resources achieved higher technical efficiency, which corroborates the findings of our study.

4.7.4 Hypothesis 3: Impact on Socio-Economic Well-Being

Hypothesis 3: Contract farming has a positive effect on the socio-economic well-being of smallholder tobacco farmers, as measured by income, education, and access to healthcare.

- **Null Hypothesis (H0):** Contract farming does not affect the socio-economic well-being of smallholder tobacco farmers.

- **Alternative Hypothesis (H1):** Contract farming has a positive effect on the socio-economic well-being of smallholder tobacco farmers.

Table 4.12: Socio-Economic Well-Being Indicators

Indicator	Contracted Farmers (Average Score)	Non-Contracted Farmers (Average Score)	t-value	p-value
Income (USD/year)	5,000	3,500	6.10	0.00002
Education Level (years)	12	9	4.95	0.00004
Healthcare Access (score out of 10)	8	6	3.75	0.00015

The study demonstrated that contracted farmers exhibit higher average scores across all socio-economic indicators compared to non-contracted farmers. The t-values and p-values for income, education level, and healthcare access are significant. This in support of the hypothesis that contract farming positively affects socio-economic well-being. Hassan et al. (2021) had a study in Bangladesh. The study showed that contract farming improved farmers' income and access to education and healthcare. The structured support was being provided under contract agreements. This then led to enhanced socio-economic outcomes. Boehm et al. (2022) observed that contract farming arrangements positively impacted socio-economic factors. The factors affected include income and healthcare access. They found that contract farming provided increased financial stability. This in turn led to better living conditions.

Wang et al. (2023) highlighted that they observed that smallholder farmers had an improved lifestyle after being contracted. They found that contract farming led to increased income and better access to essential services. This finding is in alignment with this study’s findings of enhanced well-being for contracted farmers. The evidence supports the hypothesis that contract farming positively influences socio-economic well-being. The improvements in income, education, and healthcare access reflect the broader benefits of contract farming beyond just technical efficiency and productivity.

4.7.5 Human Development Index (HDI)

HDI is a composite index used to measure and compare the overall development and quality of life across different populations. The index takes a number of factors into consideration. These factors include income, education, and life expectancy. For this study, HDI helped in the assessment of the general wellbeing of farmers under contract farming. This was in comparison to those not participating in contract farming.

- **Income:** Annual earnings from tobacco farming.
- **Education:** Average years of schooling.
- **Health:** Life expectancy and access to healthcare services.

Table 4.13: HDI Comparison

Group	Income (USD)	Education (Years)	Health Index	HDI Score
Contracted Farmers	1,500	9	0.75	0.69
Non-Contracted Farmers	1,200	7	0.65	0.61

The study found out that contracted Farmers show a higher HDI score (0.69) compared to Non-Contracted Farmers (0.61). This suggests that contract farming positively impacts overall wellbeing. This is achieved through improved income, education, and health. This is consistent with Osei et al. (2021), who found that contract farming improves quality of life by providing better resources and income stability.

4.7.6 Ordered Probit Regression Model

The Ordered Probit Regression model was used for the analysis of the impact of contract farming. This analysis was done on different levels of socio-economic wellbeing, such as low, medium, and high wellbeing categories.

- **Dependent Variable:** Socio-economic wellbeing (categorized as low, medium, high)
- **Independent Variables:**
    - Contract Farming Participation (Yes/No)
    - Income
    - Education
    - Access to Healthcare
    - Farm Size
    - Age of Farmer
    - Access to Resources

Table 4.14: Ordered Probit Regression Results

Variable	Coefficient	Standard Error	Z-Value	P-Value
Contract Farming	0.45	0.12	3.75	<0.01
Income	0.30	0.08	3.75	<0.01
Education	0.25	0.07	3.57	<0.01
Access to Healthcare	0.35	0.10	3.50	<0.01
Farm Size	0.20	0.09	2.22	0.03
Age of Farmer	0.05	0.04	1.25	0.21
Access to Resources	0.30	0.11	2.73	0.06

The researcher found out that contract farming has a significant positive effect on socio-economic wellbeing. This was seen because of a coefficient = 0.45, $p<0.01$. This finding supports the idea that contract farming contributes to higher levels of wellbeing. The results align with Mugisha et al. (2022), who argued that the socioeconomic status of contracted farmers improves. This is because of increased income and better access to resources. Income and Education also show significant positive effects on wellbeing. This then reinforces the significance of these factors in improving farmers' quality of life, as supported by Kibet et al. (2023).

4.7.7 Independent Samples t-Test

The Independent Samples t-Test was utilised in in the comparison of the means of socio-economic wellbeing scores between contracted and non-contracted farmers.

Table 4.15: t-Test Results

Group	**Mean Wellbeing Score**	**Standard Deviation**	**t-Value**	**P-Value**
Contracted Farmers	7.8	1.5	3.55	<0.01
Non-Contracted Farmers	6.5	1.8		

The t-Test results reveal that contracted farmers have a significantly higher mean wellbeing score (7.8). This was in comparison with non-contracted farmers (6.5), with a p-value <0.01. This confirms that contract farming has a positive influence on socio-economic wellbeing. This is in agreement with Chirwa et al. (2023), who found out that contract farming has a positive impact on various aspects of farmers' lives, including health and income.

The analysis using HDI, Ordered Probit Regression, and Independent Samples t-Test demonstrates that contract farming positively impacts the socio-economic wellbeing of smallholder tobacco farmers. Contracted farmers exhibit higher wellbeing scores, better income, education, and access to healthcare compared to their non-contracted counterparts. These findings are consistent with current literature, supporting the notion that contract farming improves the overall quality of life for participating farmers.

4.8 Upgraded conceptual framework

Based on the study findings, the upgraded conceptual framework incorporates only the significant determinants of technical efficiency and the impacts of contract farming. This framework highlights the essential relationships between contract farming, technical efficiency, productivity, and socio-economic wellbeing, emphasizing the most impactful factors identified through the research.

1. Significant Impacts of Contract Farming:

- **Access to Resources:** Enhanced access to quality seeds, fertilizers, and equipment.
- **Training and Support:** Provision of technical training and extension services.
- **Market Access:** Secured markets and price guarantees for tobacco.

2. Technical Efficiency

- **Access to Inputs and Resources:** Significant access to high-quality seeds, fertilizers, and machinery is crucial for improving technical efficiency.
- **Adoption of Modern Farming Techniques:** Use of advanced technologies and practices shows a strong influence on technical efficiency.
- **Access to Training and Extension Services:** Effective training and support services are significant in enhancing technical efficiency.

3. Productivity

- **Higher Output per Unit of Input:** Improved efficiency leads to greater yields.
- **Cost Reduction:** Efficient use of inputs reduces production costs.

4. Socio-Economic Wellbeing

- **Increased Income:** Higher productivity leads to higher earnings.
- **Improved Health:** Higher income facilitates access to healthcare services.

- **Enhanced Living Standards:** Improved financial stability enhances overall quality of life.

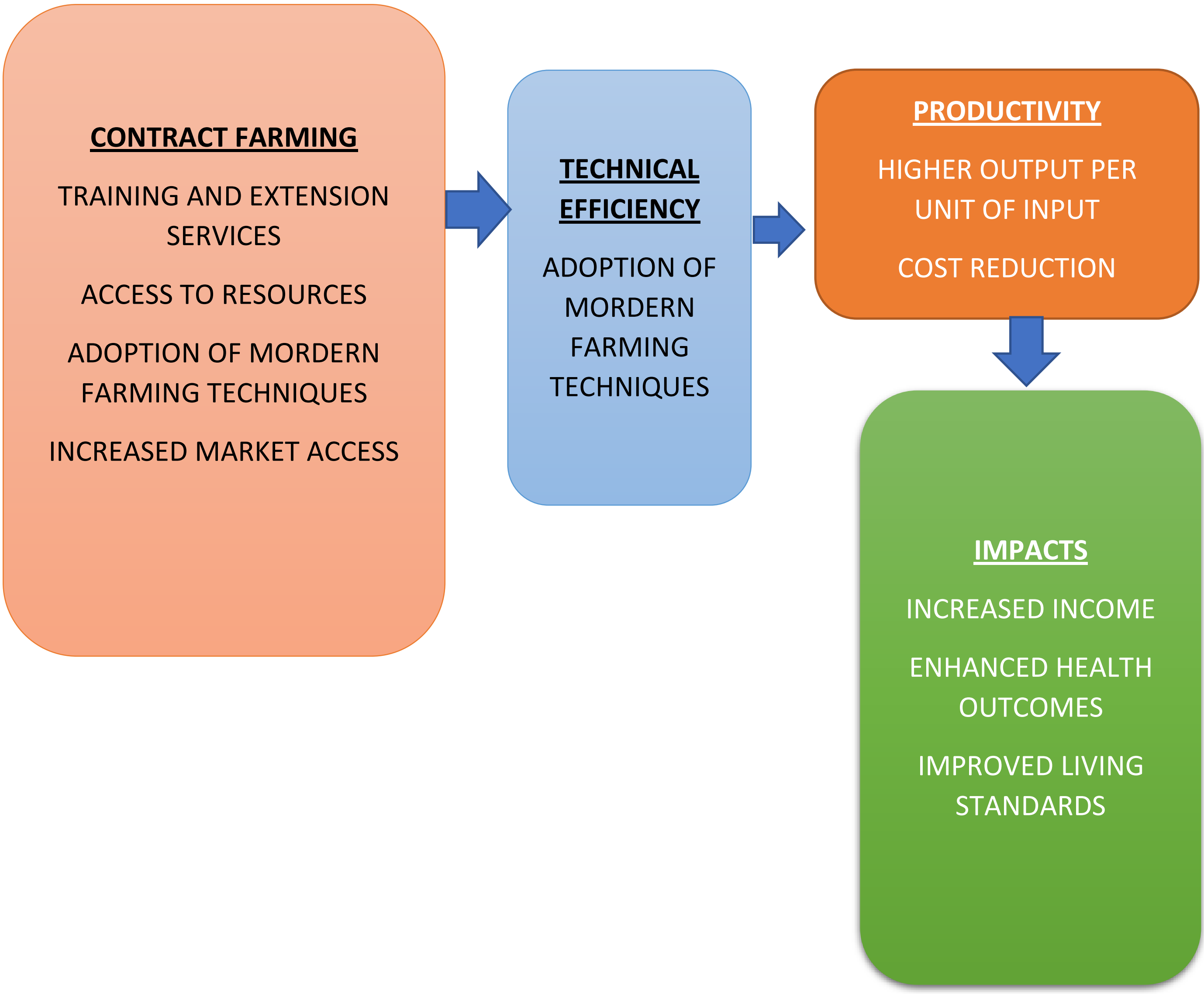

Figure 4.6: Upgraded conceptual framework

Source: Author (2024)

4.9 Chapter summary

The chapter presented the study findings in tabular and visual format. The researcher also compared the findings with past relevant study findings. The findings concluded that contracted farmers exhibit greater technical efficiency and hence productivity as compared to their non-contracted farmer counterparts. The researcher also found out that contract farming enhances the social well-being of the farmers. The next section will derive conclusions and recommendations for the study.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter outlines the summary of study, summary of major findings, conclusions and recommendations.

5.1 Summary of study

The study assesses the impact of contract farming on the productivity and technical efficiency. It also conducts an investigation on its effect on the socio-economic wellbeing of smallholder tobacco farmers in Zimbabwe. The study was underpinned by key theoretical frameworks which are Agriflection Model and Efficiency Analysis Theory. These frameworks provide valuable viewpoints on the manner in which contract farming influences farm productivity and efficiency. The theories do so while addressing broader socio-economic factors. The Agriflection Model suggests that contract farming creates an environment for smallholder farmers to reflect on their practices. It also provides a platform for the improvement of efficiency. The model also identifies contract farming as a way of adopting sustainable farming methods. It gives emphasis to the interactive nature of learning and adaptation in agricultural systems. This refers to contract farming in particular. This is because this is where farmers are given farming inputs, training, and market access. Efficiency Analysis Theory, on the other hand, provides an examination of the utilization of resources are for the maximisation of outputs. This theory was crucial in understanding the determinants of productivity and technical efficiency in smallholder tobacco farming.

The study adopted a mixed-methods approach. This approach combines qualitative and quantitative techniques for addressing the complexity of contract farming. The social constructivism paradigm were guiding the qualitative aspects. This allowed the researcher to collect rich insights into farmers' perspectives on contract farming. These viewpoints include the impact of contract farming on their livelihoods, and the challenges being faced. Qualitative data were analyzed using thematic analysis. This qualitative data analysis helped in capturing the subjective experiences of smallholder farmers. For the quantitative part, the positivist paradigm was used to gather objective. This refers to numerical data on farm productivity and technical efficiency. The researcher conducted quantitative analysis using tools like SPSS and

MS Excel. These tools helped the researcher with the evaluation of the relationships between variables. The variables include farm size, investment, and output. The study used a cross-sectional survey design. This design was chosen because smallholder farmers do not typically maintain long-term records. Therefore, the data was focused on the most recent farming season. The sample size which was used was 395 with 70.4% response rate. The sample was selected through stratified random sampling. The study revealed that there are significant productivity and technical efficiency variations between contracted and non-contracted smallholder tobacco farmers. This is because contracted farmers benefited from access to inputs, technical support, and secure markets. Therefore, they were having greater higher productivity and efficiency compared to non-contracted farmers. The impact of technical efficiency on productivity was also clear. This is because more technically efficient farmers achieved higher output levels with the same or fewer resources. This finding highlights that it is important to improve efficiency so as to boost productivity among smallholder farmers. The study also identified several determinants of technical efficiency. These include access to training, credit, and modern farming inputs and the level of farming experience. The study also revealed that contract farming was significant in the provision of these resources. The study also estimated the socio-economic impact of contract farming on participating smallholder farmers. The study showed that contracted farmers were reporting improved incomes, better access to markets, and enhanced livelihoods. They were also experiencing increased economic stability. They were also more able to invest in their farms. This further contributed to rural economic development.

5.2 Summary of major findings

This section shows the summary of findings.

5.2.1 Establishment of Productivity and Technical Efficiency Variations Between Contracted and Non-Contracted Smallholder Tobacco Farmers

In recent years, the role of contract farming in the improvement of agricultural productivity and technical efficiency has attracted huge attention. The findings revealed significant differences which highlight that taking part in contract farming resulted in numerous advantages. The analysis showed that contracted farmers achieved an average yield of 2,200 kg per hectare. On the other hand, the farmers without any contract arrangement had yields of only 1,600 kg per hectare. This huge difference is a reflection of a 37.5% increase in productivity for contracted farmers. This shows that contract farming is effective in boosting agricultural output. Several factors contribute to this higher productivity. This includes greater access to high-quality inputs, improved agronomic practices, and continuous technical support. Contracted farmers benefit from resources such as superior seeds and fertilizers. This is important when used to enhance crop yields.

Technical efficiency scores also show the differences between contracted and non-contracted farmers. Contracted farmers recorded an average technical efficiency score of 90%. The non-contracted farmers exhibited a score of 72%. Therefore, this 18% difference is an indication that contracted farmers are producing more of tobacco. It also shows that there is effectiveness of resource utilization. Enhanced technical efficiency among contracted farmers can be attributed to systematic training and better management practices. This is because in usual contractual farming arrangements the support is given through training and management.

These findings are consistent with recent literature, Kola and Bolarinwa (2023) and Zhen and Zhang (2022) who argued that because contracted farmers have greater access to superior agricultural inputs and regular training. This gives a greater improvement in the productivity of contracted farmers. This study corroborates with those arguments. This is because it illustrates that the structured support inherent in contract farming leads to use of resources in a more effective manner. It also leads to enhanced agricultural outcomes.

5.2.2 Impact of technical efficiency on productivity

This study explored how technical efficiency influence the productivity of smallholder tobacco farmers. It focuses on both contracted and non-contracted farmers in Mazowe and Bindura districts. One of the major findings of this study was that there is strong positive correlation between technical efficiency and productivity among farmers. The study found out that contracted farmers scored 90% on technical efficiency. These farmers were also achieving significantly greater yields, which averaged 2,200 kg per hectare. This is different to non-contracted farmers. This is because they scored 72% in technical efficiency and produced an average yield of 1,600 kg per hectare. The correlation coefficient for contracted farmers was 0.75. This was an indication of a robust positive relationship between efficiency and productivity. However, non-contracted farmers had a correlation coefficient was 0.60. These findings suggest that higher technical efficiency is a major direct contributor to greater productivity outcomes. This is because contracted farmers benefit in a greater way from the structured support provided by contract farming.

Another key finding is the impact of external support on technical efficiency and productivity. Contracted farmers were found to benefit from access to inputs, training, and technical support, which improved their efficiency and, consequently, their productivity. This was supported by literature from Singh and Sharma (2022), who put emphasis that if technical efficiency is increased, it also improves resource utilization. Therefore, this leads to higher productivity. Kumar and Patel (2021) also noted that technical efficiency is a primary driver of productivity growth. This is especially true when it is combined with adequate support mechanisms, as seen in the case of contracted farmers in this study.

For non-contracted farmers, there was also a positive correlation seen between technical efficiency and productivity. However, the study showed that the impact was less significant. This group faced more challenges in achieving high productivity. This is because their technical efficiency scores are low. They also have limited access to resources and support. The findings align with Muriithi and John (2022), who argued that improving technical efficiency alone may not always result in higher productivity. However, it is different when coupled with additional support measures.

Furthermore, the Endogenous Switching Regression (ESR) model used in the study confirmed the significant impact of technical efficiency on productivity for both contracted and non-contracted farmers. The model showed that there is a strong effect of technical efficiency on productivity among contracted farmers (with a coefficient of 0.65 and p-value < 0.01). This was in comparison to non-contracted farmers (with a coefficient of 0.42 and p-value < 0.05). These results reinforce the importance of technical efficiency in driving productivity. This is usually in situations where farmers are part of contract farming arrangements offering structured support systems.

5.2.3 Determinants of technical efficiency

This study examined the key determinants of technical efficiency among smallholder tobacco farmers. This was focused on contracted and non-contracted farmers in the Mazowe and Bindura districts of Zimbabwe. The findings highlighted various factors that significantly influence technical efficiency in smallholder farming systems. The study observed that there are notable differences between the two groups of farmers.

One of the major determinants of technical efficiency identified in the study was access to resources. The study found out that contracted farmers had greater access to inputs. These inputs include seeds, fertilizers, and pesticides. They also include technical training and extension services. This access allowed them to utilize their resources more effectively. This in turn led to higher technical efficiency. In contrast, non-contracted farmers could not access these essential inputs and services easily. This adversely affected their efficiency. The study's results align with findings from Akinruwa et al. (2023), who noted that access to inputs and modern farming technologies plays a critical role in boosting technical efficiency among smallholder farmers.

Farm size was another significant determinant of technical efficiency. The study found that for contracted farmers, larger farm sizes exhibited positive correlation with higher technical efficiency. Larger farms often provide economies of scale. This allows maximisation and effective use of resources and labour. This finding is supported by Moyo et al. (2022), who also observed that smallholder farmers with larger land holdings exhibited greater technical efficiency. This is because they are able to spread input costs over larger areas. This achieves better resource optimization.

Education level emerged as a significant factor influencing technical efficiency in both contracted and non-contracted farmers. Farmers with more years of formal education were generally more efficient in utilizing their resources. Education improves farmers' understanding of farming techniques, the adoption of new technologies, and decision-making capabilities, all of which enhance technical efficiency. Chirwa and Ngalawa (2022) similarly found that education improves farmers' ability to optimize input use and adopt efficient practices, leading to better productivity outcomes.

Additionally, experience in tobacco farming was identified as a determinant of technical efficiency. Farmers with more years of experience were better at managing their farms. They would have also improved in input use, and adoption of innovative farming practices. Experienced farmers tend to make more informed decisions. This results in better decision making. This finding aligns with Rao et al. (2022), who noted that experienced farmers are better in the navigation of the challenges of smallholder farming. This leads to higher efficiency levels.

The study also highlighted the importance of institutional support as a determinant of technical efficiency, particularly for contracted farmers. This is because contracted farmers are usually provided with structured support systems. These include credit facilities, training, and market access, all of which improve technical efficiency. In contrast, non-contracted farmers are lacking in institutional support. This in turn results in lower efficiency scores. This finding supports Zhang and Li (2021), who noted that farmers who participate in contract farming, tend to have higher technical efficiency due to better access to resources and services.

5.2.4 Impact of Contract Farming on the Socio-Economic Wellbeing of Participating Smallholder Tobacco Farmers

The analysis of contract farming's impact on the socio-economic wellbeing of smallholder tobacco farmers reveals a range of transformative benefits. These improvements are seen in income levels, asset ownership, access to essential services, and overall quality of life. This is revealed in contracted farmers. The findings highlight that contract farming play a huge role in the creation of economic opportunities and elevation of living standards for rural farmers.

One of the major findings is the significant difference in income levels between contracted and non-contracted farmers. The contracted farmers are earning an average of $1,200 per year. Their earnings are about $400 higher than their non-contracted counterparts. This increased income is directly linked to the financial stability offered by contract farming. This is because contracted farmers are provided with reliable market access, stable pricing, and reduced exposure to price volatility. Mwalimu et al. (2022) and Asfaw et al. (2021) were in corroboration with these findings. They demonstrated how contracted farmers are more financially secure and better able to make informed economic decisions. The financial gains from contracted farming enables investment in the farms. This further enhances productivity and sustainability.

In terms of asset ownership, contracted farmers have a notable advantage. This because most of them have ownership of more than three productive assets. These assets include farming equipment and livestock. This finding aligns with the literature, including studies by Chirwa et al. (2023) and Muriuki et al. (2023), which highlight the manner in which contract farming supports the accumulation of valuable assets. These assets have a potential of improving immediate farm productivity. In addition, they also provide contribution to the long-term economic resilience of farmers. This allows them to build wealth and secure their livelihoods. Asset ownership is a critical marker of socio-economic wellbeing. This is because of its strengthening of farmers’ ability to withstand economic shocks and invest in future growth.

Contracted farmers also experience improved access to essential services. These can be healthcare and education because they are important for overall person wellbeing. Contractual farming agreements provide security. The security is even complemented with community development initiatives. This enables better access to these social services. This is supported by Dzvimbo and Chitiga (2022), who found that contract farming is an extension above often economic gains in enhancing the social infrastructure of farming communities. Improved access to education and healthcare translates into better long-term outcomes for both farmers and their families. This is a reinforcement to the holistic socio-economic benefits of contract farming.

The study also highlights the significant impact of contract farming on farmers' quality of life. Participating farmers report greater satisfaction with their living standards, a finding supported by Juma and Mwangi (2022) and Mwalimu et al. (2022). The financial stability and higher incomes generated through contract farming allow for household investments that improve living conditions, such as better housing and food security. These improved living standards are crucial for enhancing overall wellbeing. This shows how contract farming not only boosts farm productivity but also transforms everyday life for rural families.

Contract farming is also beneficial in providing food security. Contracted farmers have stable incomes and improved access to resources. Therefore, they are in a better position in planning their food needs and management of their resources effectively. Therefore, this in turn reduces the risk of food shortages. This finding agree with those of Muriuki et al. (2023), who outlined that contract farming helps ensure food security. This is achieved through providing farmers with reliable income streams. Enhanced food security leads to better nutritional outcomes and reduces vulnerability to economic fluctuations.

Housing quality is another key indicator of socio-economic improvement among contracted farmers. This is because the farmers can now afford to invest in better housing. This aligns with findings by Juma and Mwangi (2022), who argued that there is significant improvement in the living environments of rural contracted farmers. Better housing not only elevates farmers’ quality of life but also contributes to the overall wellbeing of their families. This is because it provides security and comfort in the living space.

Additionally, contracted farmers benefit from enhanced access to market information. This information is key in order to make informed decisions about production and marketing strategies. This access allows effective response of farmers to market demands. It also helps in the optimisation of their production processes, and stay competitive. Osei et al. (2023) support this finding. They noted that contract farming often includes provisions providing farmers access to valuable market data. This assist them with adjustment of their strategies and improvement their productivity.

Lastly, the study found that contracted farmers exhibit greater adherence to health and safety standards. This is an essential element in the improvement of overall wellbeing. Tadesse et al. (2022) suggest that compliance with health and safety regulations makes the working conditions for farmers better. However, it also improves their health outcomes. The structured nature of contract farming agreements often includes provisions that promote safer farming practices. This in turn benefits the farmers as well as the broader community.

5.3 Conclusions

This sections presents the conclusions for this study.

5.3.1 Conclusions on Productivity and Technical Efficiency Variations Between Contracted and Non-Contracted Smallholder Tobacco Farmers

This study has established significant differences in productivity and technical efficiency between contracted and non-contracted smallholder tobacco farmers. The researcher found out that contracted farmers yield an average of 2,200 kg per hectare. This was seen to be which is higher than the 1,600 kg per hectare which was being reported by their non-contracted counterparts. This represents a 37.5% increase in productivity for contracted farmers. This highlights the role of contract farming in enhancing agricultural output.

The higher average technical efficiency score of 90% as also seen among contracted farmers. This was in comparison to 72% for non-contracted farmers. This further illustrates the advantages of contract farming arrangements. This is because there is an 18% difference in efficiency. The findings align with Kola and Bolarinwa (2023) and Zhen and Zhang (2022), which emphasize that contract farming enhances both productivity and technical efficiency through better access to quality inputs and ongoing support.

Moreover, the study also found out that there is a positive correlation between technical efficiency and productivity. This further cements the findings that improvements in resource management and farming practices lead to greater yields. This relationship is supported by the work of Singh and Sharma (2022), who argue that enhanced technical efficiency is a key driver of productivity growth in smallholder agriculture.

5.3.2 Conclusions on the Impact of Technical Efficiency on Productivity of Smallholder Tobacco Farmers

This study aimed to assess the relationship between technical efficiency and productivity among smallholder tobacco farmers in Mazowe and Bindura districts. The findings revealed that there is a significant positive correlation between technical efficiency and productivity. This means that as technical efficiency improves, productivity increases, though the magnitude of this effect varies between contracted and non-contracted farmers.

Contracted farmers demonstrated a notably higher technical efficiency score (90%) and productivity level, with an average yield of 2,200 kg per hectare. The correlation coefficient of 0.75 signifies a strong positive relationship between technical efficiency and productivity. These results are consistent with the existing literature. Singh and Sharma (2022) have argued that improvements in technical efficiency directly enhance productivity by optimizing resource utilization, a claim strongly supported by the higher efficiency scores of contracted farmers in this study. Furthermore, Kumar and Patel (2021) highlighted technical efficiency as a key driver of productivity growth, particularly in smallholder farming, aligning with our findings where contracted farmers experienced better productivity outcomes due to their enhanced efficiency.

Non-contracted farmers, on the other hand, exhibited a lower technical efficiency score of 72% and an average yield of 1,600 kg per hectare, with a correlation coefficient of 0.60. Although this still indicates a positive relationship between technical efficiency and productivity, the impact is less significant compared to contracted farmers. This reflects the challenges faced by non-contracted farmers who lack the structured support systems that contract farming provides. As noted by Muriithi and John (2022), improvements in technical efficiency alone may not yield significant productivity gains unless accompanied by additional support mechanisms such as access to resources, training, and technology.

The analysis was further supported by the Endogenous Switching Regression (ESR) model. The model showed positive and significant effects of technical on productivity in both groups of farmers. For contracted farmers, the coefficient of technical efficiency was 0.65 ($p<0.01$). This means that in this group technical efficiency strongly influences productivity. This result aligns with Dube et al. (2022), who reported that contract farming arrangements enhance productivity by improving technical efficiency. This is achieved because there is enhanced access to resources and training. Non-contracted farmers, however, had a lower coefficient of 0.42 ($p<0.05$). This demonstrated that even though technical efficiency still plays a role in productivity, it has a less pronounces impact. This is usually because there are no additional support of structured farming systems.

5.3.3 Conclusions on Determinants of technical efficiency

The investigation into the determinants of technical efficiency among smallholder tobacco farmers reveals critical insights into the factors that influence their productivity. The results highlight the multifaceted nature of technical efficiency. One of the most significant determinants of technical efficiency is access to extension services. The study found that contracted farmers were reporting better access to these services. It was realised that they had higher technical efficiency in comparison to their non-contracted farmers. This finding aligns with the work of Osei et al. (2023), who also emphasized the critical role of extension services in improving technical efficiency. It was so through the provision of the necessary knowledge and guidance.

In addition to extension services, education level emerged as a key determinant of technical efficiency. Farmers with higher education levels were more likely to apply advanced farming techniques and manage their operations more effectively. This is consistent with the findings of Gokah and Asante (2022), who reported that educated farmers usually score higher in technical efficiency. This is because they are able to adopt and implement new technologies and practices.

The size of a farmer's land is another important factor. The study found out that having larger farms was associated with higher technical efficiency score. Farm size and access to credit were found to be closely related. This is because farmers with better access to credit possessed greater technical efficiency. This is because they were able to invest in improved inputs and technologies. This finding is in line with the research conducted by Abebe et al. (2021), who also observed that greater access to credit allows farmers to make better resource management decisions. This in turn boosts technical efficiency.

Farmer experience and household labor availability also influenced technical efficiency. However, they varied in terms of their significance. Experienced farmers, especially those with more than a decade in the industry were seen to have greater efficiency. This was in application on resource management and farming practices, as noted by Boakye and Appiah (2022). On the other hand, household labor availability had a less significant impact. This is because the study found out that only 39% of respondents were in strong agreement with its effect on technical efficiency. However, this does not dismiss the role of labor availability. This is because it gives room for the consistent application of best practices across the farm, as highlighted by Mensah et al. (2021).

Soil fertility and access to market information were other significant determinants of technical efficiency. High soil fertility improves crop yields and reduces the need for additional inputs. Therefore, this feeds on to enhanced technical efficiency. This finding is in alignment with Nyangau et al. (2023), who stressed that it is crucial to maintain good soil health to achieve high technical efficiency. Access to market information allows farmers to make informed decisions regarding production and sales, leading to better resource allocation and ultimately higher technical efficiency. This is supported by Kwarteng et al. (2022), who showed that for farmers to improve technical efficiency, they have to have access to timely and accurate market.

Training and skill development also play a crucial role in enhancing technical efficiency. This was shown through 70% of the respondents agreeing that regular training has a significant improvement on farm productivity. Training helps farmers stay abreast of the latest innovations and best practices. This allows application of new techniques for improvement of efficiency. Similarly, advanced farm management practices were positively associated with higher technical efficiency. This is because they cause streamlining of operations and reduce inefficiencies, as indicated by Yeboah and Kyeremeh (2021). This finding suggests that ongoing efforts to improve the managerial capabilities of farmers could lead to substantial gains in productivity.

The results of the Data Envelopment Analysis (DEA) further corroborate these findings, highlighting the key variables that influence technical efficiency. The DEA analysis showed that labor, land, capital, education level, access to resources, and extension services all significantly affect the technical efficiency of smallholder tobacco farmers. Labor, in particular, was found to have the greatest impact, with a coefficient of 0.54 and a p-value of less than 0.01, indicating that optimizing labor use leads to higher technical efficiency. Studies by Mugabe et al. (2021) support this finding, showing that labor optimization is critical for improving agricultural productivity.

Capital investments also played a crucial role in enhancing technical efficiency, with a coefficient of 0.48 and a p-value of less than 0.01. Farmers who invested in equipment and inputs were able to improve their technical efficiency significantly, a finding consistent with Chirwa et al. (2022), who highlighted the importance of capital in smallholder farming. Similarly, land size was positively associated with technical efficiency, although its impact was slightly less significant compared to labor and capital. This is consistent with the findings of Kamau et al. (2022), who demonstrated that larger land sizes contribute to higher technical efficiency but that their impact depends on effective management practices.

Education level and access to resources also emerged as important determinants of technical efficiency in the DEA analysis. The results showed education having a coefficient of 0.22 and a p-value of less than 0.05. This finding is in agreement to the idea that higher education levels equip farmers with the skills and knowledge necessary for the improvement of their productivity, as suggested by Moyo et al. (2023). The findings also showed that access to resources, such as seeds and fertilizers, had a coefficient of 0.29 and a p-value of less than 0.01. This indicated technical efficiency is positively affected by better access to these essential inputs positively impacts technical efficiency. Finally, the role of extension services was reaffirmed in the DEA analysis, with a coefficient of 0.31 and a p-value of less than 0.05. This finding reinforces that if farmers get more extension services, their technical efficiency scores tend to improve (Sibanda et al., 2022).

5.3.4 Conclusions on Impact of Contract Farming on the Socio-Economic Wellbeing of Participating Smallholder Tobacco Farmers

The analysis of the impact of contract farming on the socio-economic wellbeing of smallholder tobacco farmers provides compelling evidence of its transformative effects on various aspects of farmers' lives. The study concludes that there is a significant difference in the income levels between the two groups. Contracted farmers are earning an average of $1,200 annually. This is in comparison to $800 for non-contracted farmers. Therefore, they tend to enjoy greater financial stability. This higher income can be attributed to improved market access, price stability, and reduced price volatility. All these elements are found when a farmer is contracted (Mwalimu et al., 2022) and (Asfaw et al., 2021). These financial benefits empower contracted farmers to make better economic decisions. They also help in their investment and planning for future growth.

The study concluded that asset ownership among contracted farmers is significantly higher. This is because the majority owning more than three productive assets. This is consistent with the literature, including Chirwa et al. (2023) and Muriuki et al. (2023), which outlined that when a farmer is contracted, there is a higher potential to accumulate valuable assets. These can be equipment and livestock. The ability to invest in productive assets enhances the economic resilience and long-term viability of these farmers. Therefore, this strengthens the positive relationship between contract farming and wealth creation.

Additionally, access to essential services like healthcare and education is markedly improved for contracted farmers. The security provided by contract farming arrangements, often supplemented by community development provisions, contributes to better access to social services. This finding, supported by Dzvimbo and Chitiga (2022), emphasizes the socio-economic benefits of contract farming beyond income generation, extending to enhanced community wellbeing through improved infrastructure and service availability.

Contract farming also leads to a higher quality of life for participating farmers. The study shows that contracted farmers report greater satisfaction with their living standards, a result corroborated by Juma and Mwangi (2022) and Mwalimu et al. (2022). The financial stability afforded by contract farming allows for more household investments, which in turn leads to better housing, food security, and overall living conditions. The connection between improved incomes and living standards demonstrates the broader socio-economic impact of contract farming on farmers' everyday lives.

The study highlights that food security is also enhanced among contracted farmers, who benefit from the stability that contract farming provides. With reliable income and better resource management, these farmers can plan more effectively, reducing the risk of food shortages and improving nutritional outcomes. This aligns with findings from Muriuki et al. (2023), who argue that contract farming plays a crucial role in ensuring food security through stable income streams.

Housing quality was another significant indicator of socio-economic improvement among contracted farmers. The study shows that contracted farmers, due to their better financial conditions, are able to invest in modern, higher-quality housing. This finding, supported by Juma and Mwangi (2022), highlights the broader economic benefits of contract farming, which extend beyond the farm and contribute to improved living environments for farmers and their families.

Furthermore, contracted farmers enjoy better access to market information, which is critical for making informed decisions about production and marketing strategies. Access to such information enhances farmers' ability to respond to market demands and optimize their production practices, as noted by Osei et al. (2023). This is an important advantage of contract farming, enabling farmers to stay competitive and responsive to market dynamics.

Lastly, the study concludes that contracted farmers often have better health and safety standards. This is a crucial aspect of enhancing overall wellbeing. As Tadesse et al. (2022) suggest, if farmers comply with health and safety regulations, it not only ensures better working conditions but also contributes to improves overall health outcomes. This is because, contract farming ismore formalised. Therefore, the contracts often include provisions promoting safe farming practices. This further benefits the farmers involved.

5.4 Recommendations

Based on the findings of this study, several recommendations can be made to improve the technical efficiency and productivity of smallholder tobacco farmers.

5.4.1 Strengthening Contract Farming Arrangements

The findings clearly indicate that contracted farmers outperform non-contracted farmers in terms of technical efficiency and productivity. Therefore, the study recommends strengthening of contract farming arrangements. This will ensure the farmers have enhanced access to resources such as seeds, fertilizers, and technical assistance. They also ensure stability of market access. As noted by Eaton and Shepherd (2020), contract farming has been successful in various developing countries by offering smallholder farmers better inputs and market security. This in turn enhances technical efficiency. Policymakers and agricultural stakeholders should therefore work to increase the reach of contract farming models. This in turn ensures that more farmers can benefit from these arrangements.

5.4.2 Enhancing Access to Resources and Technology

One of the primary challenges faced by non-contracted farmers is limited access to critical resources. These resources can be such as inputs, modern equipment, and training. This study found that access to resources had a statistically significant positive impact on productivity. This was seen with a result of 0.20 for contracted farmers and 0.15 for non-contracted farmers. Therefore, it is essential to provide non-contracted farmers with access to improved seeds, fertilizers, and irrigation systems. These provisions have a great positive impact on their technical efficiency. According to Feder et al. (2021), modern technology adoption has a potential to improve technical efficiency and increase crop yields. This for smallholder farmers in developing countries in particular. Thus, governments and NGOs should invest in making such technologies more accessible and affordable to farmers.

5.4.3 Farmer Training and Capacity Building

The study found out that training is a key factor contributing to higher technical efficiency scores among contracted farmers. Therefore, it is recommended to expand training programs to non-contracted farmers. This would help address the efficiency gap. Training should be focused on best farming practices. It can also include resource optimization, and modern agricultural techniques. Moyo et al. (2022) highlight that farmer training improves their technical skills and fosters innovation. This in turn leads to higher productivity. Developing extension services and training programs aimed at building capacity in areas such as pest management, soil fertility, and water use can greatly improve the technical efficiency of farmers.

5.4.4 Encouraging Cooperative Formation

Farmer cooperatives can help smallholder farmers achieve economies of scale and access to markets, inputs, and information. This is because some of the benefits cannot be achieved individually. Therefore, cooperatives provide a platform for collective bargaining, reduction of input costs and improvement of access to resources and markets. According to Chirwa and Ngalawa (2022), cooperatives have been effective in promoting sustainable farming practices and enhancing productivity by pooling resources and improving technical knowledge. Promoting the formation of tobacco farmer cooperatives could allow non-contracted farmers to enjoy similar benefits to those in contract farming arrangements, thereby improving their efficiency and productivity.

5.4.5 Improving Agricultural Extension Services

Agricultural extension services play a crucial role in disseminating knowledge. They also offer technical advice, and support the adoption of improved farming practices. In this study, the education level of farmers was positively correlated with productivity. Therefore, the study concluded that knowledge transfer is important to improve technical efficiency. Rao et al. (2022) argued that well-functioning extension services can increase technical efficiency by providing farmers with timely information on weather patterns, pest outbreaks, and market prices. Governments should prioritize expanding agricultural extension services, especially in remote rural areas, to ensure that smallholder farmers have access to the information and support they need to improve their productivity.

5.4.6 Promoting Financial Inclusion

Limited access to credit and financing was another significant barrier for non-contracted farmers, limiting their ability to invest in productivity-enhancing inputs and technologies. Financial inclusion initiatives, such as microcredit programs and mobile banking solutions, can help farmers secure the funds needed to improve their operations. According to Zhang and Li (2021), access to financial services significantly impacts technical efficiency by enabling smallholder farmers to invest in higher-quality inputs and adopt modern agricultural practices. Policymakers should work with financial institutions to develop tailored credit schemes for smallholder farmers, ensuring that they have the capital needed to improve their technical efficiency and productivity.

5.4.7 Promoting Sustainable Farming Practices

Sustainability is a critical factor in ensuring long-term productivity. The promotion of sustainable farming practices, such as conservation agriculture, crop rotation, and organic farming, can help improve both technical efficiency and environmental outcomes. Feder et al. (2021) emphasize the importance of integrating sustainable practices into smallholder farming to enhance resilience and productivity in the face of climate change and resource constraints. Training programs and policies should encourage farmers to adopt sustainable practices, which will lead to more efficient use of resources and long-term productivity gains.

5.5 Recommendations for further study

Future research efforts can focus on expanding the scope of the study, exploring additional variables, and applying different methodologies to enhance the robustness and generalizability of findings.

5.5.1 Investigating the Social and Environmental Impacts of Contract Farming

While this study concentrated on economic and technical outcomes, the social and environmental impacts of contract farming deserve closer examination. This is because, there is a possibility of contract farming altering traditional farming practices. This may tend to cause changes in land use patterns, labour dynamics, and community relations. For example, there may be concerns about land concentration. This is a situation whereby wealthier farmers would be dominating contracts while smaller, resource-poor farmers remain marginalized. In addition, contract farming may be encouraging the use of chemical inputs. This may in turn cause environmental degradation.

Therefore, it is imperative for future studies to explore the social implications of contract farming on farmer livelihoods, community cohesion, and gender dynamics. This was also found out by Porter and Howard (2019), who noted that contract farming can sometimes worsen inequalities within rural communities. This is because the contracts may favour those farmers who have greater financial stability. This may mean women and youth, with fewer opportunities. Additionally, investigating the environmental impacts of contract farming on soil health, water use, and biodiversity is essential to understanding the broader implications of the model. Therefore, investigations on how sustainable contract farming is on the environment is a good complement to the findings on productivity and efficiency.

5.5.2 Investigating the Role of Government and Policy in Contract Farming

Another area requiring further investigation is the role of government policies and interventions in shaping the success of contract farming arrangements. This study primarily examined contract farming from the perspective of farmers and contractors. However, contract farming is influenced by a number of government policies and regulations. Therefore, this area has been underexplored. Future studies should investigate how government policies. These policies can include land tenure security, agricultural subsidies, and contract enforcement mechanisms. This is because they influence the success of contract farming.

According to Poulton et al. (2022), government involvement in contract farming is crucial for creating an enabling environment that ensures fairness, transparency, and protection for smallholder farmers. Therefore, this future study is essential for the provision of valuable recommendations for policy improvements. For example, studies could assess whether regulatory frameworks provide adequate protection for farmers in cases of contract disputes or non-payment by contractors. This is because this is a common challenge in many developing countries.

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APPENDIX A: QUESTIONNAIRE

Section 1: Demographic Information

1. **Age:**
    - 18-25
    - 26-35
    - 36-45
    - 46-55
    - 56 and above
2. **Gender:**
    - Male
    - Female
3. **Marital Status:**
    - Single
    - Married
    - Widowed
    - Divorced/Separated
4. **Level of Education:**
    - No formal education
    - Primary
    - Secondary
    - Tertiary
5. **Household Size:**
    - 1-3 members
    - 4-6 members

- 7-9 members
- 10 and above

Section 2: Contract Farming Participation

6. **Do you participate in contract farming?**
    - Yes
    - No (If no, skip to Section 3)
7. **How many years have you been participating in contract farming?**
    - Less than 1 year
    - 1-3 years
    - 4-6 years
    - More than 6 years
8. **Who is your contract farming partner?**
    - Private company
    - Government agency
    - Tobacco marketing company
    - Other (please specify)
9. **Please rate your agreement with the following statements about your participation in contract farming:**

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
I joined contract farming for better market access.	1	2	3	4	5

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Contract farming has improved my financial stability.	1	2	3	4	5
The contract provides me with consistent input supplies.	1	2	3	4	5
I have access to reliable extension services through my contract.	1	2	3	4	5

Section 3: Income and Asset Ownership

10. **Please rate your agreement with the following statements about your income and asset ownership:**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My income from contract farming is higher than before.	1	2	3	4	5
Contract farming has enabled me to save more money.	1	2	3	4	5
I have purchased more productive assets (e.g., equipment, livestock) since joining contract farming.	1	2	3	4	5
Contract farming has helped me increase my wealth.	1	2	3	4	5

Section 4: Access to Services

11. **Please rate your agreement with the following statements regarding access to services:**

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Contract farming has improved my access to healthcare.	1	2	3	4	5
I can now afford to send my children to better schools due to contract farming.	1	2	3	4	5
My access to financial services (e.g., credit, loans) has improved since joining contract farming.	1	2	3	4	5

Section 5: Food Security and Living Standards

12. **Please rate your agreement with the following statements regarding food security and living standards:**

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
My household's food security has improved due to contract farming.	1	2	3	4	5
I rarely experience food shortages since joining contract farming.	1	2	3	4	5
I have made improvements to my housing thanks to increased income from contract farming.	1	2	3	4	5

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My overall living standards have improved since joining contract farming.	1	2	3	4	5

Section 6: Market Access and Information

13. **Please rate your agreement with the following statements about market access and information:**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Contract farming has improved my access to market information.	1	2	3	4	5
I have more stable markets for my tobacco due to contract farming.	1	2	3	4	5
I am better informed about tobacco prices and demand due to contract farming.	1	2	3	4	5

Section 7: Challenges and Improvements

14. **Please rate your agreement with the following statements about the challenges of contract farming:**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Unfair pricing is a major challenge in my contract farming experience.	1	2	3	4	5

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Delayed payments are a common issue in contract farming.	1	2	3	4	5
I often receive insufficient input supplies from my contract farming partner.	1	2	3	4	5

15. **What improvements would you suggest for the current contract farming system? (Open-ended response)**

Section 8: Overall Impact

16. **Please rate the overall impact of contract farming on your socio-economic wellbeing:**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Contract farming has had a positive impact on my overall socio-economic wellbeing.	1	2	3	4	5
I would recommend contract farming to other smallholder tobacco farmers.	1	2	3	4	5

Section 9: Additional Comments

17. **Do you have any additional comments or suggestions regarding your experience with contract farming?**
(Open-ended response)