‘TOWARDS AN INTEGRATED HORTICULTURAL MARKET TO STABILIZE SUPPLY CHAIN VULNERABILITIES IN ZIMBABWE’

By

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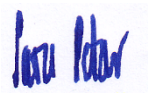

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DEDICATION

I dedicate this thesis to three heroes in my life: my wife Morley, my father Pharaoh, and my mother, Sister. Morley, a PhD student, who has always been supportive and present, ensuring that I complete this programme. My parents have consistently encouraged me, reminding me that the sky is the limit and urging me not to rest. They are the reason for the success of my academic life, and I dedicate this report to them. Special dedication also goes to my four sons: Tinashe, Munyaradzi, Tatenda, and Masimba Jr, for their unwavering encouragement. I would like to extend my gratitude to Dr. Muguti, a renowned surgeon and former deputy minister of health in Zimbabwe, who saved my father's life when he fell ill during my DBA journey. My father's illness caused me to suspend my studies for almost six months as I focused on ensuring his recovery. During this challenging time, my sister Loina and my uncle Winston Kanyepi played a significant role by contributing financial resources that alleviated my burden. I offer my sincere thanks to all of you, and I wholeheartedly dedicate this research to you; it's yours,"*chinhu chenyu ichi."*

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This journey originated from a new assignment I was given by my boss, to identify markets for our farmers who produce vegetables. My experience in that role led to a deeper interest in researching to understand why our vegetable farmers are struggling to access these markets in Zimbabwe. In this regard, special thanks go to Felistas Ndawi, the current Managing Director of Seed Co Zimbabwe, for the exposure and encouragement she provided. I remain grateful to you. I salute you, madam. My special gratitude also extends to Tendai Ngwenya, a lecturer at Lupane State University in Zimbabwe, for his valuable guidance. I am also thankful to all my colleagues at work in Zimbabwe for their moral support. Finally, I thank all the farmers, leaders, and members of multinational companies in Zimbabwe who contributed their rich knowledge and experience to this research, as well as my friends who assisted me in various ways.

ABSTRACT

This research investigates how an integrated horticultural market can stabilize supply chain vulnerabilities now found in Zimbabwe. Chapter 1 starts by giving a brief background of how Zimbabwe was the breadbasket of Africa before the 1980s, but fall from its glory in the 1990s. This research is motivated by the fact that, horticulture industry in Zimbabwe is not governed by any policy that support supply chain plays which is crucial for ensuring the supply of produce across the nation and globally. Hence, this research looked at (1) investigating how access to market information can affect horticulture supply chains, (2) understanding the nature of coordination among horticulture supply chains, (3) accessing how quality standards affect access to local and foreign markets, (4) examined the challenges being experienced by players in the horticulture industry. Chapter 2, started by providing academic discussions on integrated horticulture markets supply chains, theoretical models such as the structural change model, multi-agent systems among others were critically examined and their relevance explained. Literature on marketing information, coordination of supply chains, quality standards available in horticulture and challenges faced by horticulture farmers was evaluated with empirical researches included and research gaps acknowledged. Chapter 3 provides a detailed analysis on the interpretivist-qualitative research approach adopted. The research study included small-scale horticulture farmers, horticulture associations and service organisations, processors, wholesalers and retailers who were sampled using convenience and purposive sampling. Thematic data analysis was employed utilising NVivo 15 for Windows. Chapter 4, results show that there is lack of information sharing among horticulture supply chains. The research also shows that there is lack of coordination among horticulture supply chain that has led to duplication of roles by players in the industry and some have become negligent. Additionally the research shows that players in the horticulture industry are not familiar with quality standards such as Global GAP, BRC, IFS and this is affecting their ability to supply high value markets locally and globally. Chapter 5 the researcher recommended that the government of Zimbabwe establish a horticulture board that offers horticulture industry with inputs such as finance, seed, machinery, cold chain facilities among other resources. The board should also provide a link (in the form of an organisation) between farmers and the other players in the industry. The researcher also recommended that sound horticulture policies be established that protect horticulture farmers and industry. An integrated horticulture market model was developed at the end of the chapter showing how all this could be achieved.

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DEFINITION OF TERMS

Term	**Explanation/abbreviation**
British Retail Consortium	BRC
Cotton Marketing Board	CMB
Domboshava Horticulture Producers' Association	DOPA
Global Food Safety Initiative	GFSI
Grain Marketing Board	GMB
Hazard Assessment and Essential Control Points	HACCP
Horticulture Producers Association	HPA
Integrated Horticulture Supply Chain	Refers to the system that connects production, distribution and retailing of horticultural produce
Integrated Horticulture Supply Chain	IHSC
International Organization for Standardization	ISO
Internet of Things	IoT
Makoronyera	Informal agencies that procure horticulture produce at low prices from farmers and sell to distributors or end markets
Murewa Agriculture Producers Association	MAPA

Non-Governmental Organisations	NGO
Safe Quality Food	SQF
Sisonke Ag Fresh Farmers' Association	SAF
Small-scale farmer	These are farmers in irrigation schemes and horticulture communal farmers
Standards Association of Zimbabwe	SAZ
Supply Chain	These are network of individuals, businesses, and processes involved in producing and delivering a product or service to consumers
Supply chain	SC
Supply Chain Operations Reference	SCOR
Sustainable Development Goals	SDGs
Sustainable supply chain management	Practice of integrating environmental, social, and economic considerations into supply chain operations to minimize negative impacts while maintaining efficiency and profitability
Sustainable supply chain management	SSCM
System dynamics	SD
The Integrated Farm Assurance	IFA
Tobacco Industry and Marketing Board	TIMB

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CHAPTER 1

INTRODUCTION

1.1 Research background and scope

This research investigates how integrated horticultural markets can stabilize the supply chain vulnerabilities being faced by horticultural farmers in Zimbabwe. My observation as one of the major practitioners in the horticultural industry has been the lack of an integrated supply chain board for horticulture farmers in Zimbabwe, resulting in stagnation and negative growth in the industry. The horticultural sub-sector in Zimbabwe comprises the production of vegetables, flowers and other green produce. The unavailability of an aggregate horticultural produce has especially left horticultural farmers in a volatile situation, with most white horticulture farmers moving to nearby countries like Zambia and South Africa that have sound horticulture policies and boards.

The fact that there is no board or organisation that manages horticulture producers in Zimbabwe, has resulted in horticulture farmers lacking knowledge about (1) type of products to sale at a given period or season which affects planning, (2) the price their produce will fetch in the market at the point of sale making it difficult to calculate profit/losses, (3) how much quantities or quality is required by different stakeholders at a given period among other factors like market information for buying and selling, planting seasons, certifications and coordination of planting and harvesting periods and seasons. All parties, thus, input suppliers, producers (farmers), processors, wholesalers, and retail organisations, decision making is based on their own intuition or spot information, which has created many challenges resulting in supply vulnerabilities and losses, given that horticulture products are perishable.

The “Integration of horticulture supply chains” is part of a portfolio of interventions, with a view of integrating horticulture supply chains by enabling local smallholder farmers to gain market access to supply fresh fruit and vegetables to the country's industry and internationally (Matanda and Schroder 2002). Prior research in the horticulture market and supply chain has looked at the potential benefits and challenges of horticultural crop production for smallholder farmers (Ginige et al. 2016, Zivenge and Karavina 2012, Shuklar 2011). With the increase in the global population, natural disasters, and climatic changes, the agricultural supply chain faces lots of challenges due to fluctuations in the supply and demand of crops required (Aji, 2020). These changes add pressure on the agriculture supply chain, demanding that the process be more productive and efficient (van der Heijden and Vink, 2013). On the other hand, the rise of modern markets, specifically supermarkets in developing countries, is generally viewed as a positive move for the rural poor. However, many scholars agree that many smallholder vegetable farmers must overcome challenges of constant supplies and quality for them to obtain access to formal markets (Trebbin, 2014).

The success of these endeavors over time is due in large part to a focus on sustainability from the design stage and throughout their implementation. The Integrated Horticulture Development aims to develop the horticultural sub-sector in support of eight outputs: (1) improving the technical capacity of the Agricultural Marketing Unit and creating farmer awareness on export potentials for horticultural crops; (2) improving local market systems; (3) improving export marketing systems; (4) improving the market information collection and dissemination system; (5) improving institutional linkages; and (6) formation of farmer groups or associations, (7) building technical capacity of the Post-Harvest Unit; (8) building and making operational storage facilities (UNCTAD report 2015).

1.2 The definition of the research problem

Literature gap shows that the need to improve the operational efficiency and effectiveness of global horticultural markets have been widely researched (Tegegn, 2013). However, research by Zamasiya et al. (2014) shows that smallholder horticulture farmers in several developing countries have not yet adopted the practice of an integrated market due to inadequate research by scholars and practitioners. Most studies undertaken in Africa horticultural markets have looked at community resilience, food security and lifting the livelihoods of rural farmers through horticultural projects. It is only recently that the underlying horticultural supply chains have been examined in any detail providing a wider understanding of farm demographics, transport logistics, and vendor practice (Zhou et al. 2019). What still remains unclear, is the availability of a horticultural board or organisation that can provide efficient product and market information to horticulture farmers and associated supply chain members in managing horticultural produce.

Research by Ginige et al. (2016), in Sri Lanka reveal that the root cause for inconsistent supply is the inability of horticulture supply chain actors to receive the right information at the right time in the right format, for them to prepare the required produce when needed. Additionally, Kaloxylos et al. (2013) compounds that, the unavailability of information has been a critical issue in the agriculture-food sector for a long time. Thus, it is paramount to understand what the customer wants, where, when, at what price and what quantities, to help in responding accurately, speedily and with minimum flow of materials in the horticulture sector.

Agriculture is the mainstay of Zimbabwe's economy, as some Zimbabweans still live in rural areas and rely on agriculture and other rural economic activities for a living. Agricultural operations employ 60 to 70 percent of the people, produce 60 percent of the resources required

by the manufacturing sector, and account for 40% of the total export revenues. Agriculture accounts for over 17% of the nation's total GDP (FAO, 2017). The Zimbabwean agricultural sector is a mixture of food and cash crops. The food and cash crops have dedicated markets where supply is aggregated to stabilize supply chain vulnerabilities. Key food crops in the country include grains such as maize, millet, and sorghum, whose dedicated market is the Grain Marketing Board (GMB). Cash crops such as tobacco and cotton have dedicated markets such as the Tobacco Industry and Marketing Board (TIMB) and the Cotton Marketing Board. These marketing boards are highly regulated by the government through the process of price discovery to ensure that farmers benefit from the agricultural commodities that they produce.

However, for horticultural farmers in Zimbabwe, the strategies are different. Farmers do not have an integrated marketing board, and the support given to cash crops by the government is not extended to horticulture farmers. The failure to develop an aggregated horticultural market policy and board has left many horticulture farmers with devastating outcomes, among them being loss of productivity, profitability, resulting in other farmers becoming extinct, among other consequences.

For instance, in 2004, the Harare City council, in partnership with PacifiCorp Enterprises (Ltd) land developer, planned to decongest Mbare Musika to build another vegetable market to curb the challenges of poor selling areas that farmers were facing; however, to date, this has not been achieved. In another attempt to transform small-scale farm holders to full-fledged commercial farming, the Zimbabwe Agricultural Policy Framework (1995-2020) was developed, but failed to transform the horticulture industry. In 2021, the Rural Agriculture revitalisation project for commercialisation was also implemented with the aim of helping 280,000 small-scale farmers to receive US$6 million so they could fully engage in a consistent

supply of horticulture produce. However, a closer look at the statistics provided reveals that each farmer was set to get US$21, and this did not match the costs associated with horticulture commercialisation (UNCTAD report, 2015).

Coupled with such initiatives that did not manage to take off, horticulture farmers are still faced with the complexity of determining the prices of fruits or vegetables. The use of spot markets has resulted in instances of severe losses for farmers, either financially when they sell their produce below the cost of production or through perishability/spoilage because of oversupply in the market. It is, therefore, critical that an integrated horticulture market be established with known supply chain techniques to serve these markets efficiently and effectively. According to Magogo et al. (2015) horticulture sector is promising to be one of the country's major foreign currency earners and is showing positive signs of recovery with exports rising over the past five years from 20% in 2010 to 40% in 2015.

The above discussions show that for the horticulture sector to embrace the positive changes that are coming its way, supply chain members need to embrace the concept of 'integrated horticulture supply chains' to ensure food access and security. Following the challenges of supply chain vulnerabilities and the unavailability horticulture board in Zimbabwe, this research seeks to close this practical gap. The rational to meet Sustainable Development Goals (SDGs) in Zimbabwe, particularly SDG 2: zero hunger and SDG 12: responsible consumption and production integrated horticulture supply chains can help reduce supply chain vulnerabilities ensuring that horticultural loss are minimized at each stage of supply chain and also assisting supply chain members to make informed decision from planting to market. Thus, this study reports on a preliminary assessment of an integrated horticulture market and associated supply chain logistics in the horticulture sector in Zimbabwe. The study of

horticulture markets reflects an increasing recognition of the importance of food security in Zimbabwe and the world in general. An aggregated horticulture board is the drive towards food availability, stability, and access.

1.3 Research aims

This study seeks to investigate how an integrated horticultural market can be established to stabilize supply chain vulnerabilities now found in Zimbabwe since its demise from its former glory, ‘Bread Basket of Africa’, in the 1980s.

The main aim of this dissertation is to demonstrate how an integrated horticulture system can resolve supply chain inconsistency. Matondi and Chikulo (2012) allude to the fact that smallholder farmers find it difficult to supply supermarkets because of strict quality requirements, volumes as well and supply consistency. The marketing conditions set within each marketing channel heavily influence smallholder farmers' (SHFs) decisions. The formal market, with its emphasis on supplying consistent volumes as well as quality, generally excludes smallholder farmers from using it. As a result, they resort to informal markets, which have minimal emphasis on quality, and they are also supply-driven. Hence, one of the aims of this research is to look at order requirements (market channels, payment, packaging, and quality requirements).

It is also the aim of this research to look at how extensive preplanning and coordination can be established in integrated horticulture markets. Understanding the effect of reciprocal scheduling in the supply and demand of produce will help in reducing production loss. Zhou et al. 2019; Mutemim and Sakwa, 2017; Shuklar, 2011 postulate that horticultural markets are linked and interconnected by virtue of shared information and reciprocal scheduling, product

quality assurances, and transaction volume commitments. Extensive pre-planning and coordination are required up and down the entire chain to affect key control processes such as forecasting, purchase scheduling, production, and processing programming to avoid unnecessary losses through precision farming and real-time communication across the chain. These authors hypothesized that market information is positively related to horticulture crop production and marketing. Therefore, in this study, a preliminary assessment of how horticultural market information affects preplanning and coordination can benefit horticulture supply chain members in Zimbabwe.

Today's information-driven integrated supply chains are enabling farmers to reduce inventory costs, add product value, extend resources, accelerate time to market, and retain customers. The real measure of supply chain success is how well activities coordinate across the supply chain to create value for consumers while increasing the profitability of every link in the supply chain (Condrațchi, 2014). Horticulture produce is perishable in nature, and most of it is consumed as soon as it is produced. According to Mhazo et al. (2015) the economic value of horticulture misconception mainly stems from the fact that most households, especially in the low to medium class and the rural folk, are seen to be practicing some form of horticulture in their backyards and yet they do not realise any economic value. Other small-scale horticulture producers in Zimbabwe sell their produce in different markets (at farm gate, service centers, roadside markets, wholesalers, and their own retail outlets) across the country, however, the economic contribution remains unknown.

Bindu and Chigusiwa (2013) cites that in instances where farmers decide to go and sale their produce in formal markets, they end up facing additional transport costs and also have to compete with other players in the market who may be selling their produce at a giveaway price

so that they return to their homesteads earlier. Therefore, the availability of real-time communication is critical in the horticulture markets given the perishability of horticulture produce. An aggregated horticulture board is a drive towards an information-driven integrated supply chain. A full, aggregated horticulture board is suggested in this research to guide all activities and markets for horticulture projects. If all horticulture supply chain members have enough information about the varieties required, costs of production, and prices of produce on the market, guaranteed markets, known channels of distribution and quantities and profits they will make per commodity, it will certainly result in a more profitable and sustainable horticulture sector that meets food availability, stability and access (Trebbin, 2014). Creating aggregates will also assist small-scale farmers to join with other farmers and supply the required amount of produce at certain periods without any challenges.

This thesis also shows the role that horticulture farmers and associations play in the successful implementation of integrated horticulture supply chain markets. Since the government is the key driver of this change, horticulture associations remain an instrument through which policies are implemented. These associations are mandated to follow stipulated procedures or programs to help farmers achieve their set goals. Farmers on the other end need to be aware of these boards and the support that they can get to meet the supply and demand of produce in the market. There is a greater need for flexibility by farmers so that there is food availability, stability, and access. That is, even when there are known seasonal variations, consumers should be able to get produce at a good price not compromising on quality. Thus, this goal can only be achieved if there is an integrated horticulture system.

The thesis will also reveal the importance of the general public. It is very important that when a policy is being developed, the views of the public should be incorporated into the model.

Food production and consumption require linking the food to the social, cultural, and environmental contexts within which it is produced and distributed. For instance, in Zimbabwe, food crops consumed in Matabeleland are different from those consumed in Mashonaland or Manicaland. Each ethnic group has its type of food crops it consumes, and at certain times or when performing rituals. Therefore, the support and the role of the public, especially in emerging markets, is predominantly important in supply chain development.

1.4 Research Objectives

The main objective of this research is to look at an integrated system that can be developed in the horticulture sector, which is similar to the grain sector in Zimbabwe, for managing supply chain vulnerabilities. The grain sector has a clear system that they follow, i.e., farmers already know the time they should plant, varieties to be planted, expected prices that which they will sell their produce, and markets to which they will sell their produce. Farmers are given resources for planting grains (finance, infrastructure, technical support, equipment, etc.), then after harvesting, they have to supply their produce to the Grain Marketing Board, and they are paid their dues. Grain farmers do not struggle to access a market, nor do they struggle to access finance or land to start production of these grains. The price of the grain is known before planting, and tonnage and policies that surround the grain are also known. Some government incentives, like foreign currency exemptions and tax-free import of machinery, are also provided to encourage grain farmers to plough more of the needed grain. Hence, the research objectives that guided this research include the following;

- To determine the influence of sharing market information on precision horticulture supply chains.
- To examine the role of collaboration in successful implementation of an integrated horticulture supply chain.

- To investigate how certification in horticulture affects horticulture supply chains.
- To assess the current constraints hindering the implementation of an integrated horticultural supply chain model in Zimbabwe.
- To design an integrated horticultural supply chain model that is agile, which can be adopted in Zimbabwe to reduce supply chain vulnerabilities.

The first objective looked at the importance of having marketing information to ensure precision farming. Marketing information like price, quality, market channels, payment method, packaging, and quantity is important in ensuring an effective horticulture supply chain process. Precision farming aspects included aspects of real-time communication, staggered planting, accelerated time to market, reduction in inventory costs, seasonal crop management, added product value, crop variety to grow and time to grow it, forecasts on market trends, and availability of external resources. Horticulture farmers need to understand the relationship between the volume of products and expected returns. It does not always follow that if a farmer has high volume, then they will get higher returns. A notable example is the case of cabbages, which are high volume produce but provide low returns compared to peas or carrots because the market value were a head of cabbage, which is more than 1.5kg, can cost 0.25 cents, compared to peas that can be 0.50 cents for 500 grams. However, this proposition may not also hold in off-season periods, hence the need to understand how all these marketing dynamics affect horticulture farming to reduce supply vulnerabilities. The second objective looked at assessing the role of collaboration in ensuring the successful implementation of an integrated horticulture supply chain process efficiency. Using the Supply Chain Operations Reference (SCOR) model, the researcher identified attributes that were used to measure the SC performance, and these included: responsiveness, reliability, cost, and agility.

Another objective that the researcher looked at was the influence of certification and how it affects the horticulture supply chain. It is always a challenge for small horticulture farmers to supply their produce in formal and international markets because of strict quality requirements. International markets require all suppliers to have an international compliance certificate to export their produce. Formal local buyers in Zimbabwe require that farm produce suppliers register their companies, and they have to provide a CR form and tax clearance certificate before they are registered as suppliers to the buying company. Some companies would also request that, in addition to the above requirements, they would also have additional demands for the company to be internally registered with the buying company as a supplier, making the process more complex. All these requirements would amount to unforeseen costs, which will affect the price and profitability of horticulture produce. A study on these variables and availing information about such costs beforehand helps horticulture farmers to plan and make actual forecasts for the coming periods, which will help them in preplanning, production, and post-production planning.

Having understood what integrated horticulture markets entail through this research, it was also important to have a look at the current horticulture landscape for new and emerging constraints that can hinder the implementation of an integrated horticulture system. Given the ever-changing consumer tastes and preferences, and not forgetting methods of doing business and technological impacts, it is no longer sufficient to assume strategies of yesterday will work today or tomorrow. For instance, some consumers are conscious of what they eat, looking for aspects like the type of fertiliser used in growing the crop, water and chemicals used, and if the grower is adhering to methods of curbing climate change, among other factors. It can also be noted that the novel coronavirus of 2019 presented new constraints for horticulture markets, and more challenges are envisioned. Hence, this current research can help horticulture farmers

to identify forthcoming constraints so that they find solutions that are localised to their challenges before they safe some losses.

1.5 Purpose of Research

The essential purpose of the study is to contribute to the development of an integrated horticulture supply chain model to mitigate supply chain vulnerabilities in Zimbabwe. In order to develop an integrated horticulture model for vegetables and green crops. This research adds to the contemporary growing body of literature on integrated horticulture markets globally by reviewing supply chain models and theoretical frameworks. Though the concept of integrated horticulture markets may seem superior, Lewin's structural change model postulates that rural agriculture farmers are constrained in achieving economic gains as labour shifts to urban areas because they lack capitalization. Van der Heijden and Vink, (2013); Zamasiya (2014) identified these constrains to include to lack of capacity to meet requirements, poor bargaining power, presence of middlemen, lack of access to institutional and physical infrastructure, high transaction costs, inadequate private and public investment, as well as shortage of productive assets. Household characteristics such as labor shortages, low education levels also negatively impact participation in the market economy. The challenges experienced by small-scale horticulture have sparked debates and arguments on the impact of an integrated horticulture supply chain on agricultural production capacity (Aji, 2020).

Integrated horticulture supply chains play a critical role in the supply of horticultural produce due to the nature of its produce, which is perishable (Ginige et al. 2016, Zivenge and Karavina 2012, Shuklar 2011) The research also adopted the Supply Chain Operations Reference (SCOR) Model, which evaluates the sales and operational planning in supply chain management to understand the importance of an Integrated horticulture supply chain in

managing supply chain vulnerabilities. According to (Mangisoni, 2006), market information, particularly the price that is offered in the market, is key in farmers' decision-making with regard to which produce to plant. Lack of market information makes it difficult for smallholder farmers to know which products are needed in the market, time products are needed, what quantities/ quality are required, and at what price. Understanding the order requirements and market information all help in engaging in pre-planning and coordination for horticulture farmers. However, for these plans to be successful, it is important to establish the role that the horticulture supply chain relationship plays in order to ensure the successful implementation of the integrated horticulture supply chain. Utilizing the stakeholder influence supply chain management model by Mourtaka and Sabar (2022), this research identifies the key supply chain actors in the horticulture sector in Zimbabwe. Supply chain actors play a key role in the development of the economy (Dania, Xing, & Amer, 2018; Gereffi & Lee, 2012; Hsu, Choon Tan, Hanim Mohamad Zailani, & Jayaraman, 2013). The key horticulture supply chain players in this research include: input companies, farmer unions, extension officers, customers, money lenders, intermediaries, farmers, processors, regulatory bodies, government bodies, and marketing/support associations like ZimTrade and Non-governmental organisations.

The question is, will these supply chain actors provide valuable information and assistance to horticulture farmers that will enable them to plan and coordinate their activities? How many supply chains do we have in a district or province? Are they able to manage the existing horticulture farmers or enable new farmers to enter the horticulture business with ease? What support do these supply chains offer? Are there any strategies these supply chain actors have put in place to assist farmers in minimising supply chain vulnerabilities?

It should be noted that several horticultural supply chain models and theories have been suggested in the literature. Lewis' structural change theory, the Agriculture Supply Chain Network framework, the Stakeholder Influence on Supply Chain Management framework by Mourtaka and Sabar (2022), and the SCOR Model provide a theoretical scaffold for assessing the supply chain vulnerability in the horticulture sector in Zimbabwe. The resultant information obtained from horticulture market aspects and supply chain processes helped the researcher to develop an integrated horticulture model. The adoption of this model can help Zimbabwe meet its 2030 vision of an upper-middle income economy, together with meeting the Sustainable Development Goals (SDGs) 2 and 12 of zero hunger and responsible consumption, respectively.

1.6 Significance of the study

The challenges that small-scale horticultural farmers face are diverse and enormous, though in certain circumstances, they tend to gain some profits when market conditions are favorable and there is a shortage of supply of a particular produce in the market. Previous research (Magogo et al. 2015; Tschirley et al. 2015; and Zivenge and Karavina, 2012) shows that horticulture markets mainly examined constraints faced by horticulture farmers. Focus is mainly on how farmers lack access to capital, poor bargaining power, high transactional costs, and lack capacity to meet requirements, shortage of productive assets, labour shortages, and low education levels. While horticulture constraints can be relatively easily resolved, the issue of the dimension of food access remains unanswered in the literature; hence, the need to study the phenomenon of integrated horticultural markets.

The rationale for carrying out this study stems from the fact that as academics and researchers continue to analyse the subject of food security, which all nations have been focusing on, it is no longer a mere narrow focus on food supplies, but the focus has evolved to a wide range of access dimensions. Empirical research by (Mutemim and Sakwa, 2017; Joshi et al. 2023) shows that access to food by individuals is often a greater constraint than the availability of food itself. While there is enough evidence to show that horticultural produce is sufficient (Drechsler and Holzapfel 2022), the aspect of food access mainly depends on individual income, which is also influenced by access to produce, markets, prices, market channels, social markets, technology, and government support. Additionally, the UNCTAD report in (2015 states that food security and access are set as a national and global commitment, which is directed through agricultural national policies and programs to meet national levels of food production.

Although most cases, theories, and models proposed by researchers try to resolve small-scale horticulture supply chain vulnerabilities on a global or regional scale, the fact is that these vulnerabilities are localized and different. Therefore, they require separate research to understand geographic-specific aspects and resolve them in their unique manner. It is also significant to note that the findings of this study contribute to the body of knowledge of integrated horticulture supply chains in resolving supply chain vulnerabilities. The identified frameworks provide the facets and factors that amalgamate the concept of integrated horticulture supply chains, and this helped in resolving the research gap in the study.

This research also contributes to business practice for horticulture supply chain actors. The availability of an integrated horticulture supply chain necessitates the formation of a horticulture board similar to the grain food boards that have since been established in Zimbabwe. Once there are boards established and the supply chain process is regulated,

horticulture actors can experience sustainable livelihood as farm produce is the primary source of income for most players.

The research findings from this research also contribute to the development of horticulture agricultural policies. An aggregate horticultural policy and the formation of marketing boards by the government necessitate regulated prices and quality of produce, thereby safeguarding consumers' health and spending. Policy makers will be sufficiently guided in developing policies and programs that support horticulture farmers in Zimbabwe. Key farmer associations will clearly understand their role in making this system a success and thereby leading to improved productivity and income for farmers, better post-harvesting practices which minimise losses, enhance access to markets through stabilized prices, all leading to enhanced food security resulting in a sustainable horticulture economy in Zimbabwe. For instance, (Joshi et al. 2023; Govindan, 2018; Notarnicola et al. 2017; Hinrichs, 2003; Marsden et al. 2000) argue that regulating the horticulture industry also ensures that farmers benefit from agricultural commodities that they produce and players within the industry are also protected when engaging in business activities.

1.7 Research Design

In most social science research, quantitative, qualitative, and mixed research methods are commonly used. Saunders et al. (2015) postulates that quantitative research is usually based on quantity or impact of a phenomenon, and findings can be expressed numerically using statistics, percentages, and units of measurement. Whereas, qualitative research methods are used to gather in-depth information about a phenomenon and understand why situations or circumstances occur the way they do, rather than just making statistical inferences. Sanders et al. 2015; Silverman, 2016; Mishra and Alok, 2017 all agree that mixed methods research

combines qualitative and quantitative approaches to utilise the strengths that they both provide and mitigate weaknesses to come up with sound research.

This research took a qualitative exploratory survey approach. According to Rahi (2017) qualitative research method is the most preferred method when a researcher wants to uncover the feelings and emotions of study participants, which quantitative research methods usually neglect. Creswell (2007) also says qualitative research is particularly important when a researcher wants to understand and observe the environment in which the phenomenon is taking place to develop a theoretical framework. Therefore, to understand the opinions and feelings of small-holders horticulture supply chain actors semi-structured in-depth interviews were carried out with (input suppliers, producers, farmer associations, wholesalers and traders, processors and end users) on their views of how supply chain collaboration, coordination, relationship, information sharing can all influence an integrated horticulture supply chain.

The exploratory research method was preferred in this research as it provided insights that could further explain the integrated horticulture supply chain phenomenon and the vulnerabilities that are currently being experienced in the horticulture sector of Zimbabwe. The research results were very important in addressing the imminent problems that small-holding horticulture farmers are facing and helped in suggesting various strategies that could be used by various supply chain actors in these sectors to resolve supply chain inefficiencies. An integrated horticulture model was also suggested based on the qualitative research undertaken that could assist governments to formulate policies that will ensure horticulture farmers, its supply chain supports, and governments, the general public work together so that each player benefits from horticulture produce.

This research was also undertaken at various field days that were performed at farming areas to conceptualise the environment to which farmers are exposed in understanding the phenomenon of the integrated horticulture supply chain. Questions that were designed for both interviews and focus group discussions were in English because this was the most preferred language by the respondents. To ensure the research gets all the information required for this research, follow-up telephone interviews were also conducted with respondents who could not be found in their offices due to other commitments on the day of the interviews. Theoretical triangulation was also used by adopting the Lewin Structural Change Model, Supply Chain Operational Model, and the Stakeholder influencer supply chain model.

The information that was collected through in-depth interviews and focus group discussions was analysed using systematic thematic analysis. Caulfield (2019) states that thematic data analysis is used to examine qualitative data, categorising it into emerging common themes, patterns, and ideas. Naeem et al. (2023) proposes that systematic thematic analysis starts by transcribing quotes obtained from qualitative research, followed by identifying keywords in quotes, then codes are formulated, which leads to the formulation of themes that are used to develop different concepts that emanate from data. Models or diagrams can be used to show the relationships among concepts emerging from data, and then, finally, a conceptual model is developed, which is also supported by existing theories. The process of thematic data analysis allowed the researcher to have an in-depth understanding of existing theories of supply chain as well as understand the perceptions, feelings, and opinions of supply chain members on the phenomenon of integrated horticulture supply chain and its influence on supply chain efficiencies. This approach allowed the researcher to familiarise himself with available data in order to identify keywords that were used for coding to identify themes, verify them, to develop

a conceptual model for research that can be used by small-scale horticulture farmers in the agriculture sector.

1.8 Structure of research

This research is divided into five main sections:

Chapter one outlined the research background and scope of the study, followed by problem definition and outlining the research aims. Research objectives are also stated, highlighting the purpose of the research as well as the significance of the study to policymakers, the horticulture industry, and researchers. The research design that was used is also given in detail, and lastly, the structure of the research is provided to show the organisation of the study. Chapter two reviewed literature from different journals, authors, and books. The chapter begins by discussing the theoretical gap that exists in the integrated horticulture supply chain, followed by the researcher's views on why the integrated horticulture supply chain has become an important phenomenon for all countries studying to ensure food security by 2050. The concept of integrated horticulture supply chain is defined, highlighting existing theories and tenets. Literature review provides a holistic overview of the phenomenon under study and helps in the formulation of research questions that will be used to conduct interviews and focus group discussions. Chapter three presents the methodology that was used to assess the possible influence of an integrated horticulture supply chain on curd supply chain vulnerabilities in Zimbabwe. The methodological approach outlines the qualitative research methods that were used to collect data from participants. An interpretivist-qualitative research philosophy was selected because of its ability to capture the social aspects of the participants. Convenience and purposive sampling were used to select research participants. The chapter also included data collection techniques used in the research and a description of the thematic data analysis

process used in the research. Chapter four discusses the results of the research. It presents a diagram that shows the major findings that were obtained through interviews and observations. Interpretation of data was done, and authors who shared the same sentiments similar to that of the researcher were also included in discussing the research findings. Chapter five provides a detailed summary of the research findings, conclusion, and recommendations to the horticulture industry, specifically in Zimbabwe and other countries that have similar landscapes. This chapter ends by recommending that further studies be done in horticulture, which looks at sustainability and horticulture supply chains.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This section of the dissertation assisted me in discovering available literature that has been written by various authors and practitioners on the subject of integrated horticulture supply chain process and how this concept is linked to supply chain efficiencies. Having identified the major problem of supply chain vulnerabilities that are currently being experienced, especially by smallholder horticulture farmers in Zimbabwe, this literature review helped me to identify gaps in knowledge that this research seeks to resolve and advance this subject further. The chapter also includes disputed views from various sources on whether an integrated horticulture supply chain can improve supply chain efficiencies. Therefore, this section analyses the various supply chain theoretical model and the tenant of an integrated horticulture supply chain and provides new insights and information that contribute in achieving the research aims and objectives, thereby developing an integrated horticulture supply chain framework for small-holder farmers across nations especially in South Saharan Africa where geo-political, economic and environmental factors are almost similar.

With global population expected to reach 9.8 billion by 2050 and agricultural production and consumption to be 60% higher (Karunanayaka, 2020), horticulture production can no longer be left to the minor few but rather the majority, a focus for all governments in the world to develop strategies and tactics to meet this demand. Rapid urbanisation and sustained urban income growth are driving a transformation of African agrifood systems (Tschirley et al. 2015). In this process, new opportunities emerge for linking African horticulture farmers to expanding and changing urban food markets. A particularly intriguing outgrowth of this transformation is

the opportunities being created in domestic horticultural markets. Vegetable production by smallholder farmers has the potential to improve livelihoods through enhancing food security, employment creation, improving access to income, and general poverty reduction in most countries (Zivenge and Karavina, 2012).

Despite some challenges noted in the literature, integrated horticulture supply chains enforce internal mechanisms and develop chain-wide incentives for assuring the timely performance of production and delivery commitments (Shuklar, 2011). Horticultural markets are linked and interconnected by shared information and reciprocal scheduling, product quality assurances, and transaction volume commitments. Extensive pre-planning and coordination are required up and down the entire chain to affect key control processes such as forecasting, purchase scheduling, production, and processing programming to avoid unnecessary losses through precision farming and real-time communication across the chain. Adapting to technology to improve the agriculture supply chain has been identified as one solution. As the rest of the world is moving towards digital transformation, horticulture supply chains should follow suit to meet the current challenges they face (Timmer and Dawe, 2007).

Zamasiya et al. (2014) recommend that further studies be undertaken to understand the impact of integrated horticultural markets on supply chain vulnerabilities, particularly in developing countries. The author further notes that smallholder farmers in several developing countries have not yet adopted the practice of an integrated market due to inadequate research by scholars and practitioners. Therefore, to address this gap in knowledge this chapter starts by defining the concept of integrated horticulture supply chain and goes on to look at the various theoretical models, namely the Lewis structural change theory, Agriculture Supply chain Network

framework, Stakeholder Influence on Supply Chain Management framework and SCOR Model to understand the concept of horticulture supply chain process. A thorough review of these models and theories assisted the researcher to explore the tenants of horticulture supply chain to understand how marketing information affects precision horticulture farming, if order requirements affects transaction volumes, price and profit of horticulture produce, will horticulture supply chains pre-planning and coordination affect the successful implementation of an integrated horticulture supply chain process and what could be the notable constraints that supply chain players need to observe and manage before implementing the process. Horticulture markets are also critical in meeting both the SDGs and Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIM-ASSET) goals to enhance food security, access, and availability by 2030.

2.1 Conceptualization of horticulture supply chain

Horticulture is defined as the science and art of growing fruits, vegetables, flowers, or ornamental plants (Tigchelaar and Foley, 1991). The definition of horticulture encompasses (i) plants, thus the multitude of *"*products" (food, medicine) essential for human survival; and (ii) people, whose active and passive involvement with the garden brings benefits to them as individuals and to the communities and cultures. Horticulture in many ways occupies a middle-ground between nature as a force outside of man, untamed/wild, and culture as the dominion over all else (Relf, 1992).

Shepherd (1997) distinguishes between *market* information, which basically consists of data on prices and (sometimes) quantities, and *marketing* information. The latter is "a much wider concept, which is likely to include details on potential market channels, payment requirements,

packaging, quality, and a whole host of information required by a producer to make a successful sale, including market information". The author further disaggregates market (price) information into *current* and *historical prices*. The former is information, gathered and disseminated on a regular basis, on prices prevailing in chosen markets at the time in question. The latter is data compiled over a period of time and analysed to inform decisions about planting or storage, government planning, and early warning.

In addition, Lee (1984) proposed a concept of marketing extension workers (MEWs), whose job is to advise farmers on what crop and variety to grow in the coming season and at what time. Advice should cover new crops and market opportunities, plus forecasts of market trends and expected price movements, to assist farmers in their production planning. The role of MEWs is also to assist in the coordination between farmers and traders with farmer groups for staggered planting and marketing to avoid glutting of local markets (Lee, *ibid*).

Smallholder vegetable farmers in Africa's communal areas are faced with an array of marketing channels to use. These marketing channels include selling to urban horticultural central markets like Mbare Musika, selling at the farm gate, rural service centers, and roadside marketing. Most smallholder vegetable farmers in Africa prefer to market their produce at the farm gate. This is because this channel minimizes transaction costs as middlemen come to purchase at the farm with their transport. Yet, if the farmer chooses to transport their produce to Mbare Musika, they must look for the customers, incur transport costs, as well as compete to fetch a fair price for the day. In other instances, smallholder farmers might sell their produce to hawkers who would then sell at the roadside markets (Bindu and Chigusiwa, 2013).

An integrated horticulture system is meant to address the problems that are being faced by horticulture producers. There has been initiatives by Zimbabwe to revamp the horticulture markets through the development of a vegetable market at Mbare Musika, introduction of the Zimbabwe Agricultural Policy Framework (1995-2020) and the 2021 commercialisation program to curb the challenges that farmers were facing, but to date these initiatives have not yet resolved these problems. Ideally, the government of Zimbabwe would feel the urgency to resolve these problems, yet the question remains: what can or should be done for these programs to be a success? Countries like the United States (US) have, for the past seventy years, implemented agriculture policies, particularly in the food supply chain sector, and are still trying to perfect their policies. One of the major policies is centered on vertical coordination in a bid to abandon spot markets. Vertical coordination strategies used by the US include production and marketing contracts, joint ventures, strategic alliances, and franchising, which have resulted in the reduction of information asymmetry and the correction of some market failures.

It is critical to note that new government policy creates new problems or unpredictable outcomes due to improper information, implementation, and unfavourable conditions. The purpose of this research is to represent locally developed solutions to locally perceived problems, so that a diagnostic process of the horticulture sector in Zimbabwe is understood. Yet at times, there may be good strategies in literature and from other countries, but the political, social, cultural, economic, and geographical landscape in which these strategies operate is indeed different. Adopting them without a diagnostic research result in a mismatch and eventual failure.

2.2 Defining Integrated Horticulture Supply Chain Management

Jiang and Xu (2011) describe supply chain integration as the synchronisation of both the internal and external processes via strategic collaboration. The resultant model highlights the importance of overseeing materials, service flows, information flows, and cash flows to enhance customer value. This comprehensive strategy is vital for horticultural supply chains, as prompt information and resource management can greatly affect production and distribution effectiveness. According to Matsvange et al. (2016), integration of HSC is crucial for improving efficiency, sustainability, and responsiveness to market needs. Additionally, Zhuo et al. (2020) emphasize that successful supply chain integration can result in beneficial results for stakeholders, especially in agriculture.

Integrated Horticulture Supply Chain (IHSC) is essential in enhancing efficiency, sustainability, and increasing responsiveness to market demands. Various studies by Acquah (2023), Alves et al. (2019; Broek et al. 2019) address the dynamic facets of how integrated supply chains in horticulture can promote market access, resulting in value chain development, enhance information sharing, as well as help in the adoption of technology. IHSC also looks at the sustainability of horticulture activities as well as environmental considerations to pave the way for future directions. According to Mashapa et al. Mashapa et al. (2014), an IHSC system can result in the development of an effective value chain marketing system that enables the connection between smallholder farmers and consumer needs. Focusing on consumer needs promotes continuous innovation among farmers as they receive feedback from key actors in the horticultural value chain on what the customers prefer. An efficient value chain system leads to market power and profitability for farmers. Therefore, it is important to integrate the different stages of the horticulture supply chain to ensure that the production of vegetables aligns precisely with consumer demand, resulting in improved food access and livelihoods.

It can be noted that in the absence of an IHSC, most farmers suffer from losses incurred between harvesting and access to markets. Research that was done by Underhill et al. (2020) showed that Tonga's horticulture market suffered from postharvest losses due to inadequate market storage, as there was a lack of integration between farmers and other actors of the supply chain who could assist. The other contributor was poor infrastructure, which resulted in inefficiencies. The researchers then recommended that the farmers in Tonga needed to improve the integration of supply chain practices, which included better packaging and sourcing better storage solutions, if farmers had inadequate infrastructure, to improve market efficiency and mitigate postharvest losses. Understanding these dynamics underscores the importance of having a holistic approach to horticulture supply chain management that includes all stages, from production to consumption of produce.

As the concept of IHSC is gaining traction, the role of sustainability is coming into play. Mesa et al. Mesa et al. (2019) research shows that large European retailers are now promoting sustainable supply chain management through enforcing agreements with producers that act responsibly in producing their vegetables. That is, through organising production centred on social and environmental economy enterprises, retailers can now add value to the horticulture supply chain, also ensuring sustainable practices are practiced. These sentiments also align with Tarifa-Fernández et al. (2023) findings that highlight the importance of having environmental issues infused in the development of supply chain strategies when designing objectives to meet customer demands.

Jiang et al. (2021) further emphasize this argument by showing how combined horticultural methods can enhance sustainability in apple supply chains. Their research indicates that

implementing high-efficiency methods not only enhances economic advantages but also lessens environmental effects, highlighting the potential of combined strategies for attaining sustainability objectives. Use of technology in integrated horticultural supply chains is another important area that is emerging in farming. Fuentes (2023) states that the application of Agriculture 4.0 technologies, which include remote sensing and the Internet of Things (IoT), improves precision farming techniques. These technologies enable immediate data sharing, enhancing collaboration between supply chain partners and boosting overall effectiveness. Additionally, Harniati (2023) examines the feasibility of smart greenhouse technology in hydroponic agriculture, highlighting its ability to improve production and boost sustainability. The research indicates that incorporating cutting-edge technologies into horticultural methods can result in marked enhancements in IHSC efficiency.

However, though IHSC has its advantages, some changes persist. Chaudhuri et al. (2020) postulates that transparency and visibility are key for efficient risk management in supply chains. Notably, numerous horticulture supply chains continue to face challenges with information imbalance and insufficient coordination between partners. The researchers emphasise the need for continuous research to create frameworks that enhance integration and cooperation within horticultural supply chains. Given this research gap this research focused on examining the role of information sharing on precision farming, understanding the role of pre-planning and coordination in ensuring successful implementation of IHSC process efficiencies and current constraints hindering the implementation of an IHSC to develop a conceptual model of how best Zimbabwe can establish an integrated horticulture board that can spearhead an integration of all horticulture supply chain actors to enhance supply chain efficiencies.

2.3 Theoretical models underpinning Integrated Supply Chain Management

2.3.1 Structural Change Theoretical Framework

This research adopts the Lewis structural change theory, which was developed in 1955. Given that in Zimbabwe there is a drive to industrialise its economy, this model works best as a mechanism by which the country can transform the current domestic economic structure from heavily relying on traditional subsistence horticulture to a more organised horticulture supply chain that is governed by a horticulture board. Mutemi and Sakwa (2017) assert that the structural change theory is used by underdeveloped economies to transform the heavy dependence on subsistence farming to a more organised, modernised, and agile agriculture industry and service economy. Agricultural production on its own is not enough to result in an economic change, but there is a need to link production to marketing (Todaro and Smith 2012)

Advances in the genomic development and changes in consumer choices from social to ethical and health issues in the food industry have promoted an increasing interest in understanding and predicting how agriculture is now viewed (Drechsler 2022). These changes have been referred to as "industrialization" or "structural change" in agriculture (Susanto et al. 2023; Poray et al. 2003; Boehlje 1995). Although there seem to be several dimensions that these changes take, the transition that is inclined to vertically coordinated relationships has been observed in the United States (US) food market system. It can be noted that, traditionally, agricultural markets have always been coordinated either through open or spot markets, where market prices would depend on the supply and demand of the produce at that particular time and place. However, recently the agriculture sector has witnessed a structural change in favour of a more organised vertical coordination (Zhuo et al. 2020; Ye et al. 2017; Zhang and Chen, 2013).

2.3.2 Multi-Agent Systems in Supply Chains

According to Multi-Agent Systems in Supply Chains, transitions towards vertical coordination lead to improved efficiency and buyer and supplier relationships Fauzan et al. 2023; Sultana, 2022; Reardon and Zilberman, 2017). The multi-agent system framework emphasizes the role that various agents, like farmers, distributors, and retailers, play in the supply chain, emphasizing the need for collaboration and communication among supply chain stakeholders. A central tenet of the Multi-Agent Systems is the aspect that the agent, who can be the farmer, can act contrary to the needs of the buyer, who can be the distributor or wholesaler, thereby affecting the flow of agricultural produce. Therefore, the main aim is to develop a contract that includes the interests of both the supplier and buyer, meeting each agent's needs in the process.

According to Stahl (2022), to achieve this efficiency throughout the supply chain, a tighter contract that is well coordinated across the supply chain needs to be implemented. However, structural change may also arise due to new discoveries by suppliers themselves. These also need to be coordinated as they may result in changes in market requirements, creation of new skills, and a shift in market arrangement.

According to Siddh et al. (2017) integrated horticulture market incorporates the major elements of market aspects (price, quantities) and marketing aspects (market channels, payment requirements, packaging, quality) with supply chain management techniques. Where market information consists of data on prices and (sometimes) quantities, whereas marketing information is a much wider concept, which includes details on potential market channels,

payment requirements, packaging, quality, and a whole host of information required by a producer to make a successful sale, including market information.

2.3.3 Stakeholder Influence on Supply Chain Management Theory

Mourtaka and Sabar (2022) proposes a framework that can be used to identify the key stakeholders in agriculture supply chain management adoption and their influence. The authors propose that each stakeholder has a motive and drive that push them to continue to do business the way they do. The authors also distinguish between coercive and normative pressure, where the former denotes the influence of internal stakeholders like shareholders and investors on the operations of the business, whereas the latter denotes the pressure that is given by external stakeholders like the government authorities or customers. In their research, the following key stakeholders were identified as influencing agriculture production: customers, government, suppliers, shareholders, employees, competitors, financial institutions, NGOs, unions and social groups, media, and press, as shown in Figure 2.1 below.

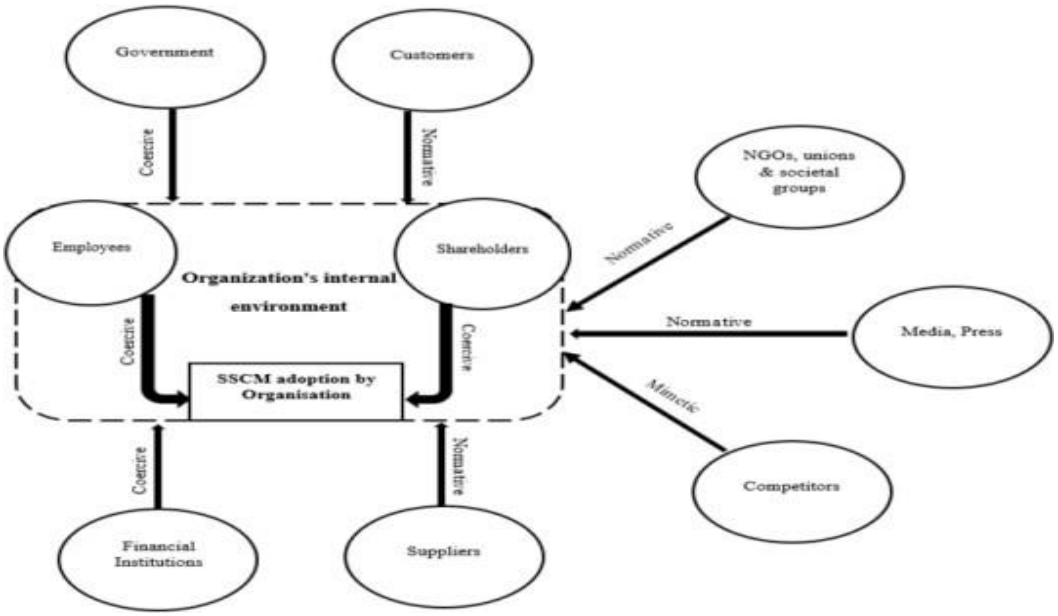


Figure 2.1: Key stakeholders, Adopted from Mourtaka and Sabar (2022)

According to Ciliberti et al. (2014) pressure that is exerted by customers usually depends on the type of customers. In most cases, large companies and public companies exert pressure on suppliers because of high bargaining power (Elg and Hultman 2011). The government is one of the key stakeholders as they establish legal frameworks and protects public interests in ensuring that businesses operate ethically. Governments can provide tax incentives to companies in the horticulture industry to encourage production. They can also provide land for agriculture or form contract farming, as they are the custodians of the land. Their influence on business operations is unmatched as they have the final say in what the business should do to operate (Andersen and Skjoett-Larsen 2009).

In the agriculture sector, suppliers are mostly the growers of the product. They try to match the requirements of the market with the demand for food produce, and in most cases, try to anticipate which markets pay more. The bargaining power of suppliers is low when there is oversupply in the market, and it becomes high when the product is in demand or in short supply. Hence, balancing these inconsistencies becomes important for food access and availability. According to Mourtaka and Sabar (2022), shareholders exert more pressure on organisations when the company is not performing well. Some investors and shareholders threaten to withdraw their investment when companies are making a loss. It is important to ensure that shareholders' interest in return on investment is met when companies are being funded by investors. Employees have been indicated by Mourtaka and Sabar (2022) to put pressure on an organisation when it comes to safety in the organisation. The horticulture sector is no exception, as some farm workers use pesticides and chemicals in growing vegetables.

Competition among horticulture producers has also increased among farmers as the industry has low entry requirements (Fuentes 2023). This has put more pressure on some farmers to

adopt different strategies to have a competitive advantage in the market. Horticulture farmers, especially in first-world countries, have adopted sustainable farming practices to outcompete their opponents (Fu et al. 2018). Financial institutions have also been seen as exerting pressure on horticulture organisations through requirements that are needed for funding. Mourtaka and Sabar (2022) postulates that some financial institutions can cut sending if organisations are not performing well in the market. However, studies by (Kirsten and Sartorius 2002; Egwu 2016; Houensou et al. 2021).show that have been made in Africa show that smallholder horticulture farmers do not usually access funding due to a lack of collateral security, greatly impacting their productivity. Media press, NGOs, social groups, and unions have also been seen as having significant pressure on company operations as they transmit business operations to the public on have pressure groups stop some company initiatives.

This framework was adopted in this research as the researcher recognized the diverse interests and motivations of different key stakeholders in the horticulture sector in Zimbabwe. The key stakeholders that were included in the research include: input companies, farmer unions, extension officers, customers, money lenders, intermediaries, farmers, processors, regulatory bodies, government bodies, and marketing/support associations. Figure 2.2 below shows the key stakeholders in the horticulture supply chain in Zimbabwe. By understanding the stakeholder dynamics, strategies can be developed to align the interests of all parties involved.

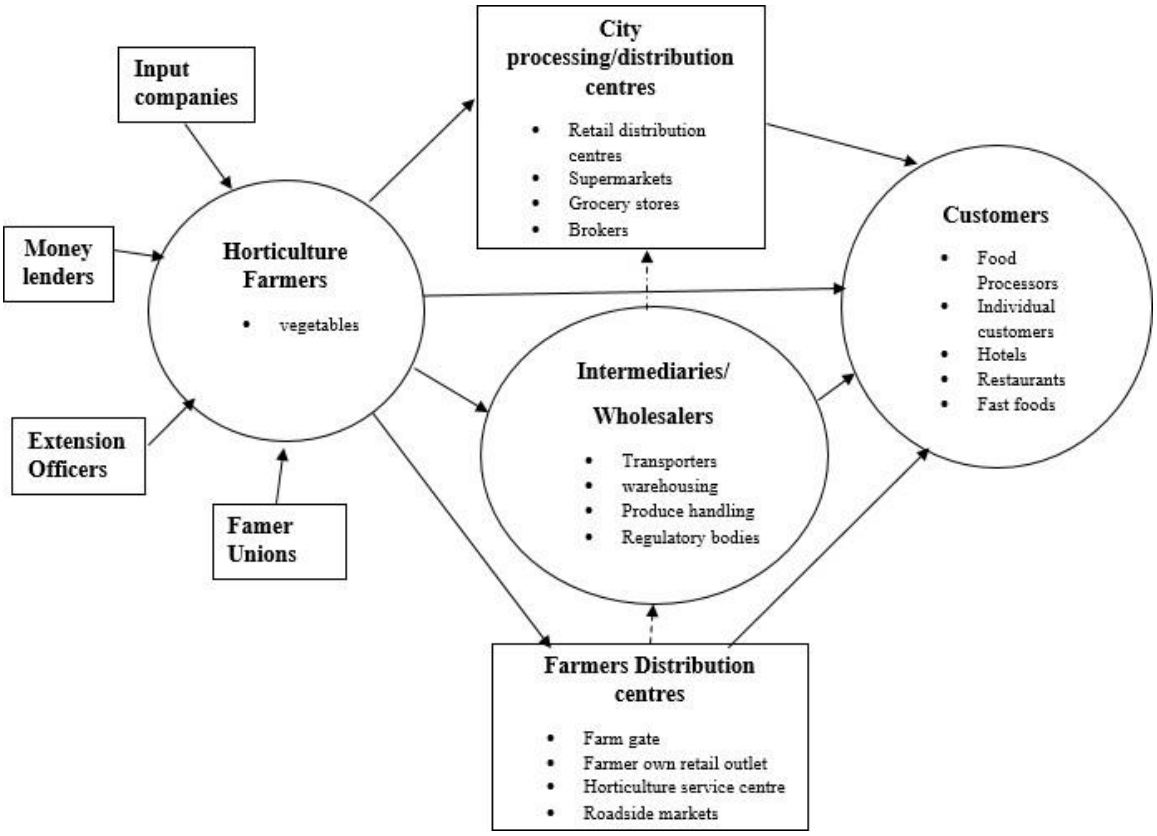


Figure 2.2: Key stakeholders in the Horticulture supply chain in Zimbabwe

2.3.4 The Supply Chain Operational Model (SCOR)

Yusianto et al. (2022) postulates that the business environment is dynamic and emerging competition has pressured organisations in the horticulture sector to design more efficient SCM strategies. The most important aspect is how well horticulture farmers and players can detect changes in SC and manage them to ensure SC performance efficiency.

The SCOR model is a systematic and measurable method that is used to measure SC performance (Yusianto et al. 2022). The model combines benchmarking, business process engineering, metrics, and leading practice in one single framework. In the SCOR model which is shown in figure 2.3 below; SCM is defined as an integration of various process which include; Plan, Source, Make, Deliver, Return and Enable from horticulture farmer to customer

in line with operational efficiency, strategy, work materials and information flow (Arjuna et al. 2022).

Planning involves creating SC strategies and developing activities to achieve them. Activities include determining demand and supply plans, coming up with a sourcing strategy, and developing inventory plans. The source looks at all the processes of procurement of goods and services that are needed to meet forecasted demand. This stage involves selecting suppliers, designing contracts, ordering, and managing supplier relationships. The make process is the stage of transforming raw materials into final products to meet planned demand. Activities may include packaging, equipment maintenance, production planning, and staging. The aspect of Deliver centres on fulfilling delivery requirements as per request. Activities include transportation, invoicing, distribution, and receiving orders. Some of the most important activities would include customer care management, management of product life cycles, product requirements (import and export documentation), as well as managing inventories of finished products. Return stage involves the ability of the company to manage defective products that are sent back and their ability to have sustainable practices, such as recycling and proper disposal areas. Companies need to be aware of regulatory requirements, business rules, and manage reverse logistics in the least expensive manner. Return process also extends to after-sales services and customer follow-ups to maintain and retain business.

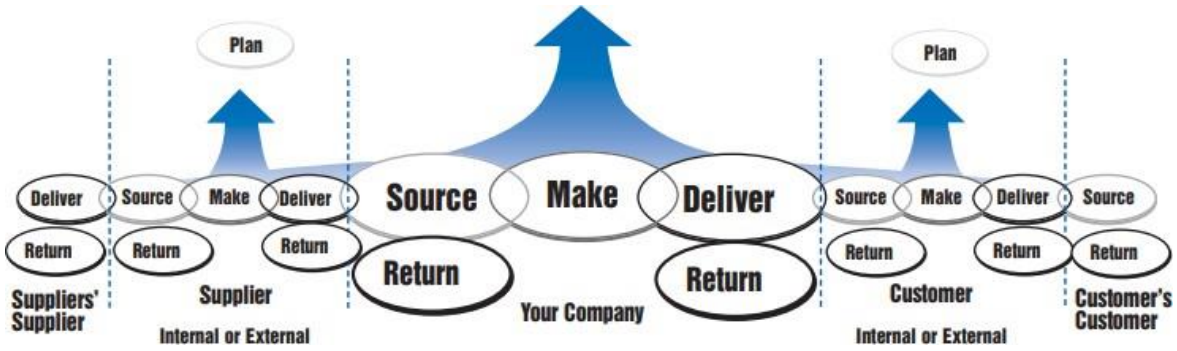


Figure 2.3: SCOR model. Adopted from Supply Chain Council (2008)

The SCOR model has three levels of process detail. Level one looks at the number of SCs and how their performance is measured, as well as competitive requirements. Level two looks at the planning and execution of SC strategies, the material flow using standards such as make to stock, make to order, and engineer to collect. The third level looks at business processes and systems that are used to perform orders, purchases, sales, work orders, replenishments, returns, and forecasts. Though level four is not available in the model, Yusianto et al. (2022) proposes that the model should be implemented and monitored for further improvements to be made or anticipate any changes.

In a research that was done by Yusianto et al. (2022) in Wonosobo district, potato agroindustry SC performance measurement consisted of six aspects, namely, Plan, Source, Make, Deliver, Return, and Enable, with 23 Key performance indicators. The researchers used the system dynamics (SD) simulation and SCOR model to improve the SC efficiency in the potato agroindustry of Wonosobo district. Results show that the SC value for January to March 2022 was 71.01%, indicating that the average measurement results were suitable for the category. The results of this research also showed that there was a reduction in labour costs in the three months of IDR 600,000 and an increase in efficiency of 11.8%. The researchers further recommended that this model can be used to increase SC efficiency in the horticulture industry.

The SCOR model was adopted in this research, and all six elements were utilised. Borrowing the works of Yusianto et al. (2022), the following SCOR matrix shown in Table 2.1 below was adopted, and investigations were made through interviews to understand the influence of integrated horticulture supply chain on SC vulnerability.

Table 2.1: SCOR Matrix

SCOR level 1	**SCOR level 2**	**SCOR level 3**
Plan	Plan Source	Plan Source Cycle Time
Source	Source Stocked Product	%Product Transferred on time to demand requirement
		%Order/lines received with the correct content
		%Order/lines received damaged free
		Transfer product cycle time
		Verify product cycle time
		Purchased Material Cost
Make	Make to Order	Produce cycle time
		Production Labour Cost
		Transportation Cost
Delivery	Deliver Make to Order Product	Delivery Item Accuracy
		Delivery Quantity Accuracy
		Customer commit date achievement time customer
		Delivery Location Accuracy
		Order delivered damage free conformance

		Shipping documentation Accuracy
		Receive & verify product by customer cycle time
		Current Delivery Volume
Return	Deliver Return Defective Product	Current Customer Return Order Cycle Time
		Current Delivery return Volume
Enable	Manage SC Human Source	Capacity Utilization

- **2.4 The influence of sharing marketing information on precision horticulture supply chains.**

The incorporation of information exchange and precision agriculture in horticultural supply chains is vital for boosting productivity, sustainability, and market adaptability. The area of precision farming is receiving increasing attention in integrated horticulture supply chain management. The subsequent journals offer important perspectives on how these components interact and enhance the overall effectiveness of horticultural supply chains.

Chen (2011) research study examine the dynamics of information exchange in rival supply chains facing demand asymmetry. This research shows that exchanging demand information can enhance profits for supply chains, which is essential for horticultural producers who depend on precise market data to make knowledgeable choices regarding production and distribution. This is in line with the concepts of precision agriculture, where decisions based on data are crucial for enhancing resource efficiency and boosting production. Chen (2011) research

highlights that sharing demand data can greatly enhance overall profitability. This discovery is especially significant in horticulture, where market demand can change swiftly, and up-to-date information is crucial for growers and sellers to make knowledgeable choices. In a similar vein, Susanto et al. (2023) emphasize that collaborative networks within Indonesia's fresh vegetable supply chain gain from better information sharing, resulting in enhanced performance outcomes. Their study highlights the importance of sharing strategic resources and information among supply chain partners to enhance collaboration.

The exchange of information in horticultural supply chains is a vital element that improves operational efficiency, responsiveness, and overall performance of the supply chain. The literature offers significant proof regarding the value of efficient information-sharing methods between supply chain partners in the horticultural industry. Zhang et al. (2011) highlight the importance of integrating information among supply chain companies to minimize uncertainty and effectively manage risks. They contend that exchanging knowledge and resources among supply chain participants is crucial for guaranteeing seamless operations and improving overall performance. This is especially pertinent in horticulture, where prompt information can greatly influence production and distribution choices. Additionally, Williams et al. (2013) agrees that information sharing can enhance supply chain visibility and help improve responsiveness. Their research indicates that thorough information exchange between purchasers and suppliers can improve the supply chain performance can be improved. This aspect of information sharing is very important in horticulture, where the perishable nature of goods requires prompt information sharing to oversee stock and minimize waste.

The effect of information exchange on trust and commitment in supply chains is likewise considerable. Lee and Kim (2023) contend that successful information sharing is essential for establishing trust and collaboration between supply chain partners. Their results indicate that prompt and precise information sharing is crucial for efficient operations and relationship management in horticulture. Huo et al. (2016) further endorse this idea by showing that firms such as Wal-Mart utilize information sharing to improve supply chain efficiency and responsiveness, especially significant for perishable goods in horticulture. Moreover, the study conducted by Baah et al. (2021) highlights that sharing information is an essential aspect of partnerships in the supply chain, allowing collaborators to achieve competitive benefits. Their results suggest that improved visibility via information sharing results in better supply chain practices and performance results. This is backed by the research of Zhang and Chen (Zhang and Chen, 2013), who emphasize that vertical information sharing can greatly lower supply chain expenses and enhance overall performance.

Conversely, Molla et al. (2010) examine the integration of e-business practices among horticulture farmers in supply chains, revealing a restricted adoption in the trading of agricultural products. Their research suggests that the horticulture industry has not completely adopted e-business practices, which could improve information sharing and integration throughout the supply chain. Furthermore, the research conducted by Jraisat et al. (2013) demonstrates the importance of information sharing within the agri-food export supply chain in Jordan. The authors observe that contemporary information technologies, like Electronic Point of Sales and Internet-Based Electronic Data Interchange, enable efficient information exchange between suppliers and purchasers, essential for sustaining a competitive edge in the horticultural industry. Engel et al. (2014) also echo this sentiment, stating that sharing

information is a vital strategy for attaining greater performance improvements in supply chains, even though numerous companies continue to restrict their sharing to transactional data.

Zhang et al. (2011) stress the importance of integrating information among supply chain companies to minimize uncertainty and manage risks efficiently. They contend that exchanging information and resources between supply chain participants is crucial for maintaining seamless operations and improving overall performance. This is especially important in horticulture, where prompt information can greatly influence production and distribution choices. Fu et al. (2018) research examine a two-tier agricultural products supply chain comprised of one company and a farmer. Their research highlights the significance of risk management and coordination strategies within agricultural supply chains, especially in developing countries. This study builds on earlier findings regarding supply chain coordination and emphasizes the significance of weather index insurance as a risk transfer tool, vital for farmers utilizing precision farming methods. Handayati et al. (2015) also presents an extensive review of coordination in agri-food supply chains, highlighting the scarce application of integrated planning models within agricultural supply chains. Their research highlights the need for better coordination methods that integrate precision agriculture technologies to boost overall supply chain efficiency.

Current research by, Ahmad (2023) research analyse employee views on information sharing and its effect on supply chain effectiveness. The study emphasises that successful logistics integration and information exchange among supply chain participants are crucial for managing the movement of materials from suppliers to clients. The research findings from Ahmad (2023) research show that when companies share strategic information, it improves decision-making abilities and operational effectiveness. Therefore, this case study highlights the significance of

promoting a culture of information exchange in horticultural supply chains to enhance performance.

Additionally, Thomassen et al. (2018) investigated the significance of information sharing in the preparation of supplier kits. The research highlights that efficient information exchange is essential for improving cooperation and integration in the supply chain. The researchers discovered that providing precise and prompt details about kit preparation notably enhances operational efficiency and minimizes mistakes. As such, this case study demonstrates how sharing information can enhance efficiency in horticultural supply chains, especially when various suppliers are engaged. Sundram et al. (2020) also looked at the impact of information technology, sharing information, and integration in the supply chain on the performance of supply chains. The research indicates that optimal supply chain performance is attained by effectively sharing information throughout the supply chain. The major highlight of the research is the importance of senior management engagement in the development of IT strategies to improve supply chain flexibility. As a result, this case study emphasizes the essential importance of information exchange in attaining superior performance in horticultural supply chains.

On the other end, Huo et al. (2016) examined the factors and effects of supply chain information integration from a resource-based perspective. The study shows that obtaining and disseminating data throughout the supply chain is essential for businesses to compete successfully. The research indicated that companies that achieve greater information integration see enhanced performance results. Therefore, the case study highlights the significance of sharing information to improve the resilience and competitiveness of horticultural supply chains. While, Blackhurst et al. (2018) researched and evaluated the supply

chain vulnerabilities through a method that utilizes network visualization and clustering analysis. The study emphasises that comprehending the interrelations in supply chains can lead to improved information sharing methods. By pinpointing weak nodes in the supply chain, managers can distribute resources more efficiently and improve information sharing approaches. This case study highlights the significance of tackling vulnerabilities by enhancing information exchange in horticultural supply networks.

Research by, Fuentes (2023) emphasises the importance of new digital technologies in precision agriculture, improving information sharing throughout the supply chain. Technologies like remote sensing and the Internet of Things (IoT) promote instant data sharing, enhancing collaboration among supply chain partners and boosting overall productivity in horticultural production. Mesa et al. (2021) also suggest a framework for supply chain management that highlights the significance of cooperative relationships and information exchange among stakeholders. Their study shows that successful communication and collaboration are essential for reaching sustainability objectives in the agrifood supply chain, especially regarding precision farming methods. A more recent phenomenon in the fourth industrial revolution is the application of artificial intelligence (AI) in the farming business. Neethirajan (2023) research looked at the impact of artificial intelligence and sensor technologies in precision agriculture, suggesting creative solutions to enhance productivity and optimize supply chain processes. While centred on livestock, the concepts of precision agriculture and technology application are also relevant to horticulture, where real-time oversight and data-informed choices can improve operational efficiency. Another research by Alcívar-Espín (2023) introduces a flow-oriented model for complete integration in high-end product supply chains, highlighting the necessity of a systematic method to handle intricate

supply chain dynamics. This model can act as a structure for horticultural supply chains seeking to reach greater levels of integration and responsiveness to market needs.

While, Ye et al. (2017) concentrate on supply chains in contract farming featuring uncertain yield and demand, suggesting coordination strategies based on the Conditional Value-at-Risk (CVaR) framework. Hasan and Habib (2023) explores new technologies in agricultural supply chain management, emphasizing how precision farming enhances coordination from production through to delivery. Their research indicates that utilizing technology is crucial for improving the efficiency and effectiveness of agricultural supply chains. Harniati (2023) research examines the feasibility of smart greenhouse technology for hydroponic agriculture, highlighting how precision agriculture technologies (PATs) can enhance inputs and lower expenses. Incorporating these technologies into supply chain management can improve coordination by enhancing production efficiency and quality. This corresponds with the requirement for improved coordination systems to handle risks linked to product leakage and expiration throughout the supply chain.

Mashapa et al. (2014) performed a case study exploring the market potential of horticultural products among smallholder farmers in Zimbabwe. The research highlights the significance of exchanging information between farmers and traders to boost market access and increase profitability. The study proposes that improved communication and information sharing can help smallholder farmers align their production with market needs, thus boosting their competitiveness in the horticultural supply chain. This research by Mashapa et al. (2014) is supported by Underhill et al. (2020) research, which looked at postharvest losses in the horticultural market of the Solomon Islands, emphasizing the impact of information sharing on

mitigating these losses. The research indicated that insufficient knowledge about storage and handling methods led to considerable postharvest losses. The study indicates that enhancing information exchange among stakeholders like farmers, vendors, and transporters could help reduce these losses. This case study emphasizes the essential requirement for efficient information exchange to improve supply chain effectiveness in horticulture. Information sharing in the horticultural supply chain is crucial for improving production and increasing efficiency.

In conclusion, available literature sources distinctly show that efficient information sharing is essential for improving the performance and resilience of horticultural supply chains. It promotes teamwork, cultivates trust, and facilitates prompt decision-making, all of which are crucial for managing the intricacies of the horticultural market.

2.5 The role of collaboration in ensuring the successful implementation of an integrated horticulture supply chain process.

The management of supply chains in horticulture is an essential field of study, as it has a direct effect on efficiency, product quality, and market adaptability. Cooperation in horticultural supply chains is progressively acknowledged as an essential element for boosting efficiency, sustainability, and competitiveness. Successful teamwork among supply chain partners can enhance decision-making, encourage resource sharing, and stimulate innovation, ultimately benefiting everyone involved.

Collaborative efforts among different stakeholders, such as producers, distributors, retailers, and consumers, are essential for integrated horticulture supply chains. Efficient collaboration and coordination methods can help tackle issues like consistent supply volume, quality control, and information exchange among stakeholders. The culture of collaboration is essential in all

horticultural supply chains. Acquah (2023) is of the view that a robust collaborative culture is essential for effective supply chain collaboration, while Wichitpong et al. (2018) also points out that collaborative efforts can lead to companies attaining a competitive advantage against their competitors. Wichitpong et al. (2018) research findings show that promoting a cooperative culture among supply chain partners can result in improved operational efficiencies, especially in the handling of supply uncertainties, and increase operational flexibility.

Chen et al. (2013) defines supply chain operational risk mitigation as a collaborative strategy that is used among supply chain partners. The researchers' empirical evidence supports the notion that collaboration is essential for managing risks effectively. This is particularly relevant in horticulture, where collaboration among producers, distributors, and retailers can help mitigate risks associated with perishability and market fluctuations. It can be noted that collaboration in horticultural supply chains does not focus on operational efficiency only, but also on sustainability. Within the framework of horticulture sustainable practices, Alves et al. (2019) present a review of literature on supply chain coordination, emphasizing the unification of environmental, social, and economic objectives. The results of this research indicate that sustainable supply chain management (SSCM) needs clear coordination mechanisms that harmonize the interests of all parties involved. This phenomenon is especially important in horticulture, where sustainability is being given greater emphasis.

Mesa et al. (2019) explore the response of fresh food suppliers to sustainable supply chain management practices implemented by large European retailers. Their findings suggest that fostering strong relationships between retailers and horticultural producers can lead to

improved sustainability outcomes. This aligns with the work of Cheung and Rowlinson (2011, who emphasize the importance of relationship management in achieving supply chain sustainability. They argue that trust developed through interpersonal encounters is fundamental for effective relationship management, which in turn enhances supply chain performance. This is supported by (Shin et al. 2019), who contends that collaboration based on partnerships promotes innovation and dedication, resulting in improved firm performance. These insights are essential as the horticultural industry increasingly emphasizes sustainability in its practices.

In another research, Mesa et al. (2021) explored management approaches and cooperative partnerships for sustainability within the agrifood supply chain, concentrating on Spain's horticultural industry. The research discovered that cooperative actions among stakeholders result in better sustainability results, including diminished environmental effects and increased social responsibility. The authors highlight that incorporating sustainability into supply chain strategies necessitates robust cooperation among all stakeholders. This case study demonstrates how working together can promote sustainability in horticultural supply chains. A more recent research by, Tarifa-Fernández et al. (2023) investigate the factors influencing environmental sustainability in horticultural supply chains. The research highlighted that the conduct of suppliers and customers varies, requiring distinct strategies to manage relationships successfully. The results indicate that customers centralize their decision-making authority within the supply chain, affecting the overall responsiveness of the supply chain to customer demand. This case study demonstrates how interconnected relationships between stakeholders can foster environmental sustainability in horticulture.

Another phenomenon that has promoted a collaboration strategy among the horticulture supply chain is contract farming. Contract farming has surfaced as an important method for incorporating smallholder farmers into contemporary supply chains. The idea of supply chain coordination is examined in greater depth through different contractual methods. Cai et al. (2014) examine how effective return contracts are in coordinating supply chains, proposing that these contracts can improve operational efficiency. This is supported by the research of Hu and Feng (Hu & Feng, 2017), who examine revenue-sharing agreements in uncertain conditions, highlighting the significance of financial incentives for coordination among supply chain participants. Mesa et al. (2019) case study research also revealed that retailers significantly influence supplier relationships by endorsing contracts that reconsider direct buying methods. By structuring production and sales based on social economy enterprises, retailers can enhance the value of the sustainable supply chain. This case study emphasizes the significance of partnership dynamics in reaching sustainability objectives in horticultural supply chains.

According to Ayvaz-Cavdaroglu et al. (2021) payment systems that are focused on quality have been seen to motivate farmers to invest in horticulture planning and developments that subsequently boost overall performance in the supply chain. Ayvaz-Cavdaroglu et al. (2021) research indicates that contracts that are effectively structured can enhance coordination between producers and buyers, guaranteeing the achievement of quality standards that is mostly required in the marketplace.

Xie et al. (2023) current analysis into the mechanics of contract farming analyse the types of contract structures that are most effective in encouraging high-quality output. The study by Xie

et al. (2023) indicates that it is vital to have contract frameworks that foster a connection between farmers and agribusinesses' business interests to achieve integrated supply chain goals. Alves et al. (2019) also performed a review on sustainable supply chain coordination within Brazilian horticulture. The research highlighted the significance of sharing information as a crucial factor for successful collaboration among supply chain participants. The researchers discovered that clear communication and cooperation among stakeholders result in better sustainability results and improved performance in the supply chain. This case study emphasizes the vital importance of sharing information to enhance coordination in integrated horticulture supply chains.

Strobeck et al. (2023) also conducted research in Queensland, Australia, and examining horticulture producers' readiness to engage in contract-based supply chain collaboration. The research revealed that there are a number of difficulties, such as sustaining supply quantities, guaranteeing product quality, and promoting information exchange among stakeholders. These results from Strobeck et al. (2023) research indicated that contractual arrangements may improve vertical coordination, aiding in the resolution of supply chain issues. Thus, this case study highlights the significance of well-defined contracts in enhancing collaboration and boosting supply chain efficiency in horticulture. In another study, Jiang et al. (2021) investigated integrated horticultural methods to enhance sustainability in apple supply chains within the North China Plain. The research examined the existing conditions of economic advantages and environmental outputs in apple cultivation, emphasizing the necessity for improved collaboration among stakeholders to reach sustainability objectives. The authors discovered that teamwork among farmers, distributors, and retailers can greatly improve both economic and ecological results. This case study demonstrates how collaboration can promote sustainability in horticultural supply chains. Peng et al. (2022) also evaluated the coordinated

revenue-sharing agreement within China's farmer-supermarket direct-purchase framework. Their study demonstrates how transaction cost theory can be utilized to tackle vertical coordination issues in agricultural supply chains, highlighting the significance of forming stable cooperative partnerships between farmers and retailers.

In regional Africa, Verhofstadt and Maertens (2013) analysed modernization trends in horticultural food value chains in Rwanda. The research emphasized the significance of vertical coordination and quality differentiation in increasing value addition within local horticultural chains. The researchers discovered that enhanced collaboration between producers, processors, and retailers results in improved market access and greater profitability for smallholder farmers. This case study highlights the significance of coordination in promoting modernization and economic growth within horticultural supply chains.

Another important phenomenon in the integration of supply chain strategies is enhancing relationships among stakeholders. Ralston et al. (2014) present a structure-conduct-performance perspective, illustrating how strategic supply chain integration affects firm performance. They argue that effective relationship management requires cross-functional processes and appropriate levels of information sharing among supply chain partners. This perspective is echoed by (Mesa et al. 2021), who assert that supply chain strategy serves as the foundation for successful supply chain management, particularly in the context of collaborative relationships. Susanto et al. (2023) further highlight the importance of collaboration in supply chain relationships, illustrating how collaborative networks can greatly influence supply chain performance. Their research suggests that a collaborative performance system is essential for ensuring business continuity and enhancing relationships between supply chain partners. This

is backed by the study conducted by (Shin et al. 2019), which emphasizes the significance of collaborative partnerships in fostering innovation and dedication within supply networks.

Additionally, the concept of coopetition—where firms engage in both competitive and cooperative relationships—has been explored in the horticultural sector. Wood (2012) discusses how New Zealand companies in the horticulture industry utilize coopetition to enhance their market presence, indicating that such relationships can lead to mutual benefits for all parties involved. Kong and Rönnqvist (2014) examined the relationship between strategic management and tactical logistics within the forestry supply chain, highlighting similarities in horticulture. The research highlighted the importance of implementing effective coordination strategies to assist autonomous business units in their planning and operations in manners that enhance the overall supply chain. The results indicate that strong coordination can improve resilience and flexibility when dealing with market changes and environmental issues. This case analysis highlights the significance of coordinated planning in horticultural supply networks.

Wilhelm (2011) examined the idea of coopetition—where companies partake in both competitive and collaborative relationships—within horticultural supply chains. The research examined how horizontal supply chain relationships can improve collaboration and performance. The results indicate that effectively handling coopetition enables companies to utilize common resources and expertise, resulting in enhanced supply chain results. This case study demonstrates the intricate nature of collaboration in horticulture, where companies need to find a balance between competitive and cooperative forces. Cao and Zhang (2010) carried out research that explored the influence of supply chain collaboration on collaborative

advantage and company performance in the horticultural industry. Their empirical results show that successful teamwork enhances collaborative processes that advantage all participants in the supply chain. The research highlights that managers can utilize established indicators of collaboration to improve operational efficiency and effectiveness. This case study highlights the significance of organized teamwork in obtaining competitive benefits in horticulture.

Schoolmen and Schiller (2015) examined how collaboration contributes to improving supply chain resilience. Their case study analysis showed that certain collaborative actions, like joint problem-solving and information exchange, greatly impact the resilience abilities of supply chains. The researchers discovered that companies that actively participate in collaborative activities are more prepared to address disruptions and uncertainties within the supply chain. This case study emphasizes the essential importance of teamwork in creating robust horticultural supply chains.

Chen et al. (2013) also examined a cooperative method for reducing operational risks in the supply chain. Their case study showed that cooperation among supply chain partners is essential for effectively managing risks. The authors discovered that collaborative initiatives to exchange information and resources can greatly decrease vulnerabilities within the supply chain. This case study highlights the significance of teamwork in strengthening the resilience of horticultural supply chains against operational hazards. Baah et al. (2021) explored how supply chain collaboration affects visibility, stakeholder trust, and overall performance within the horticultural industry. Their study concluded that efficient teamwork increases transparency throughout the supply chain, resulting in heightened trust among participants. The research highlights that sharing precise and prompt information is crucial for reaching

collective objectives. This case study emphasizes the significance of transparency in promoting cooperation within integrated horticulture supply chains. Finally, the importance of building quality, trusting relationships among supply chain partners is indispensable. These relationships not only satisfy consumer demands but also foster trust among chain members, which is critical for navigating challenges within the supply chain.

Furthermore, the importance of technology in improving supply chain coordination is highlighted by the study of Wang and Xu (2014), who suggest a Bayesian combination forecasting model to enhance coordination within retail supply chains. Their model emphasizes the significance of precise demand forecasting in enhancing coordination and decision-making. Ultimately, the research conducted by Timsina et al. (2016) highlights the importance of strategic alignment in coordinating supply chains, especially regarding agricultural goods. The authors contend that efficient coordination strategies should take into account the interconnections among various phases of the supply chain to enhance overall efficiency. Essential importance of cooperation in unified horticultural supply networks. Main discoveries highlight that productive teamwork improves operational efficiency, resilience, visibility, and sustainability. Future studies ought to persist in investigating creative cooperative approaches and structures that can enhance the effectiveness and durability of horticultural supply chains.

Moreover, the significance of technology and the flow of information in promoting collaboration should also not be ignored. Molla and Peszynski (2011) explains that better information sharing boosts coordination among supply chain participants, which is crucial for successful collaboration. This is supported by results from Susanto et al. (2023), which show a positive correlation between collaborative networks and supply chain performance regarding

fresh vegetable products. This research study shows that exchanging information and resources in collaborative networks greatly improves performance indicators. Qiu-zheng (2010) analysed the application of Vendor-Managed Inventory (VMI) as a collaborative strategy in promoting integrated horticulture supply chains. The research discovered that VMI improves cooperation between suppliers and retailers by enabling suppliers to control inventory levels using real-time sales information. This study demonstrates how VMI can enhance coordination, decrease stock outs, and boost overall supply chain efficiency in an integrated horticultural industry. Gan and Huang (2022) emphasised the need to have collaborative strategies that have dual-channel supply chains, that utilise both online and offline channels, and are unified in operation. Gan and Huang (2022) research indicates that successful cooperation among these channels can improve overall supply chain efficiency. The authors highlight that cooperation among participants is crucial for enhancing inventory management and increasing customer satisfaction. Thus, this case study emphasises the significance of collaborative strategies in improving coordination within integrated horticulture supply chains.

Supply chain collaboration is a crucial concept in literature, emphasizing the importance of seamless cooperation among various stakeholders. The presented case studies demonstrate the essential function of collaboration in integrated horticultural supply chains. Crucial insights highlight that successful collaboration improves operational efficiency, sustainability, and resilience. Future studies ought to keep investigating creative collaboration methods and models that can better improve the efficiency of horticultural supply chains.

2.6 The influence of certification on horticulture produce.

Since food safety is a key priority in all European food industries, many purchasers demand additional assurances from exporters through certification. Every purchaser within the supply chain, like Traders, food manufacturers, and retailers, needs the establishment of a food safety system for management founded on hazard assessment and essential control points (HACCP). There are more than 200 standards regarding food supply chains. Instances include GLOBAL G.A.P., BRC, and IFS Food. All the aforementioned management systems are acknowledged by the Global Food Safety Initiative (GFSI), indicating that they are widely recognized by the leading retailers. Adherence to certification schemes differs across nations, trade routes, and markets. This section discusses the key standards for fruit and vegetables, which include the GLOBAL G.A.P., British Retail Consortium (BRC), The Integrated Farm Assurance, SAFE QUALITY FOOD (SQF), FSSC 22000**,** social and environmental accreditation, and organic accreditation**.**

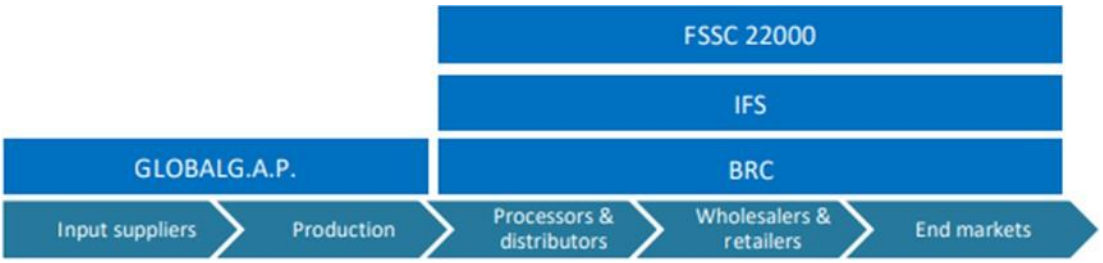


Figure2.4: Overview of Certification standards throughout the horticulture supply chain

2.6.1 GLOBAL G.A.P.

GLOBAL G.A.P. is the certification scheme that is required for shipping fresh products to Europe. This standard covers the pre-farm gate and thus encompasses the entire agricultural production process from the time the seed is planted until the product is produced (processing stage is not included). GLOBAL G.A.P. emphasizes food safety along with environmental

sustainability, working conditions, and quality of produce. It has baseline requirements for the majority of supermarkets in Europe. The Integrated Farm Assurance (IFA) Standard comprises the general rules along with Control Points and Compliance Criteria (CPCC). The GLOBAL G.A.P., IFA, CPCC is structured in a modular format, which includes:

•The All Farm Base Module: This serves as the core of all sub-scopes and establishes all the criteria that all producers must initially meet to obtain certification.

• The Scope Module: This outlines specific criteria according to various food production industries. GLOBAL G.A.P. encompasses three areas, thus 1. Crops, 2. Livestock, and 3. Aquaculture.

• The Sub-scope Module: These CPCC encompass all the criteria for a specific item or various elements of the food manufacturing and supply chain process. Thus, for example, the scopes for crops are automatically linked to the sub-scopes that a producer uses. For instance, in the case of fruits and vegetables, a strawberry farmer is required to adhere to the all-farm base, the crops base, and the fruit and vegetables CPCC to obtain a GLOBALG.A.P. IFA Fruits & Vegetables Standard Certificate.

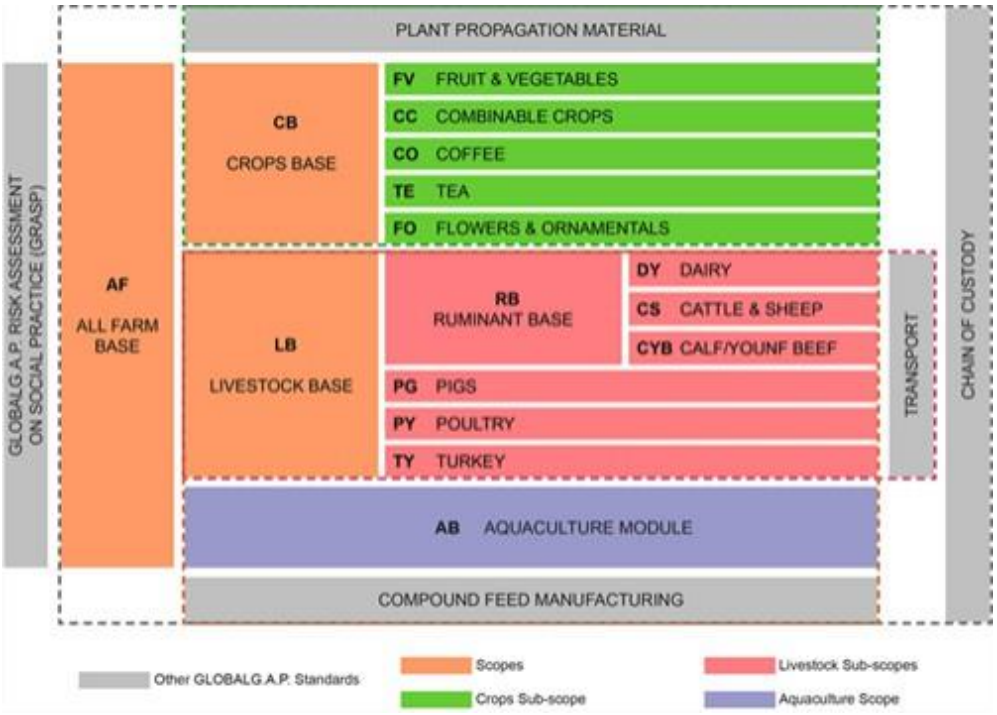
After obtaining certification, producers are granted a Global Gap Number (GGN) corresponding to the certified products. The GGN is used by other supply chain actors to trace the origin of the product as well as certification status. GLOBAL G.A.P. provides add-ons such as biosecurity, social, and environmental compliance that are in line with IFA certification. Instances include: GRASP, TR4 Biosecurity. Bananas, along with Tesco's NURTURE program.

• GRASP represents the GLOBALG.A.P. Risk Assessment on Social Practice (GRASP). It is an optional pre-prepared module created to evaluate social practices on the farm, focusing on employees' health, safety, and well-being.

• The TR4 Biosecurity add-on serves as a resource offering farmers a risk management strategy. To avoid the introduction or additional spreading of the TR4 pathogen or Panama disease from GLOBAL G.A.P. approved farms.

• The nurture module emphasizes the Plant Protection Product List (PPPL) management and the shift to GLOBALG.A.P.

Table 2.2: Overview of GLOBAL G.A.P modules



2.6.2 British Retail Consortium (BRC)

The Global Standard for Food Safety, referred to as BRC Food, is created by experts from the food industry, which includes retailers, manufacturers, and food service organizations. BRC Food was launched by the British Retail Consortium in 1998, and currently, it is in its eighth edition and is recognized globally. The standard provides a framework for managing product safety, integrity, legality, and quality, along with the operational controls in the food manufacturing, processing, and packaging sector. This standard does not apply to food items

that do not experience any processing at the audited location or to activities involving wholesale, import, distribution, or storage that are not under the company's direct control. The Standard emphasizes:

• promoting the growth of a product safety culture;

• broadening the criteria for environmental monitoring to acknowledge the growing significance of this method;

• motivating organizations to advance their mechanisms for safety and food protection;

• enhancing the understanding of the criteria for high-risk, high-care, and ambient high-care production risk areas;

• offering enhanced clarity for facilities producing pet food and guaranteeing worldwide relevance and comparison to the Global Food Safety Initiative (GFSI).

2.6.3 IFS Food Standard

The IFS Food Standard is a recognized standard for auditing food manufacturers by the GFSI (Global Food Safety Initiative). The emphasis is on the safety of food and the quality of processes and products. It relates to food manufacturing firms and businesses that package bulk food items. IFS Food is relevant when products are “processed” or when there’s a risk of contamination during initial packing. The Standard holds significance for all food producers, particularly for those making private labels, since it encompasses numerous requirements regarding adherence to customer specifications. The IFS Food Standard is employed to evaluate food manufacturers concerning the safety and quality of their processes and products. The list of requirements is arranged under the following themes:

• Responsibility of senior management

- System for managing food safety and quality
- Management of resources
- Process of planning and production
- Assessments, evaluations, enhancements
- Food protection

2.6.4 Safe Quality Food (SQF) standard

The SQF standard provides a globally acknowledged certification system that addresses the requirements of all food industry suppliers by highlighting the structured implementation of HACCP to manage food safety risks. The SQF code aims to fulfil industry, consumer, and regulatory needs across the food supply chain, starting from the farm to retail outlets. The establishment of an SQF management system must meet the buyer's food safety needs and offer solutions for companies serving local and international food markets. Elements of the SQF program include;

- The SQF practitioner must boost and foster food safety culture consistently throughout the year, 24/7.
- The SQF Food Safety Codes are categorized according to industry scope.
- External evaluation to confirm compliance with the strict standards of the SQF standard

2.6.5 FSSC 22000

The FSSC 22000 incorporates independent and international standards such as ISO 22000, ISO 9001, ISO/TS 22003, and technical specifications for specific industry requirements (PRPs), such as ISO/TS 22002-1. These standards were developed through inclusive conversation with

various international contributors. Scopes include agriculture, perishable animal products, food processing, feed production, fabrication of food ingredients, and development of food packaging materials. The FSSC 22000 framework comprises three components: ISO 22000, industry-specific PRPs, and additional prerequisites. Along with these three components, there is an FSSC 22000-quality option based on the additional requirements of ISO 9001. For businesses aiming to integrate their food quality management system within the limits of their certification, obtaining FSSC 22000-Quality certification is possible. FSSC 22000-Quality consists of a comprehensive assessment combining FSSC 22000 with a full ISO 9001 evaluation.

2.6.6 Social and Environmental Accreditation

There is a growing interest in the social and environmental ways of doing business. Most European buyers follow a code of conduct that they expect the other partners to adhere to. Social compliance is increasingly important for most fresh fruits and vegetables, not neglecting product quality guarantees. Initiatives and attention related to Corporate Social Responsibility (CSR) vary across the various regions of Europe. In the east, certain areas of Europe have fewer buyers who require strict social compliance, while some parts of Western Europe require social license to operate. Multinational companies also have their own compliance programs, for example, Unilever's Sustainable Farming Code and Tesco's NURTURE certification. Examples of buyer activities include:

• the IDH Sustainable Trade Initiative, which includes a Fresh and ingredients program aimed at increasing imports of sustainably cultivated crops by 25% in 2020 (compared to the 2016 baseline)

• The Business Social Compliance Initiative (BSCI) in northwestern Europe

• The Global Social Compliance Program (GSCP), which provides resources and tools for self-assessment.

• SMETA (Sedex Members Ethical Trade Audit) is a non-profit organization with membership number 555523528582 that evaluates and monitors your performance in relation to labour rights, health and safety, environmental issues, and corporate ethics.

• The Ethical Trading Initiative (ETI) of the UK

Examples of social or sustainable certifications for fresh produce consist of:

• GET A GRIP

• Planet Proof

• Just for Life

• Simply Trade

• UTZ/Rainforest Alliance (part of the Sustainable Agriculture Network).

For example, Broek et al. (2019) studied the susceptibility of temporary migrant labourers in the Australian horticultural industry. The research revealed that pro-market governance structures and supply chain demands greatly affect the working conditions and rights of these employees. The study emphasizes the necessity for cohesive supply chain management approaches that take into account the social aspects of supply chain interactions, especially in industries dependent on temporary workers. This case study demonstrates how weaknesses in labour relations can impact the overall efficiency and longevity of horticultural supply chains.

2.6.7 Organic accreditation

An increasing number of European shoppers prefer food products that are produced and processed using organic methods. Organic fruits and vegetables incur a higher cost in production and are also priced more favourably in the European market. To encourage organic products within the European Union, organic farming methods must be utilized as outlined in EU legislation. These organic farming methods should be employed for at least two years before fruits and vegetables can be sold as organic. Following implementation, producers must seek an import permit from the EU organic regulatory bodies. When an audit is carried out by an accredited certifier, producers are allowed to show the EU organic logo on their products.

The individuals who maintain the standards are:

- Soil Association (especially important in the UK)
- Naturland (Germany)
- BioSuisse (Switzerland)

In 2014, the European Commission suggested new laws concerning organic agriculture, with a new set of regulations intended to take effect in July 2020. The European Council's recent agreement aims to promote fair competition, prevent fraud, and boost consumer trust. Importers have started to implement the stricter regulations. In general, it is expected that organic regulation and testing will grow increasingly rigorous. Signs of using prohibited substances may result in the instant cancellation of organic certification.

2.7 Constraints that can hinder the successful implementation of an integrated horticulture supply chain

Integrated horticulture markets challenges: Though the concept of integrated horticulture markets may seem superior, some studies have highlighted that smallholder farmers are constrained from participating by several factors. These include, but are not limited to lack of capacity to meet requirements, poor bargaining power, the presence of middlemen, a lack of access to institutional and physical infrastructure, high transaction costs, inadequate private and public investment, as well as a shortage of productive assets. Household characteristics such as labor shortages, low education levels also negatively impact participation in the market economy (Zamasiya 2014).

Despite the expansion of information and communications technologies (ICTs), smallholder farmers in many developing countries continue to have limited or no access to market information (UNCTAD, 2015). Lack of vital market information on supply and demand has led to reduced margins for farmers. Furthermore, smallholder vegetable farmers also lack collective action in the form of producer groups, which can potentially assist them to overcome financial barriers, deal with transportation costs, and eventually access high-rewarding markets (Markelova et al. 2009).

Research by UNCTAD (2015), notes that the various constraints that cause smallholder farmers in developing countries not to engage in integrated horticulture markets can be resolved by compounding Information Communication Technologies (ICT) in the horticulture industry with supply chain management. Studies by Matondi and Chikulo (2012); Markelova et al. (2009) highlight the need for smallholder farmers to participate in market channels that help

them meet and exceed market profitable returns. Hence, the following section will look into the concept of Supply chain and horticulture Supply chains.

IHSC is characterised by various vulnerabilities due to changes in sustainable environmental issues, economic, and operational influences. Small-scale horticulture farmers face various constraints that are affecting supply chain efficiency, operational sustainability, and overall performance. This section discusses the various several case studies that show a number of constraints that are being faced in implementing IHSC management.

There have been several theoretical models that tried to show how IHSC management could be established however, challenges still remain in achieving supply chain efficiency and operational success. Zimbabwe's horticulture sector has been greatly affected by economic difficulties such as hyperinflation, instability in the currency, sanctions, and poor infrastructure. Earlier research by Mashapa et al. (2014) has shown that smallholder horticultural producers in Zimbabwe face significant postharvest losses, with estimates suggesting that as much as 15% of the produce is lost from spoilage and 60% from market oversupply. These losses are worsened by poor market access, as smallholder farmers frequently do not have the essential information to match production with market needs. The research highlights that conventional sales methods result in overproduction without adequate market evaluation, pushing products into markets that are unable to absorb them properly. Additionally, Mashapa et al. (2014) study among smallholder farmers near Mutare City, Zimbabwe highlighted various limitations, such as restricted market access, insufficient infrastructure, and a deficiency of information about market needs. These challenges hinder smallholder farmers from successfully engaging in the horticultural value chain, resulting in lower income and heightened poverty. The results

highlight the necessity for better market access plans and assistance systems to facilitate the inclusion of smallholder farmers in the horticultural supply chain.

Chigusiwa et al. (2013) research also investigated the function of market intermediaries in the promotion of smallholder horticultural goods in Zimbabwe as a major challenge to the success of horticulture farmers. The research shows differing opinions among farmers about the role of middlemen, with some viewing them as exploitative and others considering them crucial for gaining access to markets. This situation complicates the connections within the supply chain and emphasizes the necessity for improved coordination and clarity in market dealings. In a separate analysis, Chari and Ngcamu (2017) study identified the effects of climate-induced disasters on the horticultural supply chain in Zimbabwe as a main challenge. The research indicates that climate fluctuations, such as droughts and floods, greatly interfere with production and supply chain activities. The authors stress the importance of cohesive risk management approaches to improve resilience in the horticulture industry, especially given the rising climate-related challenges.

Munuhwa et al. (2022) explore the deficiencies in knowledge regarding supply chain management in Zimbabwe's food sector. The research concludes that insufficient knowledge and information exchange among stakeholders obstruct efficient supply chain management, resulting in inefficiencies and heightened food insecurity. This emphasizes the significance of capacity-building programs to improve the knowledge and abilities of those engaged in horticulture. This current research recommends that horticulture stakeholders share information and knowledge transfer as well as engage in capacity building to overcome constraints relating to IHSC management in Zimbabwe.

Drechsler and Holzapfel (2022) offer a detailed review of the decision-making difficulties encountered by small and medium-sized enterprises (SMEs) within horticultural supply chains. Their research emphasizes the significance of organized planning and decision-making support systems, which can enhance cooperation among supply chain partners. This corresponds with Kumar's systematic literature review (Kumar, 2024), which highlights new factors influencing supply chain management in horticulture, stressing the importance of cooperative strategies to tackle these issues. However, Zimbabwe's situation may differ in that Sun et al. (2022) research examines how economic sanctions impact supply chains in Zimbabwe, showing that these sanctions have diminished the performance of non-targeted companies within the supply chain. The research indicates that the sanctions produce an atmosphere of unpredictability, impacting the accessibility of resources and market entry for horticultural producers. This scenario highlights the susceptibility of the horticulture industry to external political and economic influences.

Research done in Kenya by Kariuki and Loy (2016) on contract farming found that most small-scale farmers faced challenges relating to quality control and requirements imposed by buyers of produce certification, and these challenges are also experienced in Zimbabwe. These constraints limit the ability of farmers to fetch higher-value markets in Kenya as well as capture international markets due to not being able to match the required standards. The findings of this research emphasised the need to have a support systems that coach farmers on the quality control systems and processes that are required in producing their crops and the processes they have to go through to attain local and international certifications.

There have been several constraints in value chain management, including inadequate infrastructure, restricted access to financing, and insufficient market information, which have posed major challenges to the Zimbabwe horticulture industry and Africa as a whole (Mapanga et al. 2018). These limitations impede producers from enhancing their operations and gaining competitive edges in the market. In support, Underhill et al. (2019) research evaluated postharvest market losses in the Solomon Islands. The study pinpointed various elements leading to these losses, such as insufficient road infrastructure, inadequate storage facilities for markets, and restricted access to cooling technology. The research highlighted the importance of cohesive supply chain strategies that tackle these weaknesses, including enhancing transport systems and investing in cold chain logistics. The results emphasize the essential importance of infrastructure in facilitating effective supply chain operations in horticulture.

The presented evidence emphasizes various significant issues confronting the horticulture industry in Zimbabwe, such as postharvest losses, financial difficulties, quality assurance problems, the effects of economic sanctions, climate fluctuations, the influence of intermediaries, and knowledge deficiencies in supply chain management. Tackling these issues necessitates collaborative actions among stakeholders, such as government backing, funding for infrastructure, and training programs for smallholder farmers.

2.8 Gaps in the literature

IHSC is a complex system that comprises multiple actors, such as producers, processors, distributors, and retailers. With the horticulture industry encountering growing challenges due to market needs, environmental issues, and worldwide competition, recognizing the need to have efficient SC systems is essential. This literature review pinpoints significant research gaps that are found in IHSC and supply chain vulnerability.

Mutemim and Sakwa (2017) explores the effects of risk and uncertainty on the choice of supply chain actors to use, highlighting the dynamic characteristics that supply chain actors have. The absence of a unified board among supply chain actors in horticulture intensifies the vulnerabilities that are currently faced, resulting in an unstable supply of vegetables and fruits. These observations underscore that limited research has been carried out about SC collaboration and its effects in reducing supply chain vulnerabilities. Wieteska (2020) also highlights the significance of supplier participation in product development and its effect on supply chain resilience as an area that needs further research. The literature reveals several research gaps in integrated horticulture supply chain management and supply chain vulnerability. Nonetheless, the existing literature does not include thorough research that examines the domino effect of disturbances in horticultural supply chains. More research is required to comprehend how vulnerabilities spread throughout the supply chain and the tactics that can be used to improve resilience.

Drechsler and Holzapfel (2022) highlight the importance of creating decision support systems that are customized for the particular needs of the horticultural industry. Their research shows that current literature fails to sufficiently cover the tactical planning areas essential for horticultural supply chains, including material requirements and demand planning. This gap offers a chance for researchers to create effective decision support systems that can improve planning and coordination in integrated horticulture supply chains. Levering on this gap, this research also seeks to examine how collaboration among supply chain partners fosters horticultural supply chain operational efficiency and resource allocations.

Schrobback et al. (2023) emphasize the coordination difficulties encountered by supply chains for fresh horticultural products, especially in sustaining supply levels and guaranteeing product quality. Existing literature is deficient in thorough examinations of contractual agreements that can enhance coordination among supply chain participants. Studies are necessary to investigate how various contract designs can tackle these issues and enhance overall supply chain efficiency, hence, this research will look at different contractual agreements that farmers in other countries have used to meet demand and stabilise horticulture crop vulnerabilities.

Kim and Cha Kim (2014) examine how strategic sourcing and organizational culture contribute to reducing risks in supply chains. Their empirical results indicate that a robust organizational culture can improve risk management abilities, which is especially pertinent for horticultural supply chains that frequently handle perishable goods and varying market demands. This research emphasizes the significance of nurturing a culture that values risk awareness and anticipatory management approaches. Additionally, Riley et al. (2016) offer empirical evidence regarding the impact of internal integration, information sharing, and training on supply chain risk management abilities. Their study shows that adaptability and visibility are essential abilities that aid in addressing vulnerabilities connected to turbulence and connectivity challenges. This is especially relevant in horticulture, where prompt information exchange can greatly diminish risks linked to product spoilage and supply interruptions.

Subburaj et al. (2020) research investigates the impact of supply chain integration on the performance of micro, small, and medium enterprises (MSMEs) in India. Their results show that the trust established between customers and suppliers significantly affects supply chain integration, which is essential for improving performance in horticultural supply chains. This

research highlights the significance of establishing robust connections to enhance overall supply chain resilience.

On the other hand, Negri et al. (2021) perform a comprehensive literature review on the incorporation of sustainability and resilience within supply chains. They recognize the necessity for additional empirical research that explores the trade-offs and synergies between resilience and sustainability. This is especially important for horticultural supply chains, which need to balance operational efficiency with environmental factors to effectively reduce vulnerabilities.

More recently, Tarifa-Fernández et al. (2023) investigate the factors influencing environmental sustainability in supply chains, highlighting the necessity for integration to adequately meet customer needs. Their results indicate that various strategies need to be taken into account to effectively manage relationships within the horticultural setting. This underscores a lack of comprehension regarding how integrated supply chain methods can improve environmental sustainability while tackling vulnerabilities.

The incorporation of sustainability within supply chain management is increasingly seen as an essential element. Mesa et al. (2021) present a framework for examining sustainability in agrifood supply chains; however, there is still a lack of clarity regarding how integrated horticulture supply chains can successfully adopt sustainable practices. Upcoming studies ought to concentrate on creating models that integrate sustainability indicators into the decision-making processes of supply chains, hence, this research also suggests an integrated horticulture model that can be adopted by horticulture farmers in Zimbabwe to ensure they are producing fruits and vegetables in a sustainable way.

2.9 Integrated horticultural supply chain model that is agile, which can be adopted in Zimbabwe to reduce supply chain vulnerabilities

Integrated horticulture supply chain management (IHSCM) in Zimbabwe seeks to improve productivity, sustainability, and market access for horticultural growers. Considering the distinct challenges encountered by the sector, such as climate fluctuations, obstacles in market access, and scarce resources, an all-encompassing model is essential to tackle these problems efficiently. This model includes different aspects such as stakeholder collaboration, sustainable methods, embracing technology, and efficient information dissemination.

2.9.1 Components of the Integrated Horticulture Supply Chain Management Model

1. Stakeholder Collaboration

- Farmers: Involve smallholder farmers in cooperatives to improve their negotiating strength and resource accessibility.

- Government: Promote policies that encourage horticultural growth, such as financial aid for supplies and enhancements to infrastructure.

- Private Sector: Foster collaborations with agribusinesses to facilitate technology transfer, enhance market access, and provide training programs.

- NGOs: Partner with non-profit organizations to offer technical support and capacity-enhancement programs.

2. Sustainable Approaches

- Agro-ecological Methods: Encourage sustainable agricultural techniques that improve soil quality, save water, and lower chemical usage. Practices like crop rotation, intercropping, and organic farming ought to be promoted.

- Integrated Pest Management (IPM) - Utilize IPM approaches that merge biological, cultural, and chemical techniques to effectively control pests while reducing environmental effects.

- Water Management: Implement rainwater collection and effective irrigation methods to improve water access and lessen reliance on inconsistent rainfall (Drechsler and Holzapfel, 2022).

3. Adoption of Technology

- Smart Farming: Employ tools like soil probes, unmanned aerial vehicles, and smartphone apps to track plant well-being, enhance resource efficiency, and refine yield forecasts.

- Digital Platforms: Create digital platforms for farmers to obtain market data, weather updates, and optimal horticultural practices. This can improve decision-making and lower risks linked to market volatility.

4. Market Information Sharing

- Market Information System: Create systems that deliver real-time data on market prices, demand patterns, and consumer choices to assist farmers in making knowledgeable decisions.

- Training and Capacity Building: Organize frequent training workshops for farmers focused on best practices, pest control, and market access techniques to improve their knowledge and abilities.

- Partnership Networks: Establish networks involving farmers, suppliers, and buyers to enable information sharing and promote cooperative relationships that improve supply chain effectiveness.

5. Risk Management

- Diversification: Encourage farmers to grow multiple crops to reduce dependency on a single product and mitigate risks associated with market volatility and climate change.

- Insurance Programs: Develop crop insurance solutions tailored for smallholder farmers to protect against losses from adverse weather or pest invasions.

6. Monitoring and Evaluation

- Performance Metrics: Define crucial performance indicators (KPIs) to evaluate the effectiveness of combined management strategies, such as yield enhancements, income levels, and ecological sustainability.

- Feedback Systems: Establish feedback channels enabling stakeholders to exchange experiences and insights, promoting ongoing enhancement in horticultural management practices.

The suggested model for integrated horticulture management in Zimbabwe highlights the significance of cooperation among stakeholders, sustainable methods, technology utilization, efficient information exchange, risk mitigation, monitoring, and evaluation. This model seeks to improve productivity, sustainability, and market access for producers by tackling the specific

challenge of supply vulnerability encountered by the horticultural sector, thereby supporting better livelihoods and enhancing food security in the area.

2.10 Chapter Summary

This chapter discussed the concept of IHSCM and provided various case studies and research gaps that are currently being identified. The researcher went on to look at theoretical models to establish the basic underpinnings of the phenomenon under study. Literature from various sources that explored HSCM strategies, such as collaboration, supply chain relationship, contract framing, and available local and international quality standards, was identified and discussed. Empirical researches were also included and used to support assertions that were made by authors. The chapter also identified some challenges that are being faced by small-scale horticulture farmers in Zimbabwe, and a proposed model of an IHSCM is provided towards the end of the chapter. This model was suggested based on the available sources of literature and empirical evidence in the field of IHSCM. The following chapter addresses the steps that were taken to carry out this current research.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methods that were used to collect data from the respondents. Figure 3.1 below shows the research framework used in the study. The purpose of providing an illustration of the research framework is to show the methods and design adopted in this study. The researcher started by outlining the main research aim such that l remained focused on the study purpose. A qualitative research design was employed other than the quantitative research design because of its nature to provide in-depth information about the phenomenon under study and understanding the views and opinions of the research participants. An interpretivist paradigm was then utilised to uncover beliefs, views and emotions that respondents have towards an integrated horticulture supply chain. In order to obtain information from the respondent the researcher conducted qualitative interviews together with observation to ensure that data collected was accurate and holistic in nature. The researcher also used Nvivo 15 to assist him in conducting thematic data analysis. Themes were developed and used to interpret research findings written in the final report. These stages discussed above are shown in figure 3.1 illustrated below;

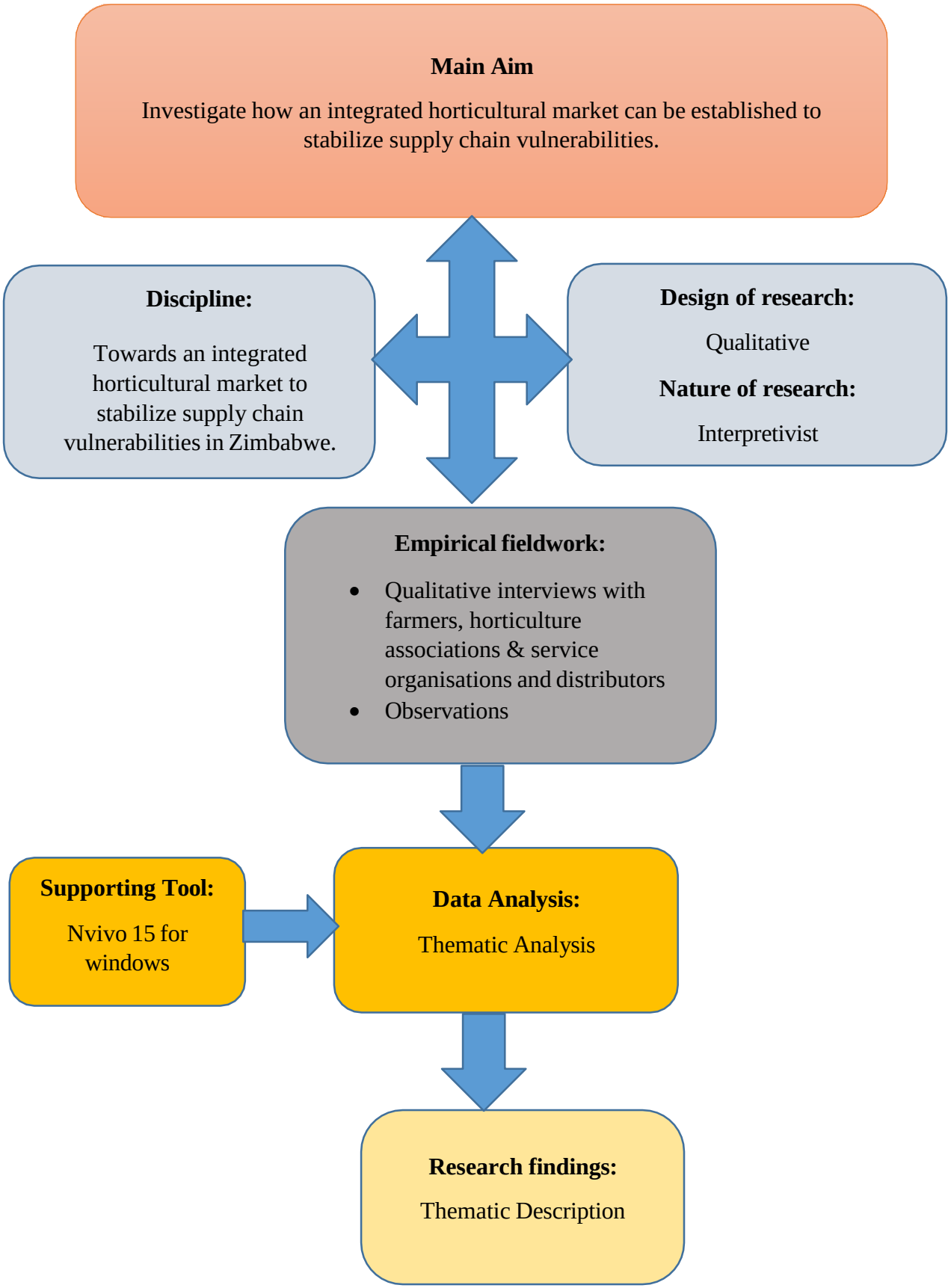


Figure 3.1: Framework showing research design method used in the study

Section 3.2 below discusses the qualitative research design method used for this research. An interpretivist-paradigm qualitative research approach was the most applicable for this research. Data collection was through observations and in-depth interviews with farmers, farmer associations, horticulture services organisations, processors, wholesalers, and retailers in the horticulture industry. Purposive and convenience sampling were the most appropriate methods to use as the horticulture industry requires people who are knowledgeable about the supply chain system in Zimbabwe. Methodology triangulation, pilot studies were utilised to ensure research findings were consistent and valid to generate sound conclusions.

3.2 Qualitative research design

Previous research on horticulture supply chains have mainly used a mixed-methods approach to evaluate the effectiveness of horticulture supply chain in attaining supply chain efficiencies (Grant et al. 2023). Given this methodological gap, the researcher was motivated to adopt a qualitative research design method exclusively because this method is critical in understanding the respondent's views, opinions, and beliefs, and the environment in which they operate. Rahi (2017) postulates that qualitative research approach makes the researcher deeply understand the concept under study and the world to which this concept is applied. Interpretivists believe that true knowledge only comes after thoroughly interpreting the subjects under investigation. Therefore, the qualitative research approach contributed to uncovering new insights about integrated horticulture supply chains, perspectives and views from highly knowledge participants of this research in their respective operating environments. Therefore, formulation of questions used in the interview and the subsequent sampling techniques used in the research followed the qualitative research approach.

The research topic ‘Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe’ falls under social constructivism; hence, using qualitative methodology to investigate its application in Zimbabwe is justified. According to Mishra and Alok (2017), qualitative research is naturalistic or anthropological in nature. Additionally, Merriam (2009) points to the fact that qualitative research is also a sociological investigation of the views and perceptions of people who live in a particular society. As such, the world in which participants live or operate is included when fully interpreting research findings. Therefore, given the strengths of qualitative research methods, the researcher settled on adopting this method to investigate the supply chain process from farm to fork, exploring the participants’ views and perceptions towards an integrated horticulture supply chain. Understanding the participants’ views in their respective environments was essential to ensure findings were relevant, consistent, and contextually accurate.

The argument to adopt a qualitative research approach is greatly upheld by early philosophers such as Schutz (1899-1959), a social phenomenologist who proved that the opinions of people living in a particular place (social and cultural) greatly contribute to situations that we find ourselves in life. Therefore, people are able to make judgments about their lives and daily activities when faced with a particular circumstance (Fereday and Muir-Cochrane, 2006). Given this early philosopher’s observation, it can be observed that horticultural crop production is embedded in the African culture. When people in Africa, particularly in Zimbabwe, started to migrate to urban areas in the 1970s, those who were left in the rural areas utilized their indigenous knowledge and continued to grow horticultural crops, establishing markets in the informal economy to sustain themselves (Horn, 1997). The horticultural crop production and marketing systems are also evident in Zimbabwe, and have their roots in patrilineal cultural patterns ascribing to women's domain over the garden to satisfy minority demands. However,

as there are now global shifts in food demand and supply, it is no longer the duty of women to meet these demands. Hence, the social constructivism and how horticulture affects people's lives are important in this research. Most people now practice horticulture, with some having backyard gardens, and some have land allocated by the government (A1 and A2) farms to grow horticulture produce and boost food access and security.

In this research, farmers, farm associations, processors, horticulture service organisations, wholesalers, and retailers provided surplus information about the circumstances relating to the integrated horticulture supply chain and supply chain vulnerabilities in Zimbabwe. It was also important to obtain information on the current challenges experienced by supply chain players in the horticulture industry, given the unique economic environment found in Zimbabwe. The knowledge and expertise provided by key participants of this research helped me to have an in-depth understanding of the current issues positively or negatively affecting the establishment of an integrated horticulture supply chain for small-scale horticulture farmers in Zimbabwe.

Patton (2002) envisages that using research participants' own words strengthens face validity and reliability of the research study. Additionally, there is not enough existing research on the integrated horticulture supply chain; therefore, using a qualitative research approach enabled the researcher to gather firsthand experiences and opinions from study participants. Saunders (2015) argues that one can use qualitative research to explore an under-researched phenomenon or concept. There also exists a literature gaps on integrated horticulture supply chain in favour of value addition research. Hence, little is known about the integrated horticulture supply chain and how it can be used to benefit small-scale horticultural farmers. Most researches dwell on the challenges that small-scale horticultural farmers face rather than understanding the world in which they operate and how that can be harnessed to create supply chain efficiencies.

Schaller and Murray (2011) also support that the culture of a people influences their perception towards a phenomenon. The research findings obtained after conducting qualitative interviews and observations helped the researcher in developing a model that can be used in establishing an integrated horticulture supply chain in Zimbabwe to address supply chain vulnerabilities. Additionally, the formulation of a horticulture board was recommended, which is housed in the horticulture supply chain framework, to ensure fair business practice, safeguarding all stakeholders' interests in the supply chain industry. The suggested model developed is grounded on Lewis' structural change theoretical model, which also supports the introduction of a new policy in light of changes in the economy and technology within a sector. The multi-agent system of supply chain also influenced the development of the model to encourage collaboration among supply chain players in the horticulture industry. While the stakeholder influence supply chain model assisted the researcher in developing risk, management, and compliance aspects that can be used for the successful implementation of an integrated horticulture supply chain framework. The SCOR model helped the researcher understand the performance attributes used in the horticulture sector, such as quality, quantity of produce, producer prices, producer costs, inventory management, and agility of players within this sector, among other variables.

3.3. The application of the interpretive-qualitative research

This research included human actors and as such qualitative research method requires that the participants' feelings, opinions and views be obtained before making conclusions to avoid making external assumptions about the subject area being investigated. The research involved experts from farm associations, farmers, processors, wholesalers and retailers that shared their emotions and opinions on how an integrated horticultural supply chain could be used to resolve

supply chain vulnerabilities. Merriam (2002) is of the view that qualitative research methods can utilise ethnography, phenomenology, grounded theory, and interpretivist research design. From the list cited above, an interpretive-qualitative research design was preferred over the other three qualitative research methods because of its ability to fit in the structure of the research. The other three design approaches were discussed to justify why the interpretivist research design was later selected.

Glaser and Strauss in (1967) propounded the grounded theory. This research design is inductive in nature and focuses on building meaning from data collected. The design gives autonomy to the researcher and he/she becomes the main instrument, thereby overriding the research participants' opinions (Merriam, 2009). As a result, employing grounded theory presents research findings that are skewed towards the researcher's intuition. Whereas, in this research, the study participants who gave their feelings and opinions on the phenomenon of integrated horticultural supply chain and supply chain vulnerabilities were the most important elements and using my own judgement as the researcher would have negatively affected the research if l had chosen to use grounded theory. Therefore, my research was objective in nature and took an interpretivist design approach by exploring the supply chain theories that exist, then developing a conceptual model to formulate assumptions based on existing literature, after which the researcher developed questions and observations guidelines that allowed respondents to give their opinions. This process allowed the researcher to develop new insights and knowledge on the subject of integrated horticultural supply chains, thereby assisting in the formulating a model that can be adopted for IHSC in Zimbabwe.

Another qualitative research design that could have been adopted in this research was ethnography. According to Hammersley & Atkinson (2007), ethnography research design

requires a holistic approach where the researcher has to spend most of the time with the participants in their natural environments to learn more about a particular phenomenon. Therefore, ethnography requires a lot of time for one to embrace the culture of the people and their way of life before writing the research findings and finding research solutions. For this reason, the researcher did not manage to adopt the method because of several reasons discussed here. Data collection period for this research fell at a time when my workplace became very busy.

The rainy season had started, and now all farmers, both in the horticulture and grain industry, were flocking to our shops to purchase inputs. Since l am also working in the industry, l hardly had time at my disposal to go and stay with my participants at their workplaces to employ an ethnography research design, hence I opted for the interpretivist research design. Additionally, coupled with farmers' pressure, the government of Zimbabwe, which is also one of the largest customers, had a huge consignment placed and to the extent that l had to employ more workers who were now on 12-hour shifts to meet the demand for inputs required. Apart from the hectic work schedule l had, industry players in the horticulture industry were also busy because they wanted to take advantage of the rainy season, hence, they could not accommodate a longer research design, making the interpretivist research design more favourable.

Given the arguments provided above, it was imperative that this research adopted an interpretivist-qualitative research design approach. Naeem et al. (2023) postulate that combining an interpretive and qualitative approach is advantageous to researchers. Given that this research had to focus on the experiences of the study participants in horticulture, as well as obtaining more information on the operating environment, this approach became the most appropriate method to utilise. When utilising the interpretive-qualitative approach, the

researcher conducting research becomes the main instrument because they use their skill, expertise, and insights and observations to shape the outcome of the research rather than using preconceived instruments (Merriam 2009). In this case, the researcher has more than 20 years' experience in the horticulture industry. The researcher has previously assumed managerial positions in sales and marketing departments in one of the key seed suppliers in the horticulture sector in Zimbabwe and is currently the operations manager for one of the international, biggest seed companies operating in Zimbabwe.

Given the researcher's strategic professional position, it was relatively easy to obtain first-hand primary information from study participants, from farmers, farmer associations, and end users of horticulture produce. Merriam (2009) stipulates that qualitative research is more successful when the researcher is more flexible and adapts to changes that may occur during research. As such, the researcher found it to be easy to interact with other players in the horticulture industry, as all questions posed to me during research could be further explained to the participants with insight. In other instances, l had to change the phrasing of the question to make the participants understand, especially on the roles of Horticulture service organisations and associations, were some individuals had some misunderstanding. In other instances, l used various methods, thus email and telephone interviews, as well as face-to-face and observations, to gain more insight into the matter that was being discussed, as the participants in my industry were either busy or had gone to attend industry conferences.

Borrowing from Naeem et al. (2023) assertion that the inductive approach method helps researchers to develop a conceptual model. After reading various models and comprehending how they are used in the horticulture industry, the researcher managed to develop their own model comprising horticulture players in the horticulture in Zimbabwe as shown in Figure 3.2

below. The model developed shows the flow of information, inputs and agriculture support experienced in Zimbabwe. Figure 3.2 below shows that horticulture farmers are between horticulture input suppliers, associations, government, NGOs and end users who are producers, wholesalers, retailers, consumers, who can be local or exporters of produce, private and public institutions. Findings of this research shows that there are some impeded challenges with this current structure as discussed in chapter four. As such, findings of this research propelled the researcher to suggest an integrated horticulture model, which Zimbabwe can use to resolve the supply chain vulnerabilities experienced in this sector (see figure 5.1).

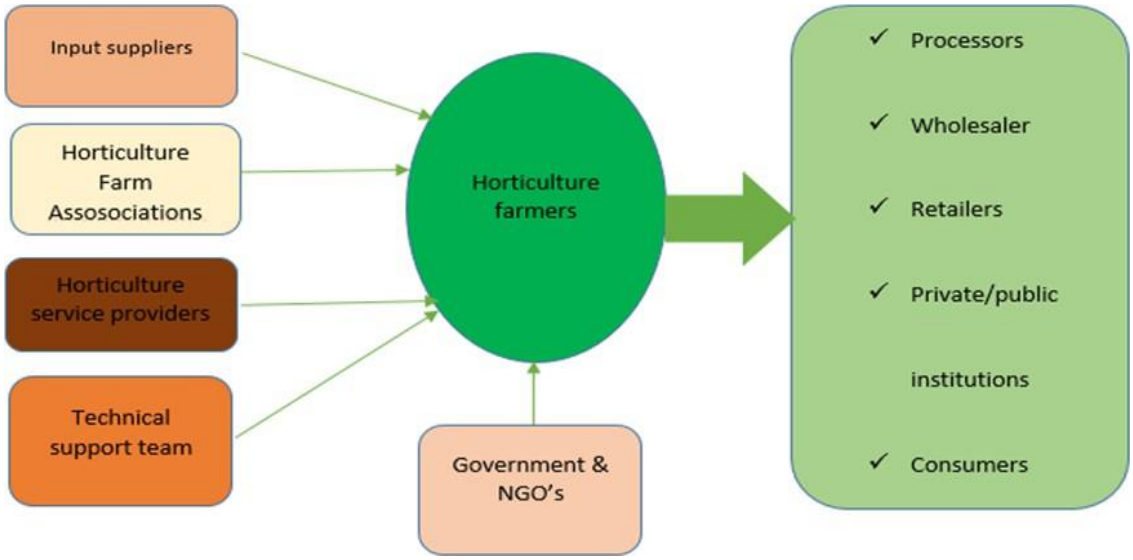


Figure 3.2: Horticulture supply chain members in Zimbabwe

Interpretive - qualitative research requires that the researcher adopt three essential tasks, thus identifying the research problem, selecting the sample participants, collecting and analysing data (Saunders et al. 2015). This research followed this criterion. The researcher first identified the research problem which was supply chain vulnerabilities being experienced by small scale horticultural farmers in Zimbabwe, then the key research participants' were identified as who work hand in hand with small scale farmers in the horticulture sector like horticulture service organisations, farmer associations, input suppliers and end users. After collecting data the

researcher used NVivo 15 software to support thematic data analysis in coding data and developing themes that were used in interpreting patterns obtained from research and assisting in answering research questions, and finally writing the research report.

3.4 Ethical considerations for the research

An ethical clearance had to be obtained before developing the main research. Upon drafting the proposal and having it approved, l then wrote to all horticultural associations, service organisations, farmers, and the end markets to ask for permission to carry out research in their respective organisations. It was important to follow the rules and regulations given by the school in conducting the research study in an ethical manner. I had to make sure that I was acting ethically in conducting my research study as l was dealing with human participants.

Beauchamp and Childress (1989) propose that following the rules and preventing participants from harm is the mandate of the researcher. As such, l had to explain to the respondents that they should not feel obligated to accept to participate in my research, that is, they had a choice to or not to participate in my research. I also explained to the participants that the research is very confidential and will only be used for academic purposes. Additionally, l had to explain to the respondents how the industry would benefit from the research once completed, also explaining the context to which the research was focusing on including the main objectives of the research.

The researcher also explained to the researcher that the pending research would not bring any form of harm to the respondent whether one wishes to undertake the research or not. After respondents were satisfied with the summary of the intended research, those that were interested in proceeding with the research were asked to fill in the consent form to acknowledge

that they would participate in the research when the researcher was ready for data collection. The participants were assured that if the aims of the research changed at any time during the research period, the researcher would restart the process of seeking consent from the participants. I also explained to the participants that if, for some reason, they feel they no longer want to participate or do not want to finish, no harm will befall them, and they were free to do so. I also made sure all respondents were 18 years of age or above, as this is the legal age at which young adults in Zimbabwe are allowed to make their own decisions in the absence of their parents or guardians.

To successfully win the trust of my respondents l had to explain how my research was going to address the supply chain bottlenecks that are currently being found in the horticulture sector and how resolving these issues can result in players in the industry realising huge profits, minimise loss and improve overall business performance and supply chain efficiency. I also provided samples of questions to be asked, such that they could attest to the fact that they were not politicised or could lead to company uproar. I did not include my company as part of the horticulture supply chain input providers, as l recognised that this would be regarded as a conflict of interest and also could affect the resultant findings of the research as my colleagues and subordinates. My workmates might have responded positively to my questions without actually pointing out the challenges being experienced in the industry because of the position l hold at my workplace fearing victimisation. This situation could have influenced the outcome of the research, hence presenting skewed findings. Hence, this research meet all ethical considerations for carrying out research with human participants.

3.5 Data collection techniques

The data collection process for my research was too involving, because information was collected from both interviews and observations. I used email interviews, did face-to-face interviews, and observations to have a complete representation of the horticulture industry of Zimbabwe. Data from my research was less structured; it did not have any numerical values and was more inductive compared to quantitative data. Nkwi, Nyamongo, and Ryan (2001) are of the view that qualitative research mostly includes the collection of data that does not include ordinal values.

Having carried out the interviews and assumed the role of an observer sharpened my qualitative skills and made me realise that l had selected the most appropriate methods to collect data about my research. After asking respondents to supply information on demographic variables such as gender, age, education level, and years in the profession and number of years they have been farming, l moved on to posing questions on supply chain vulnerabilities being experienced in Zimbabwe. Questions asked in interviews were developed by looking at the objectives of the study formulated in chapter one and reviewed in chapter two.

Questions asked in this research were centred on;

a) Understanding the different type of information that is shared among supply chain players in the horticulture sector and investigating where these players obtain this information,
b) Examining the level of collaboration among supply chain members,
c) Understanding the current challenges that may hinder supply chain players in the successfully implementing an integrated horticulture supply chain to resolve supply chain vulnerabilities in the horticulture sector, and,

d) To probe participants' opinions the importance of establishing an integrated horticulture supply chain and a board that is enshrined in the supply chain process, which is mandated to protect all players in the horticulture industry, thereby ensuring fair business practice among other agendas, hence promoting efficient horticulture supply across Zimbabwe to promote food access and availability.

Thus, the following sub-sections give a detailed account of the steps that were taken to obtain information in line with the objectives that were discussed in chapter one of the study.

3.5.1 Empirical fieldwork: Gaining access to farmers, farmers associations, service organisations, and processors/wholesalers/retailers

The empirical fieldwork section explains the steps that were undertaken to obtain information about the research as well as gaining access to the study participants in the horticulture industry. Firstly, I had to communicate with the Swiss School of Business and Management, Geneva Sarl to inquire about how l could enrol with the institution to pursue my research with the university. I was then taken through the process of how to apply and the steps l had to take to complete my research study. After meeting the requirements for enrolment, l then registered to start my degree. After enrolment, l proceeded to writing my proposal, which was later accepted after thorough research and corrections. Horticulture study participants were first consulted when the proposal to proceed with research was granted, and consent was sought from the Ministry of Agriculture and institutions that were to be involved in the research. However, in the process of writing my thesis, l faced a family challenge as my father got terminally ill and l could not proceed. After my dad had recovered, l managed to resume my studies and contacted my study participants to let them know that l would be coming in November 2024 to start data collection. The actual fieldwork took place between 15/11/24 to 17/02/25.

In conducting data collection, l explained the whole process to the study participants and disclosed that if they were not interested in participating, no harm would befall them. I also emailed other participants the information sheet prior to the actual day of the interviews because they wanted to read the information thoroughly before engaging in the research, so they could comprehend the nature of the information that was required from them. The process of collecting data was a bit cumbersome, especially in companies that had few employees, because this research was carried out during the rainy season; as such, some employees had gone into the field to assist their customers. In some cases, some farmers were hard to find, and some were in remote areas, such that one had to spend an hour or two to get to their farming areas. However, these limitations did not hinder the research from obtaining adequate information required for the research. Since the researcher was already working in the industry, it became relatively easy to identify the key personnel in different institutions and farmers who are active in the industry. Once the initial contact was established, and data collection dates were scheduled, most of the study participants were willing to work with me because they already knew me, hence increasing the success rate of the research study. As such, all inquiries and primary fieldwork were successfully completed before 31/02/25.

By applying the principles of Bryman and Bell (2015), my friends and professional contacts paved the way for me to get access to additional horticulture supply chain players. I provided all participants with the 'Consent Form for studies Involving Human Participants' to read and understand the primary purpose of the research with consent (Appendix A). The forms demonstrated the detailed knowledge of the context of research. The eight main underlying conditions for participating in the research helped the participants build their confidence and interest in participating. The process fulfilled the argument regarding the acquisition of

research participants because supply chain members and their members voluntarily participated (Bryman and Bell, 2015; Blaxter et al. 2010; Gummesson, 2000). I adopted a prudent strategy of providing the research participants with an information sheet (Appendix A), and this motivated the research participants because they knew at the onset of the research that the topic was of high value to them. The strategy endorses the argument that 'If you apply a reasoned, prepared, more prudent strategy, you are bound to obtain the access you require' (Blaxter, Hughes and Tight, 2010). Sometimes, some participants sent me messages to confirm and expressed their preparedness for the interview before the actual meeting took place, which indicated their willingness to participate in the study.

3.5.2 Population and sampling

According to Martínez-Mesa et al. (2016) a researcher should contemplate on whether to select a study sample or use the whole population (census), the researcher should also choose a sampling process and decide on how non-respondents would affect their research. For this research, the researcher used a census; that is, the researcher asked questions to respondents until a saturation point. Using the entire population for the study was deemed unreasonable as they was a large population to choose from and most of the respondents had similar opinions with regarding industry supply chain process. According to the Food and Agriculture Organisation (FAO) report (2022), there are 1.5 million smallholder farmers in Zimbabwe. Additionally, we have 400 employees from horticulture organisations, making the population very large. Martínez-Mesa et al. (2016) support that it is better to use a census when the area of study is nationwide or found in all regions, rather than selecting a sample to represent the population under study. As such, this research was nationwide as it included all the players in the five natural agricultural regions in Zimbabwe.

Additionally, the researcher also used purposive sampling because not all small-scale farmers are producing for markets; some are doing subsistence farming, hence there was need for the researcher to use his judgment as to which respondents to select. Furthermore, some employees in the horticulture organisations are not aware of the horticulture supply chain; hence, only those involved in the process directly we selected to be included in this research. The use of a quantitative sampling technique in selecting a sample size could have compromised the research validity, as some respondents who could have been selected, for instance, through stratified random sampling, might not have adequate knowledge on the subject area being discussed.

It should also be noted that samples that do not have a proper representation of the actual population cannot be used to draw conclusions for the research, as this will lead to biased research outcomes. Therefore, given the reasons cited above, the researcher chose to use census as a method of determining sample size and apply non-probability sampling techniques of purposive and convenience sampling combined with observation to collect data from farmers, farm associations, service organisations, and end users such as processors, wholesalers, and retailers.

The following section demonstrates how purposive and convenience sampling were used in this research.

3.5.2.1 The non-probability: Purposive and Convenience sampling

According to Saunders (2015) the possibilities of selecting individuals from the target population may be zero when using non-probability sampling. That is, not all respondents of the population can be selected for research, as some may not have the required information, and in most cases, the chances of being included in the research are subjective. For instance,

with convenience sampling, respondents are selected according to their convenient accessibility, which is also known as consecutive sampling. With this method, the sampling continues until the saturation point is reached (that is, when there is no new information coming in from the respondents that can add value to the research). Thus, this method was used to sample farmers to understand their views and opinions towards an integrated horticulture supply chain and supply chain vulnerabilities. Data collection was done during the rainy season, and this is the busiest season for farmers; hence, it was practicable to adopt convenience sampling as some farmers could not be reached during the time of conducting data collection, and those available were conveniently selected.

The researcher asked farmers if they had information on producer price, selling price, quantities required for the market, quality, and varieties before they planted their vegetables to ensure that efficient supply chain process. The researcher went on to ask farmers if any of the horticulture supply chain players, like input suppliers, service providers, and end consumers like processors, engage in any farming collaborations or backwards integration to support their farming activities or planning. Additionally, it was important to understand the extent to which farmers support the implementation of an integrated horticulture supply chain to mitigate post-harvest loss as well as improve financial performance. The researcher also asked farmers to comment on the challenges that they were experiencing in ensuring that there is an integrated horticulture supply chain system can become effective when implemented to resolve supply chain vulnerabilities in the industry.

It was also important to investigate whether the horticulture associations were spearheading the sharing of information amongst horticulture farmers. Using a qualitative research design enabled the researcher to obtain very important insights on how the operating environment also

played its part, either negatively or positively, to enhance the adoption of integrated horticulture management by farmers.

Purposive sampling was also used to select experts from each horticulture farm association, horticulture service providers, and users of vegetable products. Martínez-Mesa et al. (2016) define purposive sampling as a process that is used when one wants to get expert opinion on the topic under study, or can be used when there is a diverse sample. In this research, there are nine horticulture associations, and each of these offers varying support to farmers. As such, the researcher had to use purposive sampling to select experts who were familiar with the integrated horticulture supply chain and research participants who regularly do business with the rest of the industry players in the supply chain industry to obtain rich data.

The researcher needs to examine if there were any quality standards that govern vegetable produce consignments and processing of vegetables in Zimbabwe that horticulture players should be aware of and possibly adopt. The researcher had to consult the Standards Association of Zimbabwe (SAZ) on the different quality standards that could be adopted in the horticulture industry. The research findings for these standards are shown in (Appendix K). Some additional certifications for exporting to European markets also include GLOBAL G.A.P., IFS 2000, among other standards, as discussed in chapter two. It was also important for the researcher to obtain information on how the industry defines "produce quality" in the horticulture supply chain because, according to Crosby (1979), quality is "conformance to requirements". Therefore, understanding the conformance requirements in the horticulture industry is critical for the success of this sector. Additionally, understanding the different mandates that the Horticulture Development Council (HDC), Zim-trade, the Horticulture Promotion Council (HPC), and other associations play in the industry helped the researcher in

understanding whether they are effectively supporting the drive towards an integrated horticulture supply chain system and board.

While understanding the parameters of quality produce was fundamental, the researcher went on to ask horticulture associations and service providers if they were executing their roles in providing information to supply chain players in the industry. It was also important to ask the respondents the extent to which they all collaborate in the horticulture industry to ensure supply chain players are always equipped with information on which vegetables to grow, at what particular time, the acceptable quality, in what quantities, and for which markets. Understanding the dynamics that were presented by the horticulture associations and service providers provided in-depth knowledge on the adoption and implementation of an integrated horticulture supply chain in Zimbabwe.

Financial institutions like Commercial Bank of Zimbabwe (CBZ), Agribank, National Merchant Bank of Zimbabwe Limited (NMB), Metropolitan Bank of Zimbabwe (MetBank), and BancABC were very important stakeholders to be included in this research as they hold the key to capitalisation of farmers in Zimbabwe. The financial institutions play an important role by providing farmers with long-term and short-term loans, insurance, hedges against risks associated with storms, cyclones, dry seasons, etc., as well as providing financial advice. Hence, purposive sampling was the most appropriate sampling technique to use as it assisted the researcher in selecting the right study participants.

Processors, wholesalers and retailers are also critical in this research as they play the important role of being distributors of produce as well as value addition. Understanding their views on the nature of produce they receive from farmers is critical in addressing the need to have an

integrated horticulture supply chain. The digital systems they employ, like Sage 300, could also be extended to cut across the industry so that supply is easily done across markets. It was also important to obtain their views on how the supply chain of horticulture produce could be managed to ensure supply chain efficiency.

It can also be noted that it was not difficult to select the experts in these fields, as the researcher works for one of the biggest horticulture seed companies of Zimbabwe. Hence, using my industry experience and knowledge l obtained from literature, l was able to read and understand the most applicable method for my research and applied it with minimum difficulty. Hence, self-selection sampling was applied (Saunders and Lewis 2018). The selection was very successful as participants were familiar with the researcher, and they also believed that this research would benefit every organisation and small-scale farmers included in the research.

The total number of participants I used for this research was 15. These participants came from farm associations, horticulture service organisations, small-scale horticulture farmers and end processors, wholesalers and retailers, shown in Figure 3.3 below.

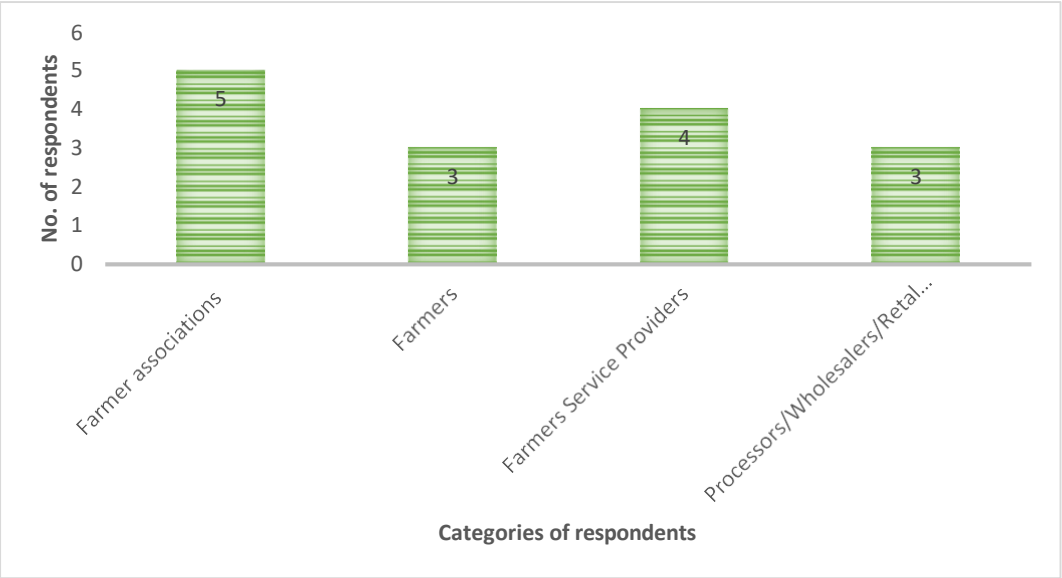


Figure 3.3: Study participants by category

The narrative below shows the different respondents and their supposed roles in the horticulture industry that were used in the research.

3.5.2.1.1 Farmer associations included;

Fresh Produce Marketers Association of Zimbabwe, Zimbabwe National Farmers Union, Fresh Produce Producers Association of Zimbabwe, Deciduous Fruits Association of Zimbabwe, Horticulture Producers Association (HPA), Sisonke Ag Fresh Farmers' Association (SAF), Murewa Agriculture Producers Association (MAPA), Domboshava Horticulture Producers' Association (DOPA), Zimbabwe Horticulture Farm Association (ZHFA). The selection of the horticulture institutions used in this research is backed by the Zimbabwe Ministry of Foreign Affairs report written by Liesdek and Anaseck (2020), a Netherlands Enterprise Agency on the Zimbabwean Fruit and Vegetable Sector Standards for export and agro-processing.

Role of Farmer Associations:

- Farmers' associations are primarily set up by small-scale and medium-scale farmers to work together in terms of buying inputs, producing, and marketing horticulture produce. Grouping and forming associations allow farmers to reduce transaction costs or gain better access to input and service suppliers.

3.5.2.1.2 Horticulture service organisations included;

Logistic companies, financial institutions, Horticulture Development Council, Farmers Unions, Horticulture Promotion Council, Consultancy and certification services, Zim-trade.

Role of horticulture service organisations:

- The logistics sector provides refrigerated trucking or transport.
- Financial institutions provide a range of financial services, which include banking, short and long-term insurance, asset management, securities trading, and property investments.
- HDC aims to serve as a platform for sector stakeholders to share information, facilitate trade, and provide services to improve production and processing operations.
- Standards Association of Zimbabwe (SAZ) is the national standards body for Zimbabwe and is a member of the International Organisation for Standardisation (ISO). Advise on GLOBAL G.A.P. certification.
- HPC was initiated by horticulture producers with the aim of supporting horticulture trade and is an active platform for sector stakeholders to engage and establish trade agreements. They lobby for producer prices, search for cheap inputs and equipment, they advise the government on behalf of its members, provide technical advice and organise issues affecting their members.
- The Zimbabwe Farmers' Union (ZFU), representing over a million communal and small-scale farmers. They lobby for producer prices, search for cheap inputs and equipment,

advice the government on behalf of their members, provide technical advice and organise issues affecting their members. The Union (ZFU) represents over a million communal and small-scale farmers. It is hierarchically

- Zim-trade works closely with their Zimbabwean and international partners, industry experts, and development cooperation partners. It provides services that focus on supporting Zimbabwe's exports, assisting Zimbabwean exporters, including first-time exporters and potential exporters, to develop, promote, and facilitate the export of their goods and services to the world. They offer services such as export helpdesk, training in export branding, market access research, online tools (EU export support), trade information through an online portal, and expertise support of international experts (PUM).

3.5.2.1.3 Farmers

Small-scale producers of green vegetables, e.g., tomatoes, onions, cucumbers, carrots, green pepper, etc.

Role of farmers

- Farmers are the backbone of every horticulture industry globally. They play a critical role in the growing and supply of high-quality fruits, vegetables, flowers, and ornamental plants.
- Farmers are engaged in the cultivation of various horticultural crops, ensuring that there is optimal growth through proper soil management, irrigation, pest control, and harvesting techniques. The farmer's expertise in plant biology, as well as environmental conditions, directly affects the yield and quality of produce.

- Many horticultural farmers are innovative and employ sustainable modern farming methods such as organic farming and climate-smart practices to improve productivity while maintaining sustainability.
- Farmers also often engage in the cleaning, sorting, as well as packaging of their produce before sending it to markets, processors, or wholesalers. Proper handling ensures freshness and reduces post-harvest loss.
- Horticulture farmers also contribute to some extent to the local and global economies by generating employment, supporting input suppliers, and maintaining food security.

3.5.2.1.4 End Users

- Processors, wholesalers, retailers

Role of End Users

- **Processors**: handle post-harvest activities such as cleaning, sorting, packaging, and processing horticultural products. For instance, they can process fresh tomatoes into canned tomato paste, or they can freeze strawberries so that they have a longer shelf life. Some processors also extract essential oils or create dried fruit products.
- **Wholesalers**: usually buy in large quantities from horticulture farmers or processors and distribute to retailers. Therefore, they act as intermediaries, reducing the burden of individual farmers having to find customers themselves. In horticulture, wholesalers might handle fresh produce, potted plants, seeds, or gardening supplies.
- **Retailers**: These are the final link in the horticulture supply chain. Retailers sell horticultural products directly to customers. They range from farmers' markets and supermarkets to horticulture garden centres to florists. Retailers focus mostly on merchandising, customer care, and pricing to match customer demand.

3.5.3 Demographic characteristics of participants sampled

The researcher managed to quantify the demographic variables of the respondents to understand the nature of the participants, providing me with research information. The demographic characteristics used in this research were important in obtaining research findings that were valid and balanced. The characteristics included participants' age, education, gender, experience, among other variables like geographic regions. It was important to have a balance in the research to get views that cut across the population. The main purpose was to ensure that various opinions and insights are collected from diverse backgrounds to achieve a broad perspective on the matter under study.

3.5.3.1 Age

For the age group, it was important to start at 18 years because that is the legal age at which children in Zimbabwe are allowed to make decisions without the need for a parent/guardian's consent. The age variance also included people who are more than 65 years of age, as this research is linked to the agricultural culture that is embedded in Zimbabwean culture. Some of the people in Zimbabwe, when they retire they move to the rural areas and start farming, as they would have inherited or they get allocated farming land by the chiefs at the village. It is also important to note that in Zimbabwe, the retirement age was 65 years at the time of research, hence, most horticulture institutions no longer had people who were above this age. The diagrammatic representation of the age of participants is shown below in Figure 3.4

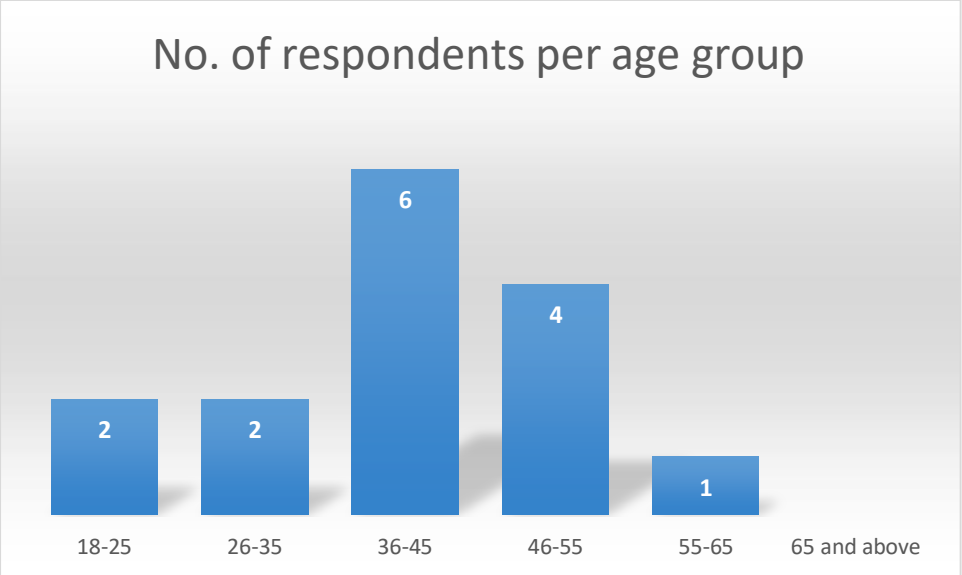


Figure 3.4: Number of respondents by age group

Figure 3.4 above shows that the majority of respondents of this research came from those who are aged 18 to 45 years of age. This is because the horticulture industry retains employees who are still energetic, and they need to be running around to do so, logistics, and attend to any inquiries quickly because the industry offers highly perishable products. There were also 2 respondents aged 18-26 and 26 to 35, respectively. The respondents in these categories were mainly found at retail outlets and wholesale markets for horticulture produce. The researcher also observed that most young people do not like working in the horticulture industry as they perceive it to be boring and slow in using modern methods in marketing. Most farmers were between the ages of 36 to 45 to above 55 years. In most cases, these farmers had retired from work due to various reasons, which were, however, linked to the economy, and they preferred to do horticulture farming to sustain their families. There was no response from participants who were 65 years and older, as the researcher realised that the industry preferred to hire those who were still young and energetic, as these were the requirements given the nature of the product to be produced.

3.5.3.2 Gender

Figure 3.5 below shows that regardless of the physical stamina required in the horticulture industry, the industry is almost balanced in terms of representation; thus, 55% of the target population were male and 45% of the respondents were female.

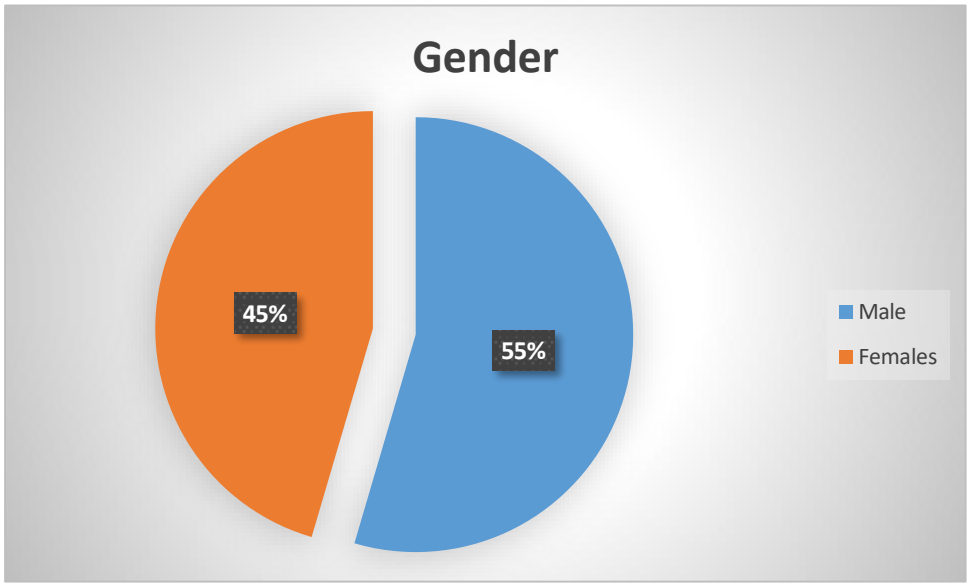


Figure 3.5: Gender

This shows that women are taking up their dominance in the horticulture industry and are now found in the horticulture service industries and associations, though they dominate the farming category. More males were represented in the service sectors of the horticulture industry than in the farming category. It was the researcher's view that most male participants do not want to spend much of their time doing small-scale farming, whereas women preferred gardening as one of their hobbies, and also stems from the patrilineal society that Zimbabwe has maintained in its cultural heritage.

Understanding the gender characteristics of the sample used in the research is important for making sound decisions to include all genders affected or influenced by the outcome of the research. It was important for the researcher to be sensitive to the feelings and opinions given by both male and female participants. It has been noted in research by Schiffman and Wisenblit (2019) that women are more emotional than men, and vice versa; men are more rational than women when it comes to decision-making. The researcher also noted that during research, some aspects women felt were more important, men did not give the same importance; rather, they had their own opinions. The researcher also observed that the industry is dominated by men, and they are mostly found at horticulture farmer associations and service organisations. Most women were found to constitute the farmers' sample and end markets like retail outlets and wholesale markets.

3.5.2.3 Educational Qualifications

Table 3.1 below shows the distribution of study participants according to educational background.

Table 3:1 Educational qualifications

Educational Qualification	**No. of Participants**
Primary Education	7%
High School education	13%
National certificate	20%
Diploma	13%
Bachelor Degree	20%
Masters	27%
PhD	-

7% and 13% of the respondents hold primary education and secondary education, respectively. 20% of the respondents had a national certificate, and the other had a Bachelor's degree. Most of the participants who work in horticulture farmer associations and service organisations have obtained a national certificate, diploma, degree and Master's. Zimbabwe has several agriculture colleges, hence people who are passionate about farming go and study the programs and some end up specialising in horticulture studies. Other universities now offer faculties of Agriculture for people to advance their education in farming. Agriculture is still one of the major contributors to the economy despite the fact that, it is no longer the Bread basket of Africa. The researcher obtained information from respondents who were learned and knew the horticulture supply chain as most of the respondents had also theoretically learned the subject area in class. The research participants additionally, had some practical experience, as such, the research provided constructive findings in the sector that could possibly change the industry trajectory to a more positive performance locally and internationally.

3.5.2.4 Number of years in the profession

It was important to look at the number of years that each participant had in his or her profession. Table 3.2 below shows that most of the study participants had vast experience in agriculture.

Table 3.2: Number of years in the profession

Number of years in the profession	No. of years
0-2years	1
2 years to 4	2
4 years to 6	3
6 years to 8	2
8 years to 10	4
10 years and above	3

12 of the participants had more than 4 years of experience in the horticulture industry. Thus, 3 of the respondents had more than 10 years' experience in the field of horticulture. For qualitative research to be successful, it requires that knowledgeable people share their views and insights on the subject under discussion. The sample participants managed to provide the researcher with quality and knowledgeable data to understand the fundamentals of horticulture management and supply chain vulnerabilities now being found in Zimbabwe. The research also showed that there were 3 people who had less than 4 years in the horticulture sector, and this was because they were young participants, especially found at retail shops and horticulture service providers that were also included in the research. It should be noted that despite their minimum experience, the respondents actually provided valuable information, especially relating to the use of IT in the horticulture industry and its adoption.

Having individuals with diverse work experience was beneficial to the researcher as it helped the research findings to be balanced. Those who had many years in the industry could have overlooked the challenges that the horticulture supply chain players face, while at the same time, they were able to share information on how the process of supply chain operates from farm to fork. Additionally, those who were experienced provided background information on initiatives that have been previously done to resolve the issue of supply chain vulnerabilities, as well as their opinion on how they think an integrated supply chain could be successfully implemented to achieve supply chain efficiencies.

On the other hand, it is the researcher's view that if l had only obtained data from more experienced participants, some of the results may have been skewed. Thus, in most cases, people who have been in the industry when asked questions about how their industry is

performing tend to hide their flaws or may feel the subject being discussed has a direct impact on their job security, hence may hide or overlook some very important contributions. Hence, the diverse work experience used to carry out this research was most appropriate to obtain quality data.

3.5.2.5 Age, gender and educational background of research participants

It was important in this research to take into consideration the differences that exist between the gender, age and academic backgrounds of research participants. The horticulture industry in Zimbabwe is male-dominated, as shown in Figure 3.5 above. Male respondents constituted 55% of the respondents, and female respondents were 45%. Gender is one of the most important factors, as differences in view can provide clearer insights into the area under study. There are more male respondents working in horticulture farmer associations and horticulture service organisations, hence the higher number obtained when the research was carried out. Most of the women were found in farming. It can be argued that women are still following the patrilineal system, hence there are more women farmers than men. Horn (1997) propounded that horticultural crop production was traditionally under women's domain in Zimbabwe. As families migrated to urban areas, many women utilized their indigenous knowledge of these crops in establishing and maintaining marketing enterprises in the informal economy, and this has also been found to be the case.

The educational background profile showed that a few participants have primary and secondary education. It can be noted that most small-scale farmers do not go ahead to do diplomas or even pursue a bachelor's degree. They depend heavily on in-house training from input suppliers, government bodies, and NGO's extension officers like ADRA and learn from experience and colleagues. Those who have degrees have acquired them such that they get employed in the

horticulture industry. These research results also show a relationship that exists between age and educational qualification to some extent. The research also shows that participants who had outstanding academic performance are between the ages of 35 up to 65 years of age. The respondents pursued further education to do Master's degrees so that they can rise in their professions and also position themselves to sit on company boards.

Other employees who got employed more than ten years ago without attaining a national certificate have since gone back to school to add on their qualifications to meet work requirements and fight competition from others who have the right qualification but cannot secure a job because the job market is saturated. The research showed that there are fewer participants within the ages of 18 to 35, and this is because agriculture is usually the least preferred profession by young adults. The researcher found out that young adults mostly get jobs on a contract basis while they are waiting to pursue other professions. For those who will continue with the profession, they would have realised that the line of work is what they wanted then they begin to advance their studies by going back to school while they work

Conclusively, most study participants are experienced, and this corresponds with the qualifications they hold. This research also showed that study participants aged 35 and above have diplomas, degrees and masters. There is also a direct relationship between the profession one is in and the type of education that is relevant to the study. The participant summary was a very insightful and informative research.

3.5.2.6 Regions and ethnicity of research participants

This research considered five agricultural regions found in Zimbabwe. It was important to cover all the regions, given horticulture is practised all over Zimbabwe, though it is more

prevalent in Regions 1 and 2. Understanding the rainfall patterns that are found in these regions and the characteristics of the regions helped the researcher select the appropriate sample participants. Table 3.3 below shows the different agricultural regions that are found in Zimbabwe.

Table 3.3: Agricultural regions in Zimbabwe

REGIONS	I	II	III	IV	V
OCCUPATION PROVINCIES	Manicaland	IIA: Mash C, E & West IIB: Mash C, E, W & Manicaland	Midlands, Mash E, W, Manicaland, Masvingo & Mat North.	All except Harare. Note Bulawayo is IV.	Masvingo, Mat S & North, Midlands, Mash W & Manicaland.
AREA SIZE SQUARE KILOMETRES	7 000	5 8600	72 900	14 7800	104 400
COVERAGE	2%	15%	18%	38%	27%
RAINFALL MILLIMETRES	plus 1000	plus 700 - 1000	plus 500 -700	plus 450 - 600	< 500
AGRIC ATTRIBUTES	Specialized and diversified farming. Intensive farming and forestry.	IIA & IIB maize (including seed maize), cotton, and tobacco farming. Horticulture and livestock.	Semi-intensive farming, beef production & maize farming irrigation may be necessary due to the occasional dry spells.	Semi-intensive farming, small grains	Extensive farming small grains and maize

Region 1, which receives more than 1000mm of water, is mostly humid, and there is a lot of horticulture done in this region. Most of the Manicaland region belongs to region 1, and there is a lot of fruit farming, forestry and horticulture done in this region. Region 2 receives between 700mm of water to 1000mm. Parts of Mashonaland West, Mashonaland Central, Mashonaland East and the whole of Harare province belong to this region. The region is synonymous with horticulture produce and livestock production, which includes cotton, tobacco farming, seed maize and horticulture and livestock. Regions 3, 4, and 5 receive low to average rainfall. Most farmers who practice horticulture have drilled boreholes as a secondary source of water to practice horticulture farming. Thus, in region 3, there is semi-intensive farming, beef production and maize farming, which is, in most cases, under irrigation because of dry spells. Regions 4 and 5 mostly concentrate on small-grain farming and livestock rearing.

Utilising the knowledge of agricultural regions in Zimbabwe, the selection of study participants was based on the intensity of horticulture activities being performed at the different regions,

hence, most study participants were found in regions 1 and 2. Region 1 has 50% of respondents, which cuts across all players in the horticulture supply chain industry. Most respondents came from region 1, where there are a lot of horticultural activities as well as the headquarters of the horticulture association and horticulture service organisation. 30% of the respondents also came from region 2 as horticulture farming is concentrated in these regions and some horticultural organisations are situated in the nearby areas.

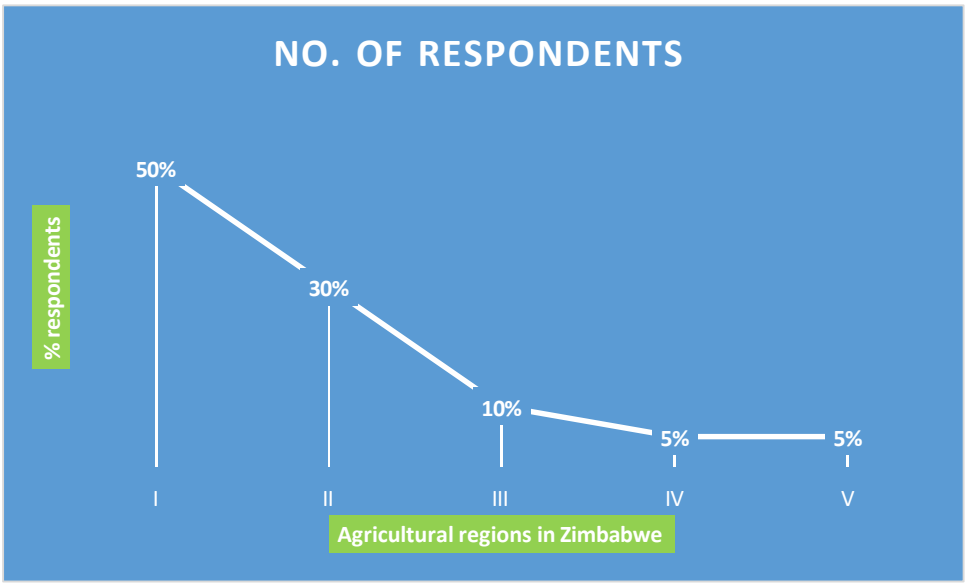


Figure 3.6: Percentage of respondents in each agriculture region

Though regions 1 and 2 had the majority of respondents, the other three regions had some representative percentages. It was important to select these respondents to ensure the validity of the research. Opinions and views of these respondents were important to generalise the findings and draw conclusions towards the subject area; integrated horticulture supply chain and supply vulnerability in Zimbabwe. Sifers et al. (2002) support that these variations are important in making valid conclusions in research.

3.5.5 Piloting

Teijlingen and Hundley (2001) argues that qualitative research design is meant to advance naturally as the investigation is progressively done, therefore, there is no need to do a pilot study. Additionally, it is difficult to conduct a pilot study because the theoretical framework is developed as results come in from respondents. Irrespective of arguments put forward for not performing a pilot study, the researcher saw it helpful to conduct one to ensure research instruments developed were reliable. The pilot study took place with 3 participants to check if the questions posed were clear and presented the information required without any misconceptions.

Participants from horticulture farmers, farmer associations and end users constituted the pilot study. The first step was to give the participants the questions that were designed so that they would check if they were contextually correct. The respondents were asked to check whether the questions communicated the message the researcher intended to communicate to the broader targeted audience. The respondents who were carrying out a pilot study had to check if the questions that were developed for the interviews were using the language that the targeted respondents would understand clearly, and whether the questions were appropriate to ask the targeted participants. Secondly, the pilot study was conducted to check if participants' responses generated the anticipated responses that the researcher could use to resolve the research problem and develop new insights about integrated horticulture supply chain management. As the pilot study was being conducted, the researcher also observed the behaviours of participants when some questions were raised. Therefore, I took note of views and opinions that were raised so that I could make corrections before populating the questions to the other respondents in the study. Thirdly, the pilot study was conducted to check if the interview questions could be performed utilising the budgeted time for each respondent, which

was 40 minutes. After identifying all the mistakes and realising that, some questions needed to be rephrased or removed to adhere to stipulated timeframes and obtaining the required information for research. Thus, the researcher had to correct the research instruments before conducting data collection. To ensure that the research instruments would remain reliable, the pilot study took place in the same environment similar to that of the final study. All ambiguous questions that could possibly confuse research participants were removed, and the most preferred language of communication was English.

3.6 Date collection method: Interviews and observations

Considering that my research adopted a social constructivism paradigm, l decided to use interviews and observations to gather empirical evidence. Using interviews creates rapport and trust between researchers and study participants. Minichiello and Kottler (2010) support that relationship building between researchers and participants is critical for the success of qualitative research. Participants should be able to trust you and be open to discussing all matters related to the subject matter under study. Since the researcher works in the horticulture industry, it was not very difficult to foster relationships during this research. Some study participants were repeat business partners. However, some new study participants to the researcher and industry. As such, I had to introduce myself to them and create that rapport before asking them to assist me in filling in my questionnaires. Additionally, l also had to use referrals from those who had previously worked with me in the industry so that l could foster rapport with some new participants who had joined the industry.

Interviews also require that a conducive environment be developed that fosters trust, comfort and safety to share ideas. Additionally, achieving quality and positive discussions requires some soft skills and an open-minded techniques that will treat each participant as a unique

entity rather than stereotyping participants. Minichiello and Kottler (2010) also note that when research participants feel comfortable, they will likely provide the researcher with authentic responses. As such, l made sure that my respondents get to know me first. l had to find ways of reconnecting with some of the respondents that l had last seen a few months back, through attending organisations' socials and horticulture meetings. When l attended these meetings and reconnected with some respondents, l went on further to hint, my research participants about my research area just too informally discuss what l was planning on researching. I also used English as a medium of communication with my respondents to avoid stereotyping my study participants, given that Zimbabwe has 11 ethnic languages, but English is spoken by 95% of the people and is also the medium of communication in schools and workplaces.

3.6.1 Qualitative interview: Semi-structured

I conducted face-to-face interviews with horticulture farm associations, service organisations, farmers and end users using semi-structured question. Saunders et al. (2015) posits that face-to-face, email, messenger, telephone or video chat apps can be used to conduct semi-structured interviews. Given that this research included a diverse group of horticulture supply chain members, face-to-face, email and telephone interviews were used to gather data from respondents. To obtain information from farmers and processors, wholesalers and retailers, l used face-to-face interviews. Several factors motivated me to apply a face-to-face qualitative interview to obtain data from research participants. The first reason was that the data collection period fell in periods where these study participants, in particular, were very busy, as this was at the start of the rainy season; hence, using other methods like emails could have delayed the responses, or there could be some non-responses.

The other reason why it was most appropriate to use face-to-face qualitative interviews was that the research could also use the observation technique to analyse the type of horticulture produce found at the farms as well as in the market. It was important to understand how the horticulture members, who deal with vegetable handle produce, store and transport to the market. As for producers, retailers or wholesalers it was also the researcher interest to look at processing of vegetables as well as have a look at the machinery and understanding their supply chain coordination with supplies of raw vegetables and end market. As noted earlier in the research, qualitative research requires the researchers to immerse themselves in the operating environment of the participants. It was critical that the researcher conduct a face-to-face interview with farmers and end markets to compare produce as it moved from farms to markets. These face-to-face interviews took at most 50 minutes, then observations took an additional 25 to 30 minutes. Conducting a face-to-face qualitative interview provided the researcher with an opportunity to obtain in-depth information about the integrated horticulture supply chains and supply chain efficiencies in Zimbabwe.

The face-to-face interview technique took the greater part of the interview technique used because farmers are the backbone of the horticulture industry, and end users like retailers are the contact between produce and the final consumer. The interview process created an atmosphere of confidence between me and research participants because the research participants acknowledged the importance of the matter when they realised that l had to visit them at their work stations and also progressed to ask questions while l was assisting them in what they were doing or not disturbing their schedules. The ease and flexibility of assisting my research participants in their workstations motivated research participants to provide in-depth information that led to the generation of quality data. Blaxter et al. (2010) supports that when research participants feel relaxed, they provide information that generates quality data. For

instance, respondents were able to provide information on how marketing information, supply chain coordination and planning affect supply chain efficiencies.

Research participants were also confident to point out some supply chain constraints that they were facing despite that some of the constraints were caused by the bottlenecks in the economy. As a social scientist, it was also important to explore the social phenomenon and behavioural sciences amongst respondents (Leavey 2014). The observation technique complemented the use of semi-structured interview processes that was done with farmers and processors, wholesalers and retailers to confirm what was discovered in the interviews. Using both interviews and observations confirms to the phenomenon that qualitative research is an evolving theory that is constantly changing (Leavey 2014).

The researcher also used email and phone interviews to obtain information from horticulture associations and service companies that support horticulture supply chain activities. Most participants are headquartered in Harare and as such they had good access to internet facilities and telephone reception, which made this technique more efficient than visiting the participants at their offices. In most cases, visiting these participants would have taken more than a two-hour drive because of the road networks in traffic that are now found in Harare. Additionally, semi-qualitative interviews provided a platform where research participants provided detailed information about ‘Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe’.

Byrne (2012) supports that it is important that participants offer their response in their actual words. Hence, the researcher sent questionnaires to the research participants' emails and WhatsApp and waited for them to fill in their responses, which they later sent back to the

researcher via email. Appendix (G) shows a sample of one of the responses obtained from farm associations, with their responses filled in to answer several questions asked in the interview guide. In the event that email responses were delayed, the researcher took it upon himself to phone the participants and ask questions over the phone. As such, I had the opportunity to clearly listen to each participant attentively without any criticism of the views or opinions as l took down their responses. Listening to respondents' experiences and views was critical for the subjective interpretation of data that was then used to draw conclusions, resolve the research problem, and develop a research model to be used in the horticulture sector.

3.6.2. Semi-structured interview questions

To conduct interviews for horticulture farm associations, farmers, processors, wholesalers and retailers, I used three sets of interview questions to probe, instigate and induce participants to provide information on integrated horticulture supply chain management. At the beginning of each questionnaire, the researcher indicated their agricultural region in which they were operating. The following 4 questions that followed required that the participants indicate their age, gender, education and number of years in the profession. Then, the remaining questions sort to explore the participant's views towards availability of market information to ensure precision farming, investigate the effectiveness of collaboration on horticulture supply chain efficiency, understand the various agriculture quality standards that are available and look at the challenges that horticulture supply chain members are facing in trying to implement integrated horticulture supply chain.

The interview questions were standardised to ensure that there is consistency in the research instrument used. The questions were administered under the same conditions as those used when a pilot study was conducted to ensure research reliability. For those questions that

required additional clarification and information, study participants were more than willing to provide the required information. Merriam (2009) proposes that probing of questions enables researchers to obtain valuable information, insights and knowledge about a phenomenon. Probing questions enabled me to produce quality information and data.

The following are samples of questions used to do research on the integrated horticulture supply chain

Table 3.4: Sample questions for horticulture farmers

Questions	Rational
1. Which vegetable crops do you mainly grow and why?	• This question was developed to identify the crops that are grown by horticulture farmers and the motive behind growing horticulture produce rather than grain crops.
2. What type of information do you receive from horticulture farmers' associations like Fresh Produce Producers Association of Zimbabwe, Horticulture Development Council, Horticulture Promotion Council, SAF, etc.?	• This question was meant to assess if any of the horticulture associations and horticulture organisations provided farmers with marketing information before, during and after planting.
3. How does this information in question (2) above assist you in your pre-planning and coordination of the horticulture supply chain?	• To examine the usefulness of marketing information provided in the planning of horticulture planting

	and coordination with other supply chain members.
4. What kind of services do you get from institutions like the Standards Association of Zimbabwe, Zim-trade, Banks, HDC, etc.?	• To evaluate if service providers in the horticulture industry share information on quality, logistics and assist farmers with inputs such as machinery, chemicals, finance, etc.
5. Which factors influence your supply chain management decisions?	• To understand the various factors that affect farmers' decisions in the distribution of their produce.
6. What are the main challenges you face in managing your supply chain?	• This question was developed to understand the farmers' challenges that they face when they want to use formal channels of distribution, thus from farmers to processors/wholesalers/retailers and final consumers.
7. How do you typically transport your products to market?	• To assess the effectiveness of transportation and logistics for transporting this highly perishable produce.
8. Do you use any technology or software to track your supply chain activities?	• This question was asked to evaluate the rate of adoption of IT in inventory management.

9. What are your views and opinions on having an integrated horticulture market that is responsible for aggregating, storing, and dispatching horticulture produce?	• To understand the farmers' views on the advantages of having an integrated horticulture board established in Zimbabwe (in the five different agricultural regions).

Table 3.5: Sample questions for horticulture associations and horticulture service organisations

Questions	Rational
1. As a horticulture association institution, what marketing information have you managed to provide to small-scale farmers who are doing vegetable crop production like tomatoes, onions, beans, green peppers, cabbages, carrots, etc.?	• To assess the kind of information horticulture associations and service providers share with all the players in the horticulture sector.
2. What kind of difficulties do farmers encounter in producing their commodity to accessing markets that are linked to supply chains?	• To analyse whether the horticulture association and service providers were aware of any challenges that farmers were facing in moving their produce through the supply chain process for horticulture products.
3. What do you think is your role as an institution in managing supply chain	• To check whether these organisations understood their mandate in

efficiencies for small-scale horticultural farmers?	managing supply chain efficiencies for small-scale horticultural farmers?
4. Based on your institutional experience, what do you think can be done to help farmers supply their produce and limit financial losses that they incur through spoilage, decay or under-pricing of their produce?	• To suggest possible ways that could be used to help small-scale farmers reduce post-harvest losses and improve supply chain efficiencies.
5. Would you say there is some coordination among all horticulture associations and farmers that has been beneficial for every stakeholder in the supply chain?	• To understand the nature of supply chain coordination that exists within the horticulture industry
6. What are your views and opinions on having an integrated horticulture board established in Zimbabwe that incorporates all horticulture stakeholders?	• To obtain information on the thoughts that participants have on having a centralised integrated horticulture board established in Zimbabwe.

Table 3.6: Sample questions for processors, wholesalers, retailers

Questions	Rational
1. As a distributor of horticulture commodities, where do you get information	• To determine where distributors of horticulture produce get their products.

on horticulture produce required by the market and prices?	
2. When purchasing horticultural produce, does your company have estimated purchase prices or are prices determined through negotiation at the time of sale?	• To understand the pricing strategies used by distributors when doing business with farmers.
3. Does your organisation engage in backwards or vertical integration with any players in the horticulture supply chain? Yes/No. If yes, what are the terms of the contract?	• To examine the extent to which distributors collaborate with other players in the horticulture industry.
4. Which IT application system does your company use for capturing horticulture consignment?	• To understand the IT application systems that distributors use in inventory management so that all players can adopt these IT systems.
5. What type of information does your company share with your suppliers to ensure supply of horticulture produce is processed efficiently? Which criteria does your company use to assess the quality of produce you receive from suppliers?	• To assess the type of marketing information that distributors can supply to horticulture players in the industry.

6. Does your company face any challenges in facilitating an integrated horticulture supply chain in the industry?	• This question was designed to understand the challenges that distributors are facing in implementing an integrated horticulture supply chain.
7. What are your views and opinions on having an integrated horticulture board established in Zimbabwe that is responsible for aggregating, storing and dispatching horticulture produce?	• To understand the views of distributors towards having an integrated horticulture board.

3.6.3 Interview guides

I used two interview guides for the face-to-face and telephone interviews to attain flexible, smooth discussions with study participants to obtain quality data. The interview guides used considered factors such as the quality of interview questions, proximity of research participants, the communication channel, and participants' availability on the day of interviews, and the time required to complete the interviews. The researcher followed Silverman (2013) sentiments that research guides are roadmaps that direct and motivate researchers to obtain information in an organised manner. The interview guides used were flexible and were created with flexibility to fit in different circumstances to obtain new emerging views from the respondents and ideas. Merriam, (2009) also supports that research guides consider respondents' professional backgrounds, gender, age, educational qualification and the differences that exist among respondents.

3.6.4 The interview process

I first set some appointments with the different study participants, allowing for 40-50 minutes for each interview. Three calls were made. The first call was made three weeks before the date of the interview to allow the study participant to clear their schedule. The second call was made the second week to remind them of the interview and to give the study participants an overview of the research. Horticulture associations requested that the questions be sent to their emails before the day of the interview. The third call was made to confirm the appointment 2 days before the scheduled interview. This was done to ensure the study respondents' schedule had not changed and to show the seriousness of the research to be undertaken. The interviews were done at the respondents' premise thus for farmers, processors, wholesalers and retailers.

On the day of the face-to-face interview, the researcher made sure they arrived 5 minutes before the interview. The other reason for arriving 5 minutes before was to ensure that l start preparation for field interviews while the research participant also prepared for the interview. Arriving on time also showed the research participants that l was serious about the subject area under study. I greeted the study participants with a smile and friendly approach as l introduced myself and highlighted the purpose l was there. I waited for their response and continued to ask about their well-being in general, avoiding asking sensitive issues like family topics or political statements. Concentrating on the topic relating to my research showed professionalism and also compliments l made relating to the supply chain processes l observed going into the premise made the study participants reciprocate my warm and friendly gesture. Once we were all settled and l was offered somewhere to sit if there was any and then l continued to take out my questions and paper to start the interview. In situations where, for instance, l visited respondents at their workstations, l would not disturb their work but engage

with them as l discussed my subject area and also assist them with the work they were performing.

On average, the interviews took 50 minutes to complete for both horticulture farmers and distributors of horticulture produce. According to Patton (1990), the quality of conversation between the researcher and participant depends on the personality skills of the interviewer. There was an in-built flexibility in the nature of communication where the researcher would wait for the respondent to share all their views and opinions before moving to the next question. In other circumstances, the research participants would require additional information to be provided so as to discuss the phenomenon further, and the researcher felt honoured to further share additional explanations, as this showed that the respondent was actively participating in the research.

It should be noted that horticulture associations and service providers could not be interviewed using face-to-face because their offices were all over the capital city. Attempting to have visited these research participants could have used up more time; hence, the researcher used email interviews and telephone interviews. As such, phone calls were made to introduce the target responses to the research topic and area of study. I went on to explain to the participants the aim of the research as well as the benefits of conducting such a study in the industry. As the researcher, l also provided my participants with information on ethical principles of carrying out the research and explained to them that if they did not want to be part of the research, they we free not to participate without any harm coming to them. After the discussion, the researcher went on to ask the respondents if they would be willing to participate in the research and if the respondent agreed, l took down their email address.

After this process, l went on to send emails with the information sheet and consent form for them to acknowledge their agreement to participate in the research. An open-ended questionnaire with interview questions was then emailed to the research participants. When the emailed was sent the researcher, put in a request that responses for the questions sent ne emailed back with the week. Some of the research participants managed to return their responses in a week so that the research would move on to analysing data. However, some of the respondents did not manage to return and fill in questionnaires in time, the researcher then started making follow-up phone calls. The respondents were very much willing to provide me with their responses over the phone some citing that they hardly had time to sit and fill in their responses. As the respondents answered the various questions, I managed to take down the responses and wrote them on the printed questionnaires l had on my desk. Only 3 participants had failed to send their feedback over email, hence the process was faster and easier than receiving emails and downloading participants' responses. Telephone interviews also provided some benefits of flexibility and reduction of travelling costs.

3.6.6 Observation

Observations are at the heart of qualitative research in the marketplace and social science research. The study participants give their opinions, views, and perceptions about the subject matter under discussion. Saunders et al. (2015) asserts that observations are done in neutral and very comfortable environments where researchers are able to assess the different aspects that surround the participant’s day-to-day workplace. Physical observations are also evolving to the use of video observation, although in this research, physical observation was used because videos were not appropriate as they would capture other people, like customers, where consent was not obtained.

The first stage in preparing for observations was to note down the various aspects that the researcher checked at processors, wholesalers, retailers and farmers' workstations. The aspects were developed using research objectives that were outlined by the research in chapter one. The main aim of the observations was to confirm the discussions that were made with the participants in an interview that was carried out on that same day. Additionally, I wanted to experience the day-to-day operations of these study participants and pick some of the issues that will help me in understanding horticulture supply chain parameters.

There was a positive response from the farmers, processors, wholesalers and retailers because l had also indicated that there was going to be an observation tour that l would carry out after completing the interviews. It should also be noted that the farmers and distributors had already signed a consent form when interviews were made, and this was an extension of the data collection method used. The information sheet also contained information on the aspect that observation may be included as part of collecting data. During observation, l was conscious not to disturb the organisation's day-to-day activities and maintained a 20-25 minute tour of their places before bidding goodbye to the participants. Thus, l restrained myself from interacting with my participants during observations so I could concentrate on identifying several aspects relating to the topic under study. As such, l took the role of note taking, observing any aspects that were later transcribed when l was doing data analysis.

After all the four group discussions were conducted, l analysed the data to identify common themes, patterns, as well as insights that were emerging from all the discussions. Thematic analysis was used to code data and develop themes that were used in writing the research findings. Key findings were interpreted and written as subheading in chapter four and conclusions and recommendations were given in the final report.

While l was making interviews and observations, l realised that farmers were very much interested in the research outcome as they realised it could benefit them immensely. The farmers also highlighted in the interviews that it was about time that the government put in place a board that could assist them with aspects such as price control, market access and proper channels for supplying horticulture products. The other farmers were even willing to constitute representatives that could go and represent them at the ministry to propose that such a board be formed that could benefit Zimbabwe's access and availability of vegetables in all parts of the country, with reasonably priced products. Information from this discussion was more valuable as postulated by (Saunders et al. 2015) that observations provide more qualitative information that is detailed and important for research. The note-taking part and observations l made were also fascinating, as one could see that farmers were passionate about the study topic, hence they had valuable information on how an integrated horticulture supply chain will help improve supply chain efficiencies.

However, since l did not want to restrain some contributions that were coming from respondents in interviews, the method thus presented minimum challenges. That is, l could not manage to take control of the rate at which questions were being posed with some of the interviewees, and as a result, l had to develop patience and let the program flow according to participants' speed to get all the needed information. Secondly, since it is usually difficult to separate political issues from agriculture discussion, some farmers were more interested in politicising the research; luckily, l did expect some of the questions posed, hence managed to divert the responses to move away from these aspects and concentrate on the horticulture supply chain. Table 3.7 below shows the areas of observation and the rationale behind performing these observations.

Table 3.7: Observation guide

Areas of observation	Rational
1. Produce available	To see the different varieties that were offered in the market, or the crops that farmers grow.
2. The state in which the produce is, for example, quality, merchandising, freshness, size,	The researcher wanted to understand the various aspects relating to the quality of produce by looking at the size, freshness, and merchandising of the products from both farmers and distributors
3. Pricing of different produce	To establish how producer prices are determined and if a stable price is being used across markets
4. Consumer behaviour when they approach the vegetable area	To understand the various actions that consumers take to eventually decide on purchasing vegetables
5. Methods of payment used	To check whether IT systems were being used for payments
6. Most desired vegetables	What made these vegetables desirable to consumers, distributors, and farmers?
7. Farmers who came in to make deliveries	Method of transportation and markets for vegetables

3.6.7 Reflection on the methodology in the empirical field

It was not an easy task to select which research method to apply, as all three methods were equally applicable (quantitative, qualitative and mixed method approach). After an extensive literature search and reading several empirical studies that were done in the horticulture industry, it became imperative that l use an interpretivist-qualitative research method. The study required that a social constructivism paradigm be applied to understand the views and opinions of the study participants. Given that the research was looking at one of the cultural values embedded in Zimbabwe (horticulture farming), a more in-depth research was needed to gather detailed information rather than just quantifying the research findings.

To the researcher's advantage, the study participants were not very difficult to locate where they work and the areas they could be found in Zimbabwe, because the researcher has 20 years' experience working in one of the biggest horticulture input companies. Having understood the nature of the respondents, it was important that census methods be applied to select the sample size, then non-probability sampling techniques such as convenience sampling and purposive sampling be adopted to select the study participants. This research took place during the rainy season, which is the busiest period for all players in the horticultural sector in Zimbabwe; hence, the use of this convenience sampling was justified for farmers. For instance, using sampling techniques like snowball sampling would have resulted in nonresponse, which would have resulted in sampling errors and unreliable research results.

Utilising the knowledge that l had obtained from my wide reach, l managed to be successful in obtaining useful and credible information from following a step-by-step guide that was given by Saunders et al. (2015) of carrying out qualitative research. Thematic analysis was also proposed as the best method to use in analysing qualitative data. In addition to following the

steps of conducting qualitative research, l was also flexible and widely read to such an extent that in my daily routine, l could notice aspects of supply chain that were occurring in my surroundings and write them down to reflect on them later when l was developing my instruments.

I was also kind, patient and warm throughout the research process, treating every participant individually, not collectively, hence the study participants were willing to provide me with the required information. I had to ask farmers and distributors to give me appointment times that they were more flexible with for me to go and do a face-to-face interview. Making appointments with study participants showed l respected their work schedules. I was also fortunate to get respondents who were forthcoming with information, I did not have to struggle much for them to provide their views and opinions.

Finally, l would say conducting observations with farmers and distributors raped up the research. More research insights were identified that affected the effectiveness of horticulture supply chains. Assuming the role of note taking became advantageous as l could also observe what was taking place. After both interviews and observations were completed, data analysis and description were done using thematic analysis.

3.7 Qualitative data analysis

Finding the most appropriate data analysis method to use was a difficult task, given that there are several methods available. Qualitative analysis is believed to be complicated and nuanced (Holloway and Todres, 2003) because of the amount of data that needs to be arranged, coded, verified and re-evaluated before making the final conclusion. A researcher can use conversation analysis, content analysis and thematic analysis. Founded in the 1960s by sociologist Harvey

Sacks, together with Emanuel Schegloff and Gail Jefferson, content analysis investigates patterns such as turn-taking, interruptions, and how individuals resolve misunderstandings in dialogue. It is frequently used in areas such as sociology, linguistics, and psychology to examine casual conversations and interactions in formal environments like courts or interviews. Conversation Analysis (CA) is a technique employed to examine social interactions, concentrating on how individuals utilize language in actual conversations. It analyses verbal and non-verbal communication, including gestures, pauses, and tone, to comprehend how people construct meaning and manage social interactions.

Whereas, content analysis is a research technique employed to methodically examine and understand communication, including text, images, or audio. It assists in recognising patterns, themes, and significances within the material. Scholars utilize it to analyse a range of subjects, from political addresses to social media content, to grasp trends, biases, or the effects of communication. Whiles thematic analysis is a qualitative research technique employed to recognise, examine, and interpret patterns or themes in a dataset. It aids researchers in revealing insights regarding individuals' experiences, opinions, or values by arranging data into significant categories.

However, having considered content analysis, conversation analysis and thematic analysis, l finally settled on using thematic analysis to analyse my results. The reason is that conversation analysis is used to analyse how people have conversations, looking at the language aspect (Silverman, 2001). It is a very popular method to use when doing social psychology. Content analysis is not used in most horticulture studies as it mainly serves as a technique for examining communication, which is found in texts, images and videos. Horticulture research on supply

chain requires an in-depth understanding of the study participants' opinions, views and experiences. Additionally, immersing one's self, in the environment in which they operate to understand the implications of the subject area of the participants was the other reason why thematic analysis was used as it provides this avenue. Therefore, my research was looking at social aspects of culture and livelihoods in the horticulture industry; hence, thematic analysis was deemed the most appropriate method of study.

3.7.1 Thematic data analysis

This section shows the application of thematic analysis in the research study and explores how it was used to develop research findings. According to Thomas (2006), thematic analysis is a method of data analysis used to identify and interpret the patterns or themes of a data set and usually leads to the development of new insights and understanding a phenomenon. Additionally, Xu and Zammit (2020) proposes that thematic analysis involves the identification and reporting of patterns found in a data set which are then interpreted for their inherent meaning on the basis of understanding keywords that study participants use. However, Patton (2015) emphasis that researchers should not let their preconception disturb the identification of key terms obtained from interview transcripts. Additionally, the ability of the study participants to freely give key information on research aligns with the inductive approach, which this research also adopted. Naeem and Ozuem (2022) propagates that researchers who use thematic analysis further develop their skills, which will enable them to conduct other kinds of qualitative research, such as discourse analysis (Flick 2022). Hence, through the use of this method, l managed to sharpen my qualitative data analysis skills.

It is also essential to note that thematic analysis leads to the development of a conceptual model. Naeem and Ozuem (2022) proposes that a series of steps has to be taken to construct a conceptual model in thematic analysis. Thus, keywords need to be identified, quotes need to be selected, coding has to be done, a theme developed, and findings have to be interpreted. This research, therefore, utilised the six-step approach of conducting thematic analysis developed by (Naeem et al. 2023), known as the 'systematic thematic analysis' because it follows a structured and sequential approach to interpreting research data. This approach is diagrammatically illustrated in Figure 3.7 below.

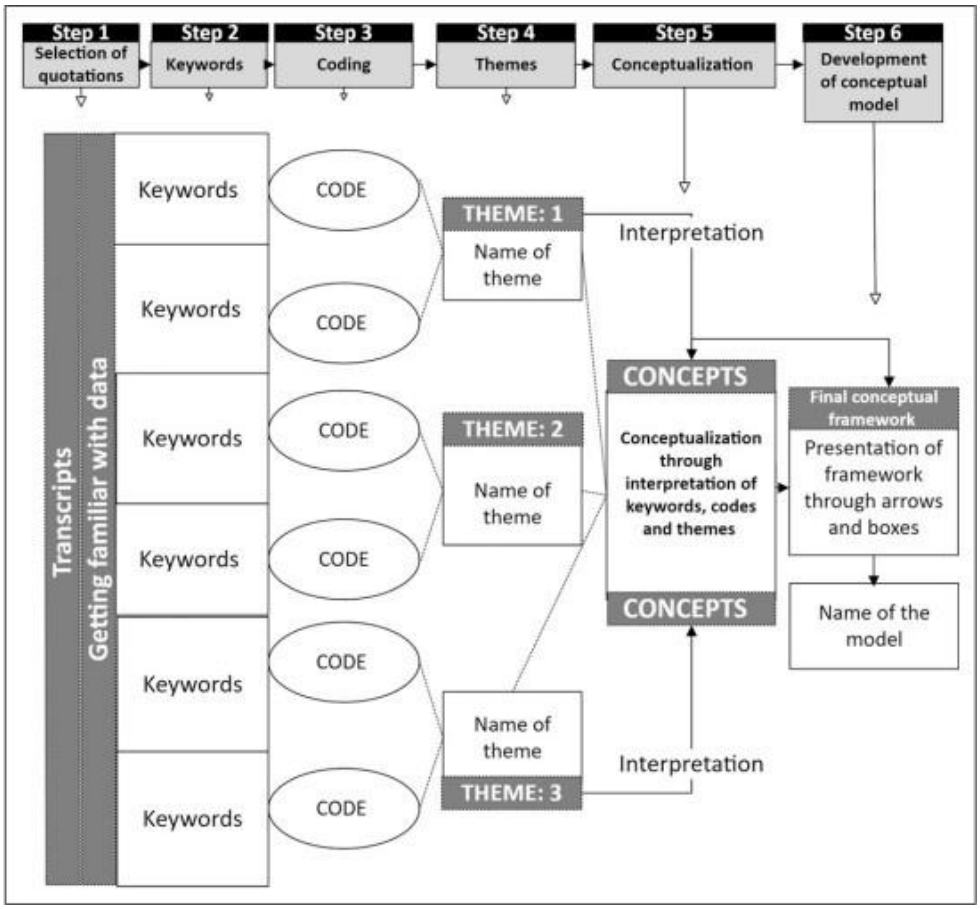


Figure 3.7 Systematic Thematic Data Analysis Process: Adopted from Naeem et al. (2023)

The following selections provide detailed information on how this the six step process was utilised in my research. Using both manual coding and NVivo, l managed to follow the six steps of thematic analysis as propounded by Naeem et al. (2023).

Step 1: Transcription, Familiarisation with the Data, and Selection of Quote

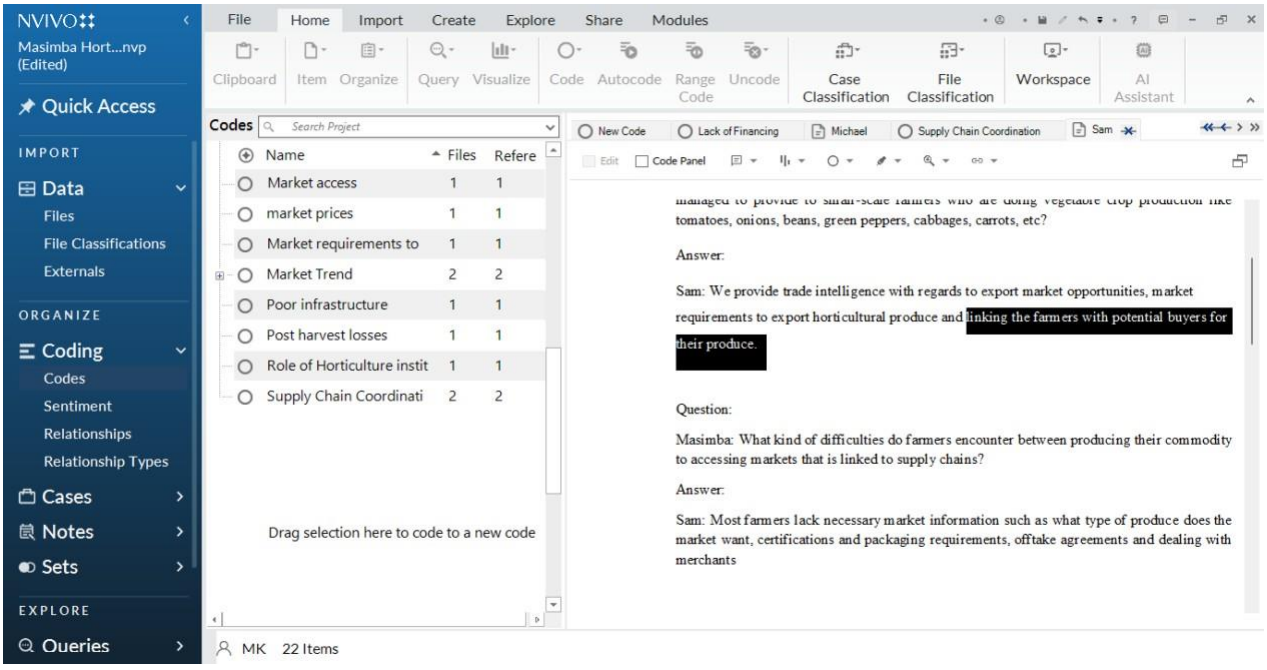
This is the first stage of the systematic thematic analysis process. The stage involves transcription of data, and the researcher has to familiarise himself/herself with the information provided by respondents. The researcher has to immerse himself or herself in the content to identify emerging patterns and interesting features of the research. The researcher then selects quotes that bring the data to life and substantially represent diverse viewpoints and patterns that are important to the research objectives identified in the research (Naeem et al. 2023).

Data obtained from both interviews and observations was transcribed at this stage. All scripts were uploaded to NVivo Pro 15, and I had to go through the interview scripts and notes that l collected during observations several times, immersing myself in the data that l had obtained. According to Lamba et al. (2022) the process of selecting some parts of the responses makes transcribing easier and more concise for data screening.

I also studied quotes that were given by study participants that seemed to have information relating to the area of study. These quotations were also helpful in reviving my memory as l could also visualise the respondents' answers and some important conversations that we had during interviews. The use of quotes assisted me in understanding patterns in the data provided by respondents. Creswell (2012) identified three types of quotations that a researcher can notably use thus, discrete, embedded, and longer quotations. For this research, l used all three types of quotations, discrete quotations are short and precise, while embedded, are brief quotes

that may convey another meaning, and longer quotations have more information that needs dissecting in relation to the research questions posed. Table 3.8 below shows one of the discrete quotes that the researcher used to transcribe data into meaningful codes. Since a confidentiality clause was signed, l used fewer quotes and did not write the names of the respondents to maintain confidentiality when l was writing the final report. I used pseudo names to protect my research participants' privacy. The study of social constructivism also supports the use of quotes to bring life to research (Eldh et al. 2020). Rereading the written transcripts and notes l made gave me some initial impressions, and a general overview of the research data. This process opened my eyes to some of the emerging patterns that the majority of respondents were talking about, paving the way for the next stage of selection of keywords.

Table 3.8: Quote in interviews screenshot



Step 2: Selection of Keywords

This stage involves a closer examination of data; it can be from interviews, focus group discussions, or visual content and observations. When examining data, recurring patterns,

terms, or visual elements are identified and considered as keywords. These keywords summarise study participants' experiences, views and perceptions that are directly derived from data (Naeem et al. 2023). Oliver et al. (2005) also notes that when respondents provide their responses, this will be used by the research to extract meaning that help construct the reality of a situation, and these are taken as keywords, which are very useful in developing codes and eventually themes for the research. When keywords are identified, they are put under the objective category.

As l went through interview and observation transcripts, l realised that there were some recurring patterns and words when respondents were responding to particular questions. Using 5 different highlighters, I identified patterns in the interview scripts that l had uploaded, identifying the most relevant statements that were linked to research objectives. I used one colour highlighter to represent and address each particular objective. So since l had 5 different objectives, l also used 5 different highlighters. With the aid of NVivo Pro 15 software and a list of key words was produced as shown in the codebook in Table 3.9 below. The research had to go through the interview transcripts and notes on observation guide identifying key words that were related to the objective of the research paving way for the next stage of coding.

Table 3 9: Sample of keywords found in research

Name	Description
limited storage facilities	
Linking farmers to potential buyers	
Market access	
Market Information	
market prices	
Market requirements to export of agriculture produce	
Paying members	
Person for not getting certification	
Poor infrastructure	
Post-harvest losses	
produce when they are offtake offers	
Quality and grading issues	
Quality Requirements	
certification and packing requirements	

Eldh et al. (2020) supports that quotes selection echoes an epistemological stance of interpretivist and social constructionism theory, which was also adopted in this research. Naeem et al. (2023) and Ozuem (2022a) state that a researcher can start with data analysis while still collecting data and can note down keywords commonly used by participants. Naeem et al. (2023) suggest six R's that can be used to identify keywords, and the researcher adopted these. The six R's are outlined in Table 3.10 below.

Table 3.10: Definitions of the 6Rs for Keyword Selection in Thematic Analysis.

6Rs for Keyword Selection	Definitions
Realness	Words that reflect the genuine experiences and perceptions of the participants
Richness	Words that are rich in meaning and provide a detailed understanding of the phenomenon being studied
Repetition	Words that frequently occur in the data, which indicates their significance and relevance to the participants
Rationale	Words that are connected to the theoretical or philosophical foundation of the research
Repartee	In general, repartee refers to quick, witty conversation or a quick, witty reply. However, when used in the context of thematic analysis and in selecting keywords from the data, "repartee keywords" are words that are insightful, evocative, and stimulate further discussion or consideration
Regal	Words that are central to understanding the phenomenon under study and contribute significantly to the literature through adding new insight

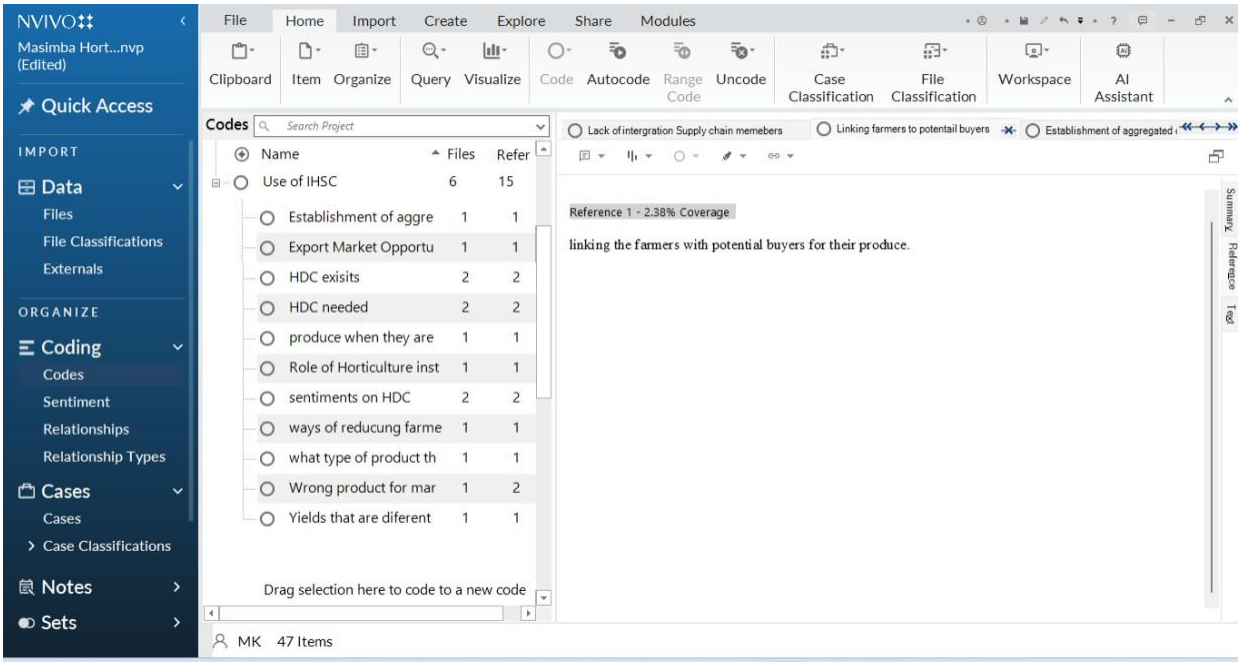
This stage of selecting powerful, meaningful, and important keywords from quotations helps pave the way for coding data in the next stage. The identified commonly used keywords by the participants and quotes were also used to discuss the results in writing the final report.

Step 3: Coding

Coding is where the researcher comes up with short phrases or /words that are also known as codes. These codes are then assigned to segments of data that capture the data's core message, the importance, or themes. This stage simplifies the complex textual data by transforming it into a theoretical form and assists in the identification of elements relating to research questions. Keywords play an important role in coding because they are the backbone for analysis, and they help to convert raw data into meaningful, insightful and manageable units that can be interpreted. In this research, coding was done by selecting keywords that were identified in research the research instruments used and assigning them to key research objectives categories of the research. Table 3.11 below shows that the researcher generated 47

codes that were entered using NVivo 15 and by going through transcripts and observation guide notes.

Table 3.11: Sample of codes used in the research



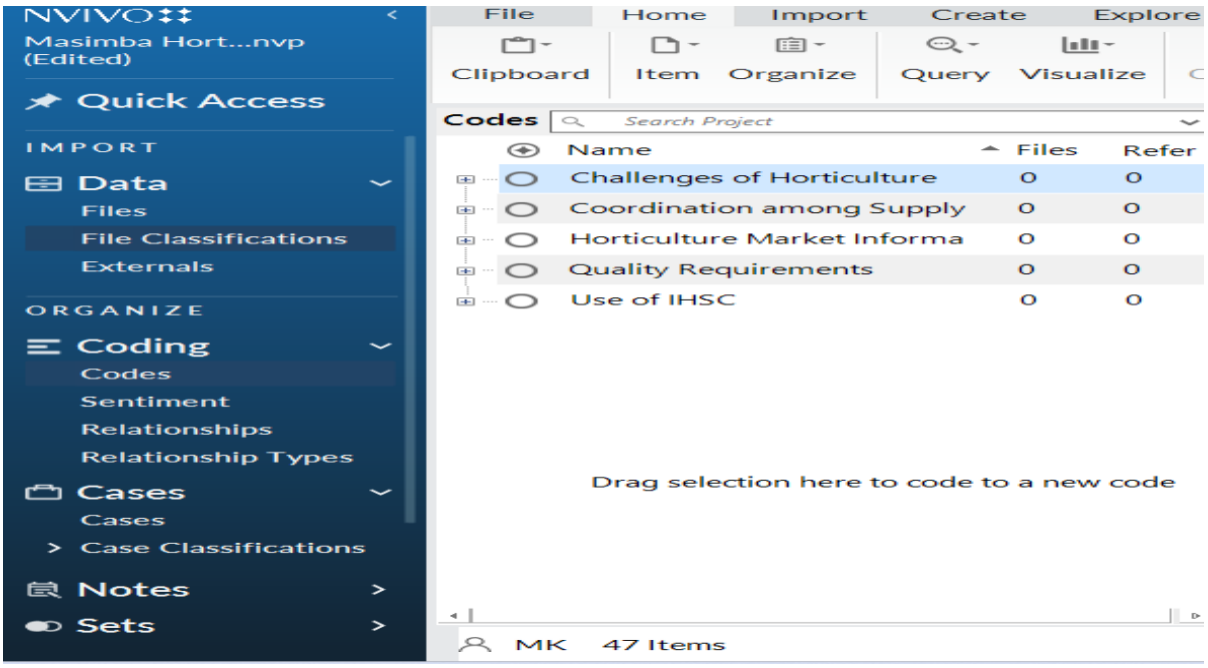
This stage paved the way for the next stage of theme development.

Step 4: Theme Development

At this stage, the researcher organised codes into meaningful groups to develop a theme. Thus, a theme represents patterns and relationships that exist within a data set. This process provides insights into the research questions provided in the research study. At this stage, the researcher had to transition codes to abstract interpretation by developing themes. These themes are more substantiated as they embody patterned meanings that will link research questions and data. However, the fact that a theme is constantly repeated in conversations does not necessarily mean that they are important (Nowell et al. 2017). Thus, as a researcher, you need to go through the codes and extract those that are salient, significant themes in the coded text segments. They should be related to research questions. Hence, with the aid of NVivo under the subsection of

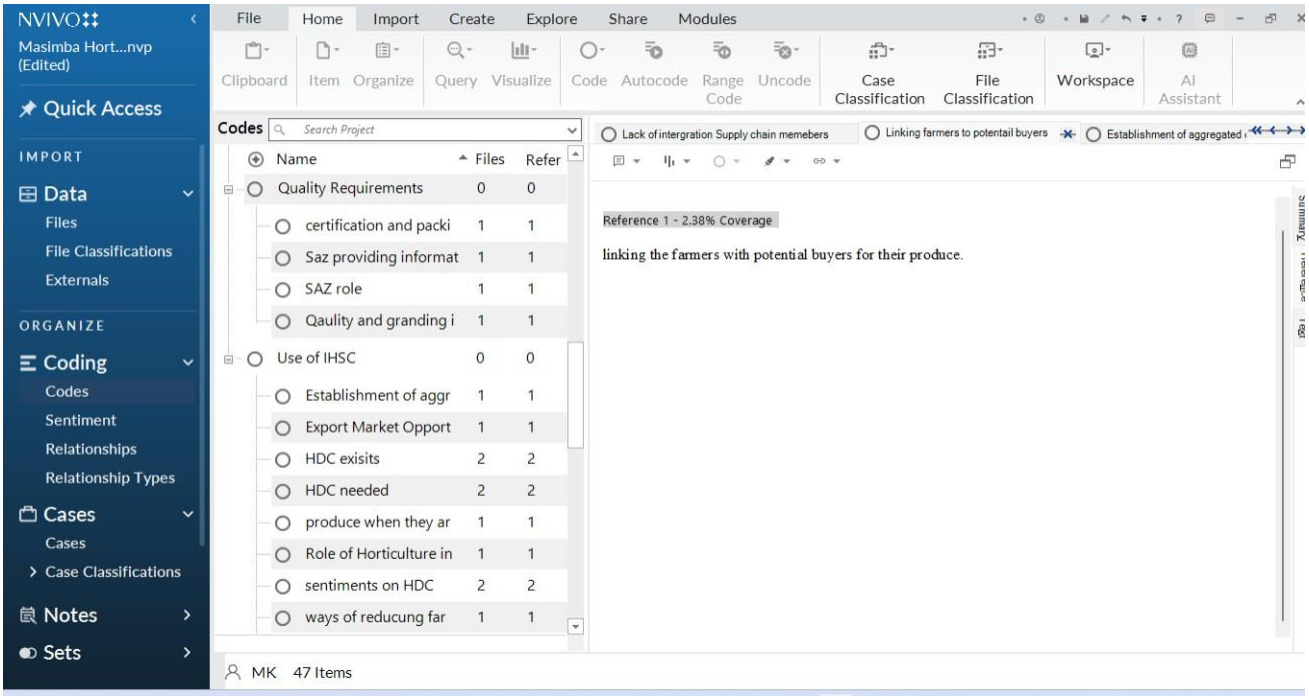
organise, the researcher managed to develop key research themes through the assistance of artificial intelligence (AI) to group codes that relate to the same theme using keywords that were developed earlier and each category of objectives. Table 3.12 below illustrates the themes that were developed with the aid of AI thus; challenges of horticulture, coordination among supply chain, horticulture market information, quality requirements, and use of IHSC.

Table 3.42: Sample of Themes developed in research



Therefore, as observed in Table 3.12 above themes that were developed were empty, however, there were 47 codes that were already created in the folder. The next step was to categorise the following codes under each theme. This was done so that I could provide grounds for broader data analysis. I selected the most relevant codes for each particular theme and placed them in those categories, thereby merging all essential codes because they showed some promising findings. Table 3.13 shows a sample of themes and codes placed in their categories.

Table 3.13: shows a sample of themes and codes placed in their categories



Step 5: Conceptualization through interpretation of keywords, codes, and themes

Conceptualisation stage involves understanding and defining the concepts emerging from data. The researchers must identify social patterns and then refine them to align with the research being undertaken. The researcher can utilize tools like diagrams or models to comprehend the relationships that exist among these concepts. The quality of the definitions developed should be assessed to measure if they are applicable, clear, accurate and reliable and how well they contribute to theory and practice. In conceptualisation, researchers can look for structure or links from research findings as they progress. Visual aids in the form of maps, models, and diagrams are the final outcome of conceptualisation (Jackson and Mazzei, 2012). For this research, the researcher defined notions and then moved on to interpreting relevant data to create relations between different concepts that were put in the model. Firstly, l had to define a range of possible dimensions of the concept and then had to find indicators that showed the presence of the concept in data. Borrowing from other theories of supply chain that were put

forward, l managed to have a better understanding of how the different notions l found in data could be defined and used in research. The criteria that l used for measuring definitions used in data are illustrated in Table 3.14 below.

Table 3.14 Criteria for measuring the definition found in the data

Criteria	Achieved
Does the definition make the meaning of the phrases or words picked as major concepts obvious?	Yes
Do the definitions of themes as new concepts help understanding of the research results?	Yes
Are the definitions and explanations of the concepts accurate and reliable?	Yes
Do the definitions of the concepts reflect the real scenario or context of the research?	Yes
To what level of analysis does the notion of participation and theory apply to these concepts?	Grounded in the participants experiences and perceptions
How can the selected concepts be used to justify research outcomes as contributions to theory and practice?	Linked to real data
Are all the concepts related to each other, which would support development of a conceptual model?	Yes

Consequently, at this stage l had to verify whether themes developed provided a broad scope of what is being explored and its boundaries. I did not use codes that did not fit in with my research questions and developed themes. The technique that l used to code my data helped me in developing themes in a much simpler and easier way. The same aspects, such as recognisable themes, provided an insight into the development of the model, which was later used in chapter four for interpreting research findings.

Step 6: Development of Conceptual Model

According to Naeem et al. (2023) the final stage in thematic analysis is the development of a conceptual model. Development of a conceptual model involves the process of creating a unique representation of the data, which is often guided by existing theories. The model that is

developed serves to answer the research questions as well as underscore the study's contribution to knowledge. This last step signifies the conclusion of the analysis; it summarises all the findings and perceptions derived from the data.

Using findings from this research and hybrid of theoretical models (1) Lewis structural change theory, (2) Multi-Agent Systems in Supply Chains, (3) Stakeholder Influence on Supply Chain Management theory and (4) Supply Chain Operations Reference framework the researcher developed a conceptual framework that explores in-depth information on the integrated horticulture supply chain and its ability to resolve supply chain vulnerabilities in Zimbabwe. It is every farmer's dream to be able to understand which product to plant, how much the product will cost, how much the product will fetch in the market and which distribution channels are cost-effective and to which markets these products can be sold. The research findings showed that access to market information was important to farmers to ensure precision farming. Supply chain collaboration was also lacking among horticulture supply chain members. Most players in the industry were not familiar with the quality standards that are used for horticultural products. Therefore, it is the researcher's view that the level of coordination, market information, quality standards required, and challenges that affect the implementation of an integrated horticulture supply chain process are key to the horticulture industry. This relationship between these factors that affect the application of an integrated horticulture supply chain are shown in figure 3. 8. For IHSC to be successful Zimbabwean government needs to address small-scale farmers' challenges and ensure there is supply chain efficiency for everyone in the sector to benefit.

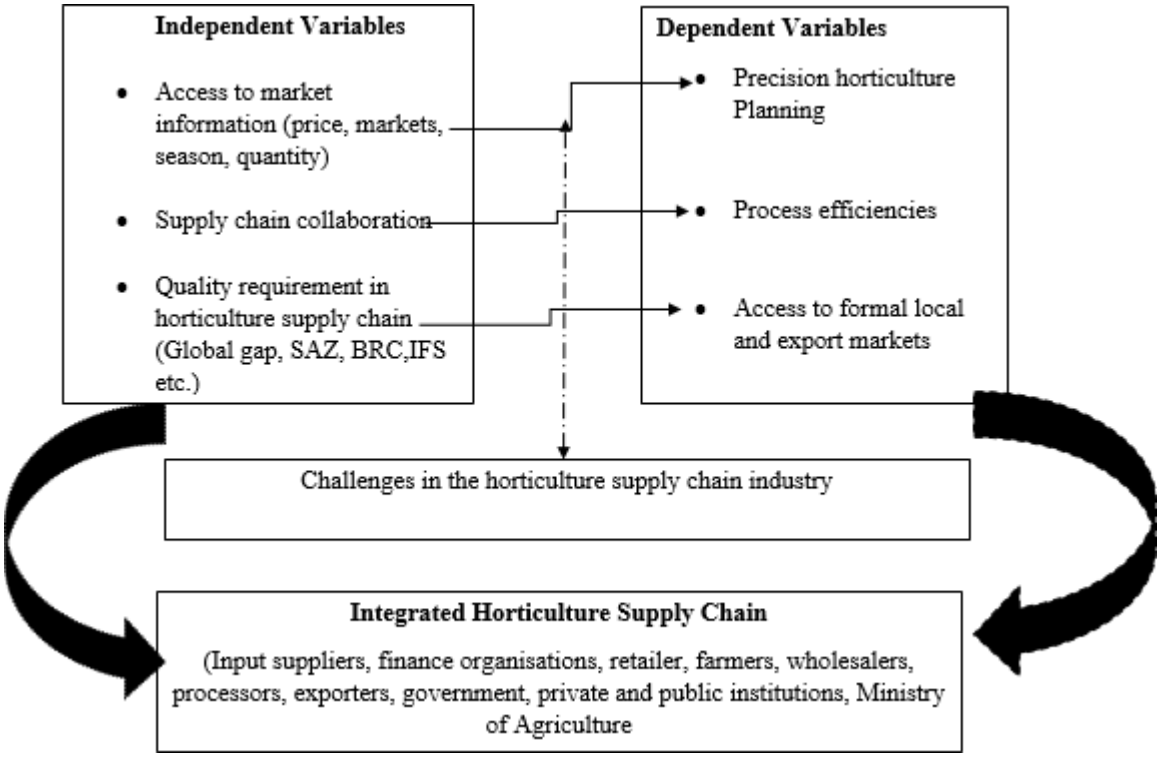


Figure 3.8: Researcher's own conceptualisation of the horticulture supply chain for small farmers in Zimbabwe

3.8 Reliability and validity of the research project

Reliability of research data refers to the extent to which the research method used can still obtain consistent results if the research were to be repeated somewhere else under similar conditions and using the same research instrument. The research findings should also represent similar outcomes, even if a different researcher uses the instrument that was developed by the initial researcher or when different participants are targeted. To ensure the reliability of research, this study conducted a pilot study with 3 participants who represented the actual targeted sample respondents. The pilot study was done to remove any ambiguity in the research questions designed before interviews and observations could be conducted. Coding of information, resulting in the development of common themes in this research, also increased data reliability. Additionally, the use of a standardised questionnaire ensured consistency of the research instrument.

Validity in research refers to the extent to which a research instrument accurately measures what it is intended to measure. Thus, results that are obtained from research should correspond with concepts or constructs in the real world or to the environment in which the research was carried out. To ensure validity, another researcher carefully selects study participants who can provide in-depth information about the research area. For this research, the researcher selected participants from farmers, horticulture associations and service organisations, processors, wholesalers and retailers as these are the custodians of the integrated horticulture supply chain. The research also made use census to determine the number of participants who could supply information on the topic under study. Appropriate sampling techniques, such as convenience and purposive sampling methods, were also utilised to select the most knowledgeable participants for the research. The researcher also used triangulation of data through the application of face-to-face interviews, email, telephone interviews and observation methods.

3.8 Conclusion of the methods

The research methods and design used for this research had a methodological fit. The chosen designs of social constructivism, interpretivist-qualitative approach, and the use of non-probability sampling techniques worked well for this research. Census was used to obtain information until saturation point was reached. Thematic data analysis and description were also used to complete the qualitative research design that the researcher used. The researcher finally managed to develop a conceptual model using research findings also utilising some inputs from existing theories.

3.9 Chapter Summary

Chapter three outlined the research steps that were taken to collect data from farmers, horticulture associations and service organisations, processors, wholesalers and retailers on the topic towards an integrated horticulture supply chain to address supply chain vulnerabilities. At the start of the chapter, the researcher presented a diagram that showed a roadmap of how information was collected from respondents. The researcher went on to define qualitative research design and justify why it was used for this research instead of a mixed-methods approach or a quantitative method. The following sections outlined the different qualitative approaches that were available for the researcher to use, however, an interpretivist-qualitative research philosophy was deemed appropriate to carry out this research as it looked at the social constructivism of study participants. The various roles of study participants were identified and discussed. The chapter also outlines the sampling techniques that were adopted in carrying out research and the different data collection methods. The researcher then went on to explain how the actual research was carried out, also providing information on ethical procedures followed and the thematic process engaged in. Research reliability and validity were discussed at the end of the chapter to show how the research instruments used in this research were consistent and accurate. The following chapter presents the research findings and discussion of this thesis.

CHAPTER 4

FINDINGS AND DISCUSSIONS

4.0 Overarching conceptual findings

4.1 Overarching findings

The figure 4.1 below illustrates the five major themes that came from the research and some overarching findings that help explain the sentiments that were put forward by respondents.

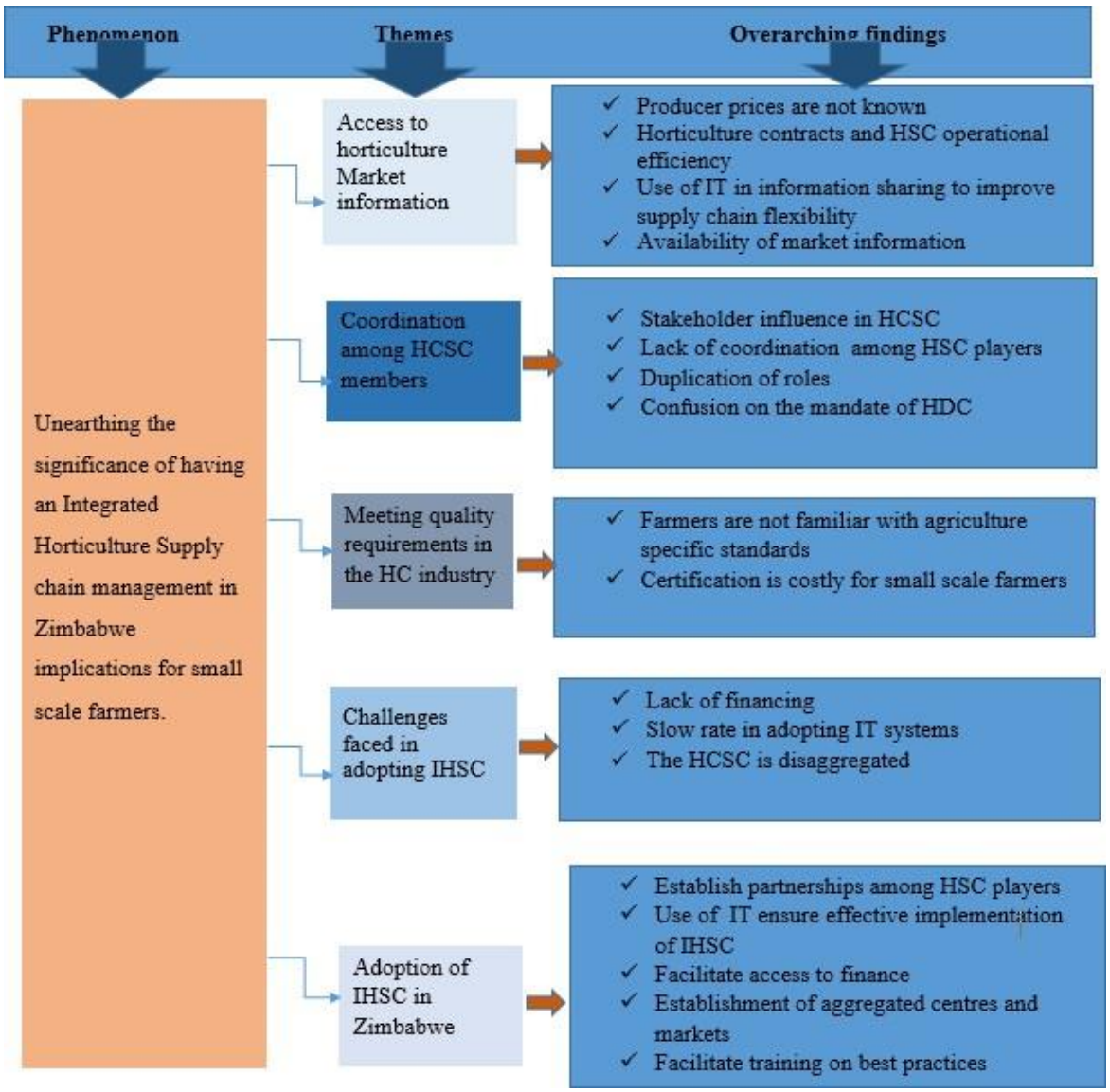


Figure 4.1: Thematic Map for the Overarching Conceptual Findings

The findings presented in figure 4.1 above show an iterative process of perspectives and opinions obtained from farmers and horticulture institutions that are found in the horticulture industry in Zimbabwe. Among the study participants were some horticulture institutions that provide farmers with agro farming methods and varieties to plant, while others also help farmers with market information and export advice. Farmers and horticulture institutions representatives and associations managed to provide a valuable and extensive analysis on the matter regarding the significance of having an integrated horticulture supply chain in Zimbabwe. In reporting this research, I followed the guidelines provided by Tong, Siansbury, and Craig, (2007), thus the Consolidated Criteria for Reporting Qualitative Research (COREQ) (See appendix H).

These guidelines assisted me in being transparent and showing how l managed to arrive at my findings with the chosen methods of study. In presenting my findings, l have also inserted some quotes that were made by participants to provide valuable responses l got from the interviews l conducted. However, due to ethical considerations regarding confidentiality, I did not use the names of the participants; hence adopted pseudo names. All the other elements like gender, age, years in the profession and educational qualifications remained the same to avoid distorting the respondent's data. I introduced this chapter by providing the significant themes that came out of the research and their overarching findings (*figure 4.1 above*), making sure there was no repetition. These themes are presented in an orderly manner and provide a concise picture of the area being studied. Utilising Braun and Clarke (2006) sentiments of developing themes and presenting them, the following sections shall look at the interpretation of the research findings.

The chapter also gives an in-depth account and critical discussion of the research findings, making sure that the judgments that come out through evaluation are useful, and the interpretations made show the significance of results to research aims. Additionally, I had to use my literature in chapter two to assist me in making reference to arguments put forward, to support, contradict or add to the findings l got from research. This process helped in contributing to the existing body of knowledge on integrated horticulture supply chain in resolving supply chain vulnerabilities. Therefore, these results contribute towards closing the gaps identified in literature as it shows the implications of research findings and connections to the existing body of knowledge. Hence, this chapter provides an important and broader perspective of the practical implications and applications of research results. Concurrently, the chapter also lays a platform or foundation for limitations that this study could not address, therefore making further recommendations for future studies to look into the subject matter to contemporary heights.

The information provided below discusses and evaluates the research findings on the research topic.

'Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe'

4.2. Theme1: Access to horticulture market information

4.2.1 Producer prices are not known before, during and after harvesting

The majority of the participants interviewed communicated that the major challenge they face is the lack of information on how much their produce will cost in the market before planting or after harvesting. Most farmers communicated that when they start their planting season, they have no idea of the produce price in the market after harvesting. What worries the farmers the

most is whether production cost will be covered after harvesting and sale of the commodities, or if the production cost are recovered, will they be able to make a profit. Some participants even pointed out that because of lack of market information before, during and after harvesting it has become risky to commercialise horticulture farming, hence they have resorted to subsistence farming to avoid taking such huge financial risks. Mangisoni (2006) research supports that the availability of market information, particularly concerning prices, plays a crucial role in the decision-making processes of farmers when determining which crops to cultivate. This underscores the importance of price information in guiding agricultural production choices. A statement by one of the farmers expressed below underscores the importance of knowing the price of produce in decision-making for farmers.

"*If I know in advance the available markets and prices, then I will be able to produce products for a ready market and also produce according to the quality required".*

Given this price dilemma, the researcher went on to ask farmers why they could not use previous season's prices to guide them in making their budgets. The research participants communicated that they could not use previous season prices to develop estimate for the current production because the pricing of vegetable commodities are influence by the demand and supply at a particular time and place. If, suppose there is an influx of tomatoes in the market at that particular period, the demand becomes low, and this pushes the price of the product down, drastically affecting the ability of the farmers to make any profits. When this situation occurs, some farmers communicated that they end up selling their produce at giveaway prices making a loss just to recover production costs. Vegetables are highly perishable in nature, and farmers end up making hasty decisions to sell quickly because they also do not have cold chain infrastructures. The respondents also said on the other hand, in cases where there is a shortage

of vegetable commodity in the market, the price shifts upwards and they tend to benefit positively sometimes making profits that are double or more than in sessions when they is normal supply. These results indicate a largely comparable situation, which future researcher can explore. However, these findings resonates with Chen's (2011) research study which investigates the dynamics of information sharing within competing supply chains that encounter demand asymmetry. The research shows that sharing demand information can increase profits for supply chain. Sharing of information is crucial for horticultural producers who largely rely on accurate market data to make informed decisions about production and distribution. This aligns with the principles of precision agriculture, where data-driven decisions are essential for improving resource efficiency and increasing production. Chen's (2011) study also emphasizes that sharing demand information can significantly improve overall profitability. This finding is particularly important in horticulture, where market demand can fluctuate rapidly, and timely information is essential for producers and vendors to make spot informed decisions.

Additionally, research by Lee and Kim (2023) shows that the sharing of information in horticultural supply chains is an essential factor that enhances operational efficiency, adaptability, and overall effectiveness of the supply chain. Literature provides substantial evidence about the importance of effective information-sharing strategies among supply chain partners in the horticultural sector. One notable example is Wal-Mart, which utilize information sharing to improve its supply chain efficiency as well as responsiveness to market needs. According to Baah et al. (2021), exchanging information is a crucial element of partnerships within the horticulture supply chain, enabling partners to gain competitive advantages. Their findings indicate that enhanced transparency through information sharing leads to improved supply chain practices and performance outcomes. This assertion is well supported by the study

of Zhang and Chen (Zhang and Chen, 2013), who highlight that vertical information sharing can significantly reduce supply chain costs and improve overall performance.

4.2.2 Horticulture contracts and HSC operational efficiency

The research participants also shared their sentiments towards lack of shared information on how contracts for horticulture supply chain are processed. The participants explained that companies in the horticulture industry shy away from addressing the issue of offtake contracts, as they want to avoid risk in the event that maybe crops fail due to uncontrollable factors like floods, heat waves or drought seasons. Farmers also said in most cases they are the ones that end up bearing the risk, while other supply chain players just go ahead with their business, but at the same time, they expect to get vegetable supplies from farmers. Additionally, the research respondents have accused Horticulture Development Council (HDC), a non-profit making organisation, for focusing on commercial farmers because they have to pay a membership to obtain information they can use for both their local and international export markets. Some of the respondents indicated that they are not familiar with the role of horticulture association across the industry and as such securing of contracts becomes difficult. According to CAI Et Al. (2014) contracts can enhance operational efficiency; therefore, if supply chain players in the horticulture industry coordinate with each other, this would improve the availability of produce in markets and assist in addressing supply vulnerability.

However, respondents from the seed company said they have tried to take matters into their own hands by trying to close the gap of offtake contracts. Input companies, especially seed companies, said they developed a strategy, where they approach big processing companies to sign contracts for supply of vegetables that they may require to produce for instance juice; sauces etc. Once they secure these contracts, they go back to the farmers then contract them to

grow the vegetables required, thereby supplying them with the inputs they require. The companies will monitor the planting from the clearing of the land, germination, pesticide control, weeding all the processes until the produce is harvested. Input companies will then collect the produce and supply the processor sometimes meeting the requirements of the contract signed. For instance, seed companies said they have adopted this strategy to safeguard their interest, this is because once farmers stop production of horticulture commodities, and these companies will incur huge losses with possibility of closure. Farmers are their customers and they do not want them to shift from producing horticulture produce to grains. Grains have input suppliers, the market is already there and producer price and cost are known.

Other input suppliers highlighted that they have engaged Zim-trade and the Horticultural Development Council to help them identify markets for farmers' produce. Their view is, if farmers cannot sell their produce profitably, they will not be able to return to buy seeds, which will negatively influence the seed business. A current research conducted by Xie et al. (2023) recommendation is in line with the strategies that input companies in Zimbabwe are implementing. The researchers are of the view that establishing contract frameworks that promote a link between farmers and agribusinesses' interests is essential for achieving integrated supply chain objectives.

Research participants interviewed also agreed that it was going to be beneficial to have contracts among the supply chain players using backward and vertical integration. For instance, having processors/wholesaler's contract farmers to produce the commodities required in different markets and then input suppliers and horticulture servicer provide support farmers with offtake contracts. Mesa et al. (2019) case study research also claim that retailers

significantly influence supplier relationships by endorsing contracts that reconsider direct buying methods to reach niche markets.

However, on the other end representative from one of the big processing companies also expressed that they used to collaborate with input suppliers to contract farmers to produce commodities that they would use to make products like Jam, juice, cooking oil, baked beans etc. The organisations mentioned that, these initiatives have since ceased due to several challenges. One of the major challenges was that processing companies now prefer to import commodities from other countries, citing that it is expensive to buy from local farmers. The participants indicated that Zimbabwe is using a strong currency, hence the cost of production becomes high, pushing the prices of commodities up compared to commodities produced in countries such as Zambia. A notable example given by one of the respondents was that the current exchange rate of USD: ZMW was 1: 28.86 (as at March 2025). Now, at the time of research, the price of a kg of tomatoes in Zimbabwe was $ 0.88 USD, and in Zambia it was 16.49 ZMW. If the $0.88 is converted to Zambian Kwacha, the price of tomatoes would be 25.39 ZMW, making Zimbabwean tomatoes more expensive by 8.9 ZMW. As such, when the processors realised this gap, they started to import, leaving Zimbabwean farmers stranded with their produce. The sentiments obtained from the processing company in the horticulture industry substantiate the theory of the SCOR matrix, which looks at supply chain performance measures, which are Plan, Source, Make, Deliver, Return, and Enable. As illustrated in Table 2.4 The third tier of the SCOR matrix examines the business processes and systems utilized for processing orders, making purchases, executing sales, managing work orders, conducting replenishments, handling returns, and generating forecasts. Sourcing as a measure of SC performance examines all the procedures involved in acquiring goods and services required to satisfy anticipated demand, and purchased material cost is one of the key decisions to be made,

together with cycle time and demand requirements. Thus, processing companies are justified in looking for cheaper materials elsewhere to improve production efficiency. Although the government has intervened to promote local production by banning the importation of certain horticultural products, it is evident that, due to the porousness of our borders, some reputable companies continue to engage in smuggling of these same products.

4.2.3 Use of IT in information sharing to improve supply chain flexibility

This research also looked at how the horticulture industry has managed to embrace technology to improve information sharing amongst supply chain players. Some research participants, especially input suppliers, processors, wholesalers and retailers, commented that they to a large extent implemented electronic point of sales and internet-based electronic data interchange, which has facilitated efficient information exchange between buyers with suppliers. What was, however, interesting to note from the interviews done was that these supply chain actors across will only share information on the quantities they have sold and what they require from suppliers, none share information on selling price using email or WhatsApp messaging. Some farmers indicated that distributors as well as retailers will still want to negotiate the production price lower price, but without sharing the retail price. One of the farmers shared their view, saying it would be reasonable to have retail outlets share the estimated final price for the product so that they agree on a reasonable selling price, but this was never possible. These research findings are in line with Engel et al. (2014), who postulates that the exchange of information is an essential tactic for achieving enhanced performance gains in supply chains, but many organisations only limit information sharing to transactional data.

However, with the fourth industrial revolution and artificial intelligence coming into play, one of the horticulture supply chain service players suggested that the industry could take advantage of these developments and develop a database and applications for tracking marketing

information. This suggestion is in line with Neethirajan (2023) research, which looks at the influence of artificial intelligence and sensor technologies in precision farming, proposing innovative ideas to boost productivity and improve supply chain operations. Although focused on livestock, the ideas of precision agriculture and technology utilization also apply to horticulture, where immediate monitoring and data-driven decisions can enhance operational efficiency, especially given the perishability of horticulture produce. A different study by Alcívar-Espín (2023) presents a flow-focused model for comprehensive integration in premium product supply chains, emphasizing the need for a structured approach to manage complex supply chain dynamics, which is presented by the need to have cold chain storage facilities. This model can serve as a framework for horticultural supply chains aiming to achieve higher degrees of integration and responsiveness to market demands.

4.2.4 Availability of market information

Research participants interviewed revealed that in most cases, there lack adequate information on which horticulture product is required in a particular market. One of the respondents eluded that the horticulture market is so complex and dynamic, and it requires farmers to have up-to-date information so that their products meet the required product at the right time and market. The respondent went on further to say, a market like Victoria Falls for instance, would require unique produce to cater for tourists who come from different countries and have their special type of foods they consume, compared to other places in Zimbabwe that will be consuming traditional, known horticultural produce. One of the respondents from horticulture farm associations expressed the following:

For horticulture, it is producing the wrong product for a market, e.g. farmers produce table potatoes without market information, just as they do for most field crops, then try and sell to

fast food establishments who make French fries. Most of horticulture requires that the primary focus be on the quality requirements of the markets, and better still, securing the market first before production. Meeting the quality requirements for the markets, and where prices are linked to quality, results in farmers failing to realise the highest price. By its nature, there is a lot of dynamism in the horticulture sector, and without up-to-date information, a farmer may produce a product, which has gone out of fashion or cannot meet the needs of that particular market. It is important to get up-to-date information.

The research participant also shows that if farmers are able to produce the right product for the right market in the right window, with the right quality, they stand a chance of fetching higher prices for their produce. The respondent's views are also supported by Ginige et al. (2016), research which was done in Sri Lanka. This research revealed that the primary cause for the inconsistent supply of horticultural produce is the inability of farmers to receive correct information, at the appropriate time and in a suitable format, such that they can adequately prepare the required produce when needed. Suppose there is a ceremony that needs to be performed in two months, and this function requires some cabbages for salads. A farmer who is contracted to plant this produce will select a variety that will be ripe in two months, like Cabbage Fabiola, rather than taking the Cabbage Majesty that requires three months to ripen. Hence, if all farmers had such information at hand, like the time a product is required, the place, quantities, as well as price horticulture sector in Zimbabwe will be booming and significantly contributing to the GDP of the country.

These observations from this research are not new. Kaloxylos et al. (2013) posits that the availability of information has been a major hurdle in the horticulture sector for a long time. Therefore, it is important to understand what customers desire, where, when, at what cost, and

in what amounts, to assist in providing accurate, prompt responses while minimising supply chain vulnerabilities in the horticulture sector. Having observed this theoretical gap, it is important that horticulture supply chain players, especially farmers, do market research before growing crops. Most horticultural products are highly perishable, and most farmers have not invested in simple, small cold chain infrastructures and are not in a position to store their harvested produce, so it is very critical that they identify markets first before producing. They need to spend more time in the market, not timing the market. Market trends, cost-benefit analysis, market price monitoring, value addition and diversification are essential for the horticulture industry to be profitable and sustainable.

Another cause of concern that some participants raised was that they are organisations that collect useful information on prices, markets, quality required and possible estimates for the next period. However, these organisations require some membership fees which can go as high as $1000USD/ per year. Small-scale farmers commented that with that amount of membership fees, they can use the money to plant two or three crops and realise some income from their produce than pay to get information.

Ginige et al. (2016) indicate that the primary reason for erratic supply in Sri Lanka is the failure of horticulture supply chain participants to obtain the correct information at the appropriate time and in a suitable format, which hampers their ability to produce the necessary goods when required. Moreover, Kaloxylos et al. (2013) state that the lack of information has been a significant problem in the agriculture-food industry for an extended period.

4.3 Theme 2: Coordination among HCSC members

4.3.1 Stakeholder influence in HCSC

I applied the stakeholder influence model of Mourtaka and Sabar (2022) to analyses these findings. The framework identifies the key stakeholders in horticulture supply chain management and their influence. The authors propound that each of the stakeholders within the horticulture supply chain has motives, and these motives drive them to achieve the organisation's set goals. Additionally, the researchers posit that there is coercive and normative pressures that influence the way business undertakes their business. Coercive pressure stem from influence that comes from internal stakeholders such as shareholders of the company, employees and investors whereas on the operations of the business, whereas, normative pressure denotes the influence that is given by external stakeholders such as government authorities, customers, suppliers, competitors and financial institutions.

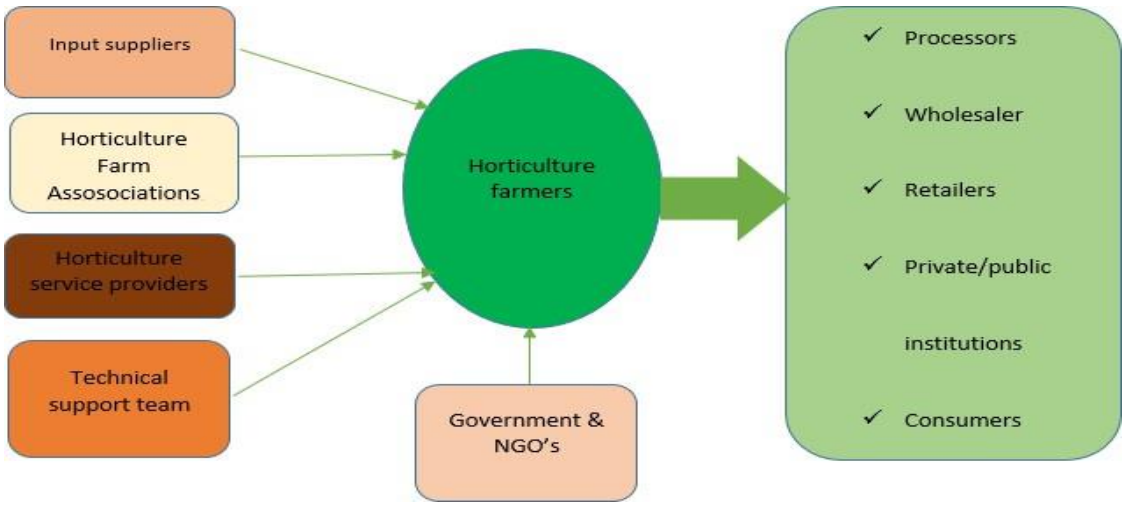


Figure 4.2: SC players in Zimbabwe horticulture industry

As illustrated in the figure 4.2 above, the key SC players in the horticulture industry in Zimbabwe include;

(1) Input suppliers - provide farmers with seeds, chemicals, fertilizers, ploughing and planting machinery.

(2) Technical support team (government and private institutions) - engage in training to educate farmers and markets about the varieties available and planting information.

(3) Horticulture farm associations – associations are required to adhere to specified procedures or initiatives to assist farmers in reaching their established objectives.

(4) Horticulture service organisations – these offer different services to players in the horticulture industry to meet requirements, for example, financing, logistics, horticulture information, consultancy and certification services, etc.

(5) Processors, wholesalers, retailers, private and public institutions and consumers.

(6) Government and NGO's

Research findings show that the most vulnerable group of stakeholders in the horticulture sector are the small-scale farmers. Participants showed that most of the farmers have low bargaining power when selling their products. One participant was quoted as saying;

"We are selling produce to middlemen and Mbare Musika, and these middlemen peg prices for our products, and at times we are forced to sell at very low prices, and as a result we are making huge losses".

In another conversation, the respondent explained concern over what are known as Makoronyera "chance agencies" who go to farmers and convince them to sell their produce to them, but they offer very low prices to such an extent that some farmers are not able to cover their production cost. Some smallholder horticulture farmers can also be approached by a few big individual farmers who have established export markets and can be asked to supply them with produce at a very low price so that they can resell in the form of exports at very lucrative

prices in the process exploiting these small producers. These big farmers will become middlemen, taking advantage of these small producers who do not have access to these export markets. These results are in line with UNCTAD report (2015) findings, which express that farmers are still faced with the complexity of determining the price of fruits and vegetables. Other research has also shown that the use of spot markets has caused significant losses for farmers, either economically when they sell their products at less than production costs or when they suffer losses through spoilage because of excessive supply in the market. For other farmers, determining production price becomes a challenge because they do not write all costs aspects incurred during production, especially when their family members were the ones who were involved in labour.

Integrated horticulture supply chain offers a solution to farmers unfair treatment in the SC as according to Joshi et al. 2023; Govindan, 2018; Notarnicola et al. 2017; Hinrichs, 2003; Marsden et al. 2000) argument, that regulating the horticulture industry ensures that farmers financially benefit from agricultural commodities that they produce and players within the industry are also protected when engaging in business activities.

The other stakeholder influence paradox includes farmers, processors and input suppliers. Currently, processors are not willing to directly contract farmers due to various challenges related to risk. As such, input suppliers are experiencing normative pressure stemming from processors. Because input companies such as seed companies can only exist if they continue to sell seed to farmers, they are now being forced to enter into offtake contracts with farmers such that they can supply processors with the produce they require. At the end of the day, input companies bear the risk from both angles, thus, from the producer’s side and from the processors' side. For instance, if they contract farmers to produce a certain crop and these

farmers fail to meet the deadline for delivering the ripe product, the contract is cancelled, and input suppliers are left with produce but no market. These findings resonate with Chaudhuri et al. (2020) research, which concludes by saying horticulture supply chains still encounter issues with a lack of adequate coordination among partners. Clarity and openness are seen to be essential for effective risk management within supply chains.

However, it should be noted that though processors shy away from bearing the risk of contracting farmers to produce for them, they also encounter risk when outsourcing. The other risk faced by most processors is the importation of banned GMO products. In Zimbabwe, GMO products are still not permitted to enter the country, so these processors must exercise due diligence when trying to bring in certain products from abroad. Since horticulture products are perishable Kim and Cha Kim (2014) show that strategic sourcing can also have its consequences where products do not meet required quality standards and there is are high risk of return as shown by the SCOR model. Hence, organizational culture contributes to reducing risks in supply chains. Their empirical research indicates that robust coordination among supply chain members can improve risk management abilities, which is especially pertinent for horticultural supply chains that frequently handle perishable goods and varying market demands. This research emphasizes the significance of nurturing a culture that values risk awareness and anticipatory management approaches for all players, hence, IHSC becomes essential.

The technical support team's influence is dependent on the organisation or institution that will be funding the institutions to help farmers with the information they require. Some members have highlighted that they come from public institutions where funding is limited, and they also have big territories to cover, which affects the ability of farmers to receive the information

required in time. The other challenge they cited was that some horticulture areas are hard to reach, hence, it may take time for the farmers to hear of any initiatives that are being offered so as to take advantage of the programs. Given the advances in technology, the technical support team can integrate information from various supply chain players and share it with farmers on direct and cheaper platforms like WhatsApp groups, as it happens to avoid loss of produce.

Research participants commented that the government has the highest normative power in the supply chain of horticulture inputs. This is because the institution is the biggest buyer of inputs, which they distribute to farmers. Hence, they have the power to negotiate prices which are low and also negotiate payment terms and select the varieties that they want to purchase. Additionally, most players in the horticulture sector also experience some form of pressure as they are policies and regulations that they have to adhere to, in the operations of their business.

Empirical research done in the United States (US) established agricultural policies, especially in the food supply chain, and continues to refine its strategies. A key policy focuses on vertical coordination with the aim of moving away from spot markets. The vertical coordination strategies employed in the US consist of production and marketing agreements, joint ventures, strategic partnerships, and franchising, leading to decreased information asymmetry and addressing certain market failures.

4.3.2 Lack of coordination among HSC players

Research participants commented that there is some disintegration among supply chain players in the horticulture sector. The research shows that while SC players seem to have their own mandate towards the horticulture sector, there is minimal contact within the sector. For

instance, Zimbabwe Standards Association (ZSA) supports the interests of ZSA members who are into research and development to come up with recommendations on adaptable varieties and G.A.P, production/importation and marketing of adaptable varieties.

The research also posed this question to the participants: “Is there any coordination between input suppliers, farm associations, farmers, processors and government institutions in managing the horticulture supply chain beneficial for every stakeholder in the supply chain? One of the participant expressed their view, saying;

Not to the level that it should be, and this has made it difficult to collect valuable information, which would help the seed industry best serve the horticulture sector, e.g. how much area is planted for each horticulture crop; what are the variety needs and/or product profiles of the different horticulture crops.

Timsina et al. (2016) emphasize the significance of strategic alignment in managing supply chains, particularly concerning agricultural products. The authors argue that effective coordination strategies need to consider the links between different stages of the supply chain to improve overall efficiency. Crucial significance of collaboration in cohesive horticultural supply chains. Key findings emphasize that effective collaboration enhances operational efficiency, resilience, transparency, and sustainability. Future research should continue to explore innovative collaborative methods and frameworks that can improve the efficiency and longevity of horticultural supply chains.

4.3.3 Duplication of roles

Research findings also show that HDC advocates for the needs of horticultural producers and supports exporters in the horticultural sector. It also focuses on building infrastructure, advocating for supportive policies, and improving financing and investment options in the horticulture industry. ZimTrade is also crucial to Zimbabwe's economic growth by encouraging and supporting exports. ZimTrade aids in enhancing the capabilities of exporters and aspiring exporters via training, market analysis, and consulting services. It offers essential market insights, such as trade directories and newsletters, to assist companies in recognizing export prospects. ZimTrade arranges trade fairs, exhibitions, and various promotional events to present Zimbabwean products and services to global markets.

Horticulture service providers are essential for the horticultural sector by delivering specialized services that improve productivity, sustainability, and market accessibility. Here are several of their main contributions: They offer knowledge in fields such as crop management, pest management, irrigation systems, and soil health to guarantee maximum productivity. Service providers deliver training sessions to prepare farmers with contemporary methods and effective practices. They assist in linking farmers to buyers, exporters, and distributors, ensuring that crops arrive at the appropriate markets. Providers offer vital resources like seeds, fertilizers, and tools specifically designed for horticultural requirements. They play a role in creating new technologies and methods that enhance efficiency and sustainability in horticulture.

By analyzing the roles that these organizations play one can note that there is no clear lines of the mandate between the role of Zimtrade and HDC. Some horticulture service providers also play the role of assisting farmers with exports and skills development which HDC and Zimtrade also do. One participant noted that this has led to duplication of roles by many horticulture organisations.

4.3.4 Confusion on the mandate of HDC

90% of the people who were interviewed were not aware of the mandate of Horticulture Development council. Most respondents were of the view that HDC is the horticulture board, whereas, it falls under the category of horticulture associations like the Horticulture Promotions council, farmers' Union, and these organisations all support players in the horticulture industry. Research results showed that there is confusion about the mandate of HDC in the horticulture industry. The players did not have adequate information on the association's goals, mandate or responsibilities. Respondents shared that because of a lack of awareness of the mandate of the association, it was difficult for them to align their organisation's objectives with the company. For those respondents who showed some bit of knowledge about the organisation, they did not know exactly the boundaries of their mandate. Some of the respondents, when asked if it was essential that the government of Zimbabwe develop an Integrated horticulture board similar to the current Grain Marketing board of Zimbabwe that regulates everything to do with grains in Zimbabwe, the respondents' answer was;

a. "*The HDC already exists but lacks government support",*

While the other responded saying,

b. ***It's already there in the form of HDC, it may need to extend its mandate so that it is responsible for the aggregation and marketing of horticultural produce as well. Decentralised, forming regional hubs. HDC has to find effective ways of bringing all stakeholders together as well as promote dialogue between various actors in the value chain so that there is transparency***.

These findings show that there is a misunderstanding amongst players in the industry on the role of HDC. Thus, this lack of clarity on the association's role might be contributing to some

supply chain vulnerabilities that are currently found in Zimbabwe. This would mean that SC players may not be aware of support that may be available to them, hereby leading to slow growth in the industry. The adverse effects of SC players having a vague insight into the mandate of the association may result in the players being sceptical about the information the organisation offers. It is important that the association engage in communication strategies to restore horticulture players' trust and help in growing the industry with their knowledge.

4.4 Theme 3: Meeting quality requirements in the horticulture industry

4.1 Farmers are not familiar with agriculture-specific standards

Research findings also showed that there is a critical gap in the horticulture sector industry on the lack of familiarity among horticulture small-scale farmers with agricultural standards. Some horticulture plays are not familiar with which genetic purity, pathology examinations, certification and parameters of a quality produce. While the buyers of horticulture highlighted that they assess quality based on freshness, appearance, size, weight, and adherence to specifications and standards, farmers expressed concern over the evaluation of quality by the other players in the industry because it is subjective. One farmer even mentioned that the requirements differ with every shop. For example, in other shops they require that lettuce be washed before supplying, while other shops insist that is should not be washed because it will lose its freshness quickly. Research participants also noted that in other outlets they use scales, while in other shops they use numbers to charge vegetable products. While there are quality differences and varied ways of dealing with suppliers of horticulture produce, respondents cited that they lack knowledge on genetic purity and physical quality standards, which ultimately results in them producing products that fetch low market value, production of substandard products, buyer dissatisfaction and diminished competitiveness. According to Ginige et al.

(2016), certification standards frequently serve as requirements for entering profitable markets. Player's lack of knowledge about these standards hinders their capacity to fulfil compliance obligations, reducing market access and financial prospects.

Additionally, Chaudhuri et al. (2020), says the lack of understanding of pathology examinations may hinder early detection and control of crop diseases. This increases the risk of widespread disease outbreaks, leading to lower yields and greater post-harvest losses. It should be noted that it is difficult for farmers without knowledge about quality standards to effectively engage with other players in the supply chain, like agronomists, buyers, processing companies and even customers. This situation results in collaborative disadvantages and affects the SC process and horticulture industry sustainability. There are also economic disparities between small-scale farmers and larger commercial players who are better informed about standards and certifications requirements in horticulture. This situation results in small-scale farmers experiencing post-harvest losses because of lack of knowledge. Standards often serve as prerequisites for accessing formal or international markets; hence, the lack of knowledge on available quality standards by horticulture players restricts them from participating in high-value markets.

4.4.2 Certification is costly for small-scale farmers

Findings from the research showed that certification is costly for small-scale farmers as it poses a financial strain on their limited budgets. Some respondents even mentioned that the initial certifications fee for Global G.A.P is 300 pounds for application and 6000 pounds for certification of standards followed by an additional certification add on fee of 500 pounds plus a yearly subscription fee of 3000 pounds, with additional fees for auditors and exam retake and these fees were beyond small-scale farmer's capacity. For this reason, some respondents communicated that they end up selling their products in low-value markets because they are

excluded from trade channels, as they do not have any certification. Exporters, buyers of private and public entities and key producers like Cairns, certification is a prerequisite, thereby resulting in a major competitive disadvantage for small-scale horticulture farmers. In some instances, farmers are isolated in the value chain as their produce will not meet standards.

4.5 Theme 4: Challenges faced in adopting IHSC

4.5.1 Lack of financing

Research showed that one of the major challenges that supply chain players are facing in Zimbabwe is the lack of financing. Players in the horticulture industry commented that it is currently difficult to secure loans from financial institutions in Zimbabwe. They stated that the banking sector has been hesitant to offer loans to the sector as the sector is bedevilled with so many risks stemming from climatic change, droughts, market instability and absence of a policy framework that supports stable producer prices that are used by banks to calculate loans. Other players in the sector were concerned with the high interest rates charged by local banks to such an extent that some producers mentioned that it was even cheaper to borrow from international or regional banks as their interests were much lower than Zimbabwe.

Mapanga et al. (2018) research shows that restricted access to financing within the horticulture SC limits the ability of SC players, especially farmers, to effectively source inputs such as seeds, fertilizers, chemicals, and irrigation systems, which are important in horticultural productivity. Once farmers are affected, this will lead to low production and failure by farmers to meet market demands, leading to supply chain vulnerability and loss of income for the next planting season, thereby affecting sustainability in horticulture. Peng et al. (2022) research, done in a Chinese supermarket, showed the importance of vertical integration in horticulture to promote a direct-purchase framework. The study demonstrates that SC players can reduce

transaction costs and boost SC efficiencies through vertical coordination by forming stable partnerships between farmers and retailers. Once they are offtake contracts between players in the horticulture sector, the challenge of financing can be reduced as players can supply inputs to farmers to produce, and once they are sold, they can work out the payments accordingly.

4.5.2 Slow rate in adopting IT systems

Research participants commented on the fact that there seems to be a slow uptake in adopting IT systems, especially for small-scale farmers. One of the respondents said;

While most SC players in the industry use IT, most farmers are yet to start using software for inventory management. Our company, for instance, uses SAGE 300 for Data entry (Input details such as produce type, quantity and supplier information), inventory management, order processing (creates and manages orders, ensuring accurate fulfillment), reporting and generates reports on sales, inventory and finances for better decision making in sales.

The research findings show that the industry has benefited from using IT software in the inventory management and decision making in most middle SC players like processors, wholesalers, retailers, while a few other small retailers and the bulk of farmers have slowly adopted IT systems. Most farmers cited inadequate digital infrastructure as the main hindrance to limited internet connectivity or a lack of interest in using digital technology in managing their inventory and order processing systems. They still utilise the manual way of counting and recording on paper as being the most reliable means of stock control. Some small-scale horticulture farmers commented that it is expensive to purchase IT gadgets, and maintaining

the IT systems is another issue, as they need to constantly subscribe to the packages that they will be using.

Some respondents mentioned that the constant power cuts are affecting their operations, further creating barriers for effective implementation of IT systems. It is the researcher's observation that apart from the challenges that are currently being faced in adopting digital technology in the horticulture industry, some SC players are more comfortable with using traditional methods of inventory management despite the availability of cost effective methods that can be utilised and require less complications like mobile phones and use of automated machines. Digital Platforms and Mobile Apps, serve to connect with farmers and other horticulture SC players, track field data, and manage logistics. These tools can facilitate real-time data capture and improve communication throughout the supply chain.

4.5.3 The HCSC is disaggregated, with each town/commodity/market acting differently

Findings from this research shows that Zimbabwe's horticulture supply chain is disaggregated in nature as each town, commodity, and market operates independently, and this has resulted in supply chain inefficiencies across regions. One of the research participants stated that each town and market operates as an independent entity, which has its own rules, practices, and preferences and as such, it is difficult to have consistency in quality, pricing and standard SC practices across regions. When one of the respondents was asked to comment on the nature of challenges the SC members have in trying to adopt an integrated horticulture supply chain, the respondent was quoted as saying;

"*Yes, we face challenges such as inconsistent supply, communication gaps with suppliers, and varying quality standards across the regions. It is difficult to source commodities in other towns because of price gaps and quality inconsistencies from suppliers"*

Thus**, t**he lack of centralized coordination among horticulture SC members has resulted in supply chain inefficiencies, including duplication of efforts and misalignment of goals. These aspects have disturbed the smooth flow of goods from producers to consumers. With markets having market-specific dynamics, having an IHSC system poses a challenge as other players in the industry focus on exports, while others prefer the local market. Additionally, respondents commented that the absence of integrated information systems restricts SC members from accessing real-time market data, delaying decision-making and responsiveness to market demands. Farmers also highlighted that the disaggregation of markets has posed challenges to them, as some have to incur huge transaction costs to ensure their produce is bought before it gets spoiled, leading to them fetching lower incomes. In other cases, there are huge price variances that can occur overnight, leading to either a huge loss/profit depending on price movement; hence, farmers are always at risk when they do not have off-take contracts. On the other hand, consumers may experience price variations and inconsistent product availability.

Timsina et al. (2016) highlight the importance of strategic alignment in the management of supply chains, especially related to agricultural items. The authors contend that successful coordination strategies must take into account the connections between various phases of the supply chain to enhance overall effectiveness. Essential importance of cooperation in unified horticultural supply networks. Their major findings highlight that successful teamwork boosts operational efficiency, resilience, transparency, and sustainability. It is important that a

centralised market be established for different commodities such that a standardised price, quality and procedures are agreed upon to resolve supply chain vulnerabilities.

4.6 Theme 5: Adoption of IHSC in Zimbabwe

4.6.1 Establish partnerships among HSC players.

Findings from research show that the adoption of IHSC requires partnership among HSC members. There is a need to have a unified voice, improved coordination and enhanced knowledge sharing. One respondent shared that the establishment of a partnership will enable an integrated horticulture board to drive growth, improve coordination and enhance the competitiveness of the horticulture industry. Careful consideration on the benefits and challenges of partnership need to be examined before moving forward. These findings align with Mutemim and Sakwa (2017), who report that the lack of a cohesive board among horticulture supply chain participants exacerbates the existing vulnerabilities, leading to an unreliable supply of vegetables and fruits.

These research findings suggest that HSC collaboration can result in enhanced operational efficiencies, particularly in managing supply uncertainties and boosting operational flexibility. Effective collaboration and coordination strategies can address concerns such as maintaining a steady supply of produce required in the market, managing quality and sharing of information among stakeholders of SC. Effective partnership among supply chain members can also improve decision-making, promote resource sharing, and foster innovation, ultimately benefiting all parties involved. Contract developed with players in the SC can include price agreements, delivery schedules, and quality standards.

4.6.2 Use of IT systems to ensure effective implementation of IHSC

For information integration and dissemination, there is a need to leverage digital platforms such as mobile marketing, social media platforms, and search engine optimisation. It is the researcher's view that all horticulture Supply chain players can be capacitated to have access to IT systems such as SAGE 300, which includes data entry, inventory management, and order processing, and reporting. These systems have been seen to enable efficient operations for SC players and improve accuracy for stock management, and support data-driven decision-making, which is currently lacking in the horticulture industry. Inventory management systems will help in tracking stock levels and minimising wastage, thereby optimising supply chain efficiencies. Order processing software helps in making sure that accurate orders are fulfilled, thereby promoting customer satisfaction. Having software that assists in reporting is very critical in the horticulture industry of Zimbabwe, as there is no real-time data available to SC players to use in their day-to-day operations. Reporting software can generate reports on inventory, sales, and critical data, which is essential for strategic planning and operational efficiency.

4.6.3 Establishment of aggregated centers and markets in all provinces /districts

An integrated horticulture board in Zimbabwe, responsible for aggregating, storing, and dispatching produce, presents a complex set of potential benefits, namely market stabilization, enhanced quality control and increased market access. The researcher recommends that the government establish centralized platforms for information sharing and supply chain management to enhance coordination and transparency among SC members. Policies need to be put in place that promote collaboration in towns, markets, and SC players so as to standardise SC practices and improve operational efficiency.

It is important that when developing these policies and centralised platforms, public and private sector players be included to build a more cohesive supply chain operation. Agricultural departments and trade associations need to publish regular updates regionally and create online marketplaces platforms like local farmers' markets, processors markets, and retailer markets and publish information on demand forecasts, order quantities, delivery schedules, quality standards, and any specific requirements to ensure efficient processing of horticulture. There is a need to have websites and newsletters focused on horticulture in the industry. Networking programs need to be implemented such that growers and other distributors discuss critical issues affecting their industry

4.6.4 Facilitate access to financial inputs

It is essential that the government of Zimbabwe develop policies that encourage financial institutions to invest in agriculture, like the risk-sharing mechanisms, which can bridge the financing gap that is encountered by players in the horticulture SC industry in Zimbabwe. Additionally, it is input for the government to develop stable producer prices and market prices for horticulture commodities across regions, as this is also affecting access to finance as financial institutions do not have pricing information to use in determining the amount of loan one is likely to borrow when producing a particular quantity for the market. It is also important that the government monitor microfinance scheme interest rates and support cooperative lending to have more avenues for players in the industry to assess finances when they need it. Public-private partnerships have also be viewed by Hu and Feng (Hu and Feng (2017) as an effective strategy for bridging the financial gap that is experienced in the Horticulture industry. This research shows that revenue-sharing agreements between horticulture SC are a significant financial incentive for coordination among supply chain participants. Thus, government bodies can collaborate with horticulture institutions and have some financing contracts that will help

in capacitating the industry in obtaining the required inputs and materials, such as storage facilities across regions for the industry to grow.

4.6.5 Facilitate training on best practices

It is important that farmers (who are the backbone of the horticulture sector) work with agronomists to improve their yields and minimise post-harvest losses. Agronomist provides detailed guidance on best farming practices, including optimal planting, cultivation, and harvesting techniques. Educating both farmers and the market to exploit the quality attributes of the improved varieties. Raising awareness on good quality seed and improved varieties & seed suppliers. Research and development of improved varieties that address the real needs of the value chain in Zimbabwe. Maybe do what other markets do, develop a product with an end market in mind and then actively participate to supply good seed variety, ensuring traceability along the value chain." Farmers need to start producing only when they have secured an offtake agreement and hence produce according to that agreement. There is a need for the industry to share with the farmers the indicative market prices for each market to assist them in making decisions.

The researcher also recommends that there is a need to have targeted interventions, especially for farmers who lack information on agricultural standards that are required within Zimbabwe and for international markets. Understanding the required quality standard for a particular product will provide an opportunity for farmers to explore export markets, as they will be producing according to market specifications. For instance Global G.A.P standard includes the pre-farm gate, hence covering the whole agricultural production process from when the seed is sown until the product is generated (excluding the processing stage). GLOBAL G.A.P. highlights food safety as well as environmental sustainability, labour conditions, and the

quality of produce. It establishes fundamental requirements for most supermarkets across Europe. Additionally, training programs on available standards such as GAP, Sanitary and Phytosanitary (SPS) Measures, Hazard Analysis and Critical Control Points (HACCP): SAZ, Organic Certification and Export-Specific Standards are essential in the SC horticulture industry. Government bodies and farmer associations need to carry out some outreach programs to educate the farmers and other supply chain players on the importance of adhering to quality standards.

The expense of obtaining quality certification poses a major barrier for small horticultural farmers. Tackling this problem necessitates creative approaches, including subsidized training programs, governmental backing, or collaborative frameworks that share expenses among farmer communities. Such initiatives could enable small-scale farmers to fulfil market demands, improve their competitiveness, and open up new avenues for growth and success. Technical support that can also be given by agronomists and input suppliers helps improve the productivity of commodities and reduce disease infections while improving the quality of the produce. The farmers are the backbone of the horticulture success; hence, receiving real-time information on quality standards will empower small-scale farmers, fostering stronger collaboration within the sector and driving sustainable growth in the horticulture industry

CHAPTER 5

SUMMARY AND CONCLUSION

5.0 Introduction

This chapter provides a summary of findings based on chapter two and the research questions designed in chapter one. Conclusions for this research are outlined, and the researcher's comments are also included. The chapter also discusses the limitations of the study and how the researcher overcame them. Major recommendations are given to resolve supply chain vulnerabilities in the horticulture industry, and the chapter ends by suggesting areas for further research in the sector and theory.

5.1 Summary of findings

This research involved players in the horticulture industry, namely farmers, horticulture associations and service organisations, processors, wholesalers and retailers. 15 participants were contacted, and the saturation point was reached with the 14th participant, and the researcher proceeded to add another respondent to confirm that no new additional information was coming through from respondents. The ages of the participants range from 18 years to 65 years, and most of the younger participants were found in the processing, wholesale and retail sector, while those in the middle ages of 35 to 45 came from horticulture associations and service providers. The majority of respondents had either a college certificate or a first degree. Male respondents dominated the research however, there was a balance in gender representation with 55%, 45% of male and female representation, respectively. 70% of the respondents came from natural agricultural regions 1 and 2, as this was the dominant horticulture region in Zimbabwe and also housed most horticulture farmers, associations and service providers.

The findings from this research showed that most supply chain players do not share market information with other players in the industry. For instance, farmers begin their planting season without knowledge of how much the commodity they are planting will fetch in the marketplace. Retailers and wholesalers wait to negotiate with the farmer on the producer price and cannot budget on the amount of money that they will pay farmers, see discussion in (*4.2 section in chapter four).* Additionally, organisations that are mandated to provide supply chain players with market information are passive in their roles or require membership fees to assist the farmers.

The research findings also showed that there is a lack of collaboration between supply chain players in the horticulture industry (*see section 4.3 in the research findings).* Farmers, in most cases, start planting crops without any off-take contracts. Processors and input suppliers shy away from engaging in backwards integration for fear of incurring some losses. Some companies that are also supposed to provide finance and inputs to farmers are very skeptical because small-scale horticulture farmers do not have collateral security. As such, the horticulture supply chain is disintegrated. As such, this disintegration it is now causing duplication of roles where farmers, for instance, receive agriculture extension services from ADRA or companies such as Prime Seedco.

On another note, supply chain players have noted in the research that they are not well-versed with the local and export quality standards that are required in the horticulture industry *(see section 4.4 in chapter four).* For some, quality is determined by the buyer of the product, not the seller of the product. Whereas for some players who are familiar with the standards, they shared that it is expensive to get their organisations certified. Global Gap was said to be costing

more than 6000 pounds for initial registration. As such, they exist a huge gap in terms of knowledge on these quality standards in the horticulture industry.

Research results to address the fourth objective also showed that supply chain players in the industry are currently facing challenges relating to a lack of financial aid, slow uptake of IT inventory systems by some layers, and the presence of a disaggregated market (*see section 4.5 research findings)*. Most wholesalers, processors and retail shops were seen to have adopted IT systems to some extent for inventory management and order processing, whereas farmers were seen as lagging. The cost of borrowing from financial institutions was also cited as another challenge that is hindering effective integrated supply chain processes. Some respondents cited that they borrow from regional countries because it is cheaper to get loans there than in Zimbabwe high interest rates. Additionally, the presence of disaggregated markets has provided challenges for consistency in pricing and availability of produce across regions. As such, profiteering has been the order of the day in markets, with farmers and other first-line distributors not benefiting from the production of vegetable commodities.

Lastly, the researcher asked respondents to comment on the aspects that could assist in ensuring the adoption and implementation of an integrated horticulture supply chain. Research findings show that for an effective horticultural supply chain to be successful there is need to have supply chain players adopt IT systems throughout the value chain process, there is need to have partnership among supply chain players for instance backward or forward integration, off take contracts given to farmers, contract player within the sector to carry out other supply chain activities across the chain, establish aggregated markets across provinces, facilitate access to

financial inputs and facilitate trainings in best practices found in horticulture (*see section 4.6 of research findings).*

Having outlined the findings of the research, the next section looks at the conclusions that were provided by the researcher based on the findings of the research.

5.2 Conclusion of findings and implications

5.1.1 Influence of sharing market information on precision horticulture farming.

This research concludes that most horticulture players are unaware of the producer price and selling price before commodity production. As such, these findings demonstrate that farmers usually start production of commodities without any information on where to sell their produce, the quantities that may be required, as well as the quality assessment criterion that will be used. In most cases, processors, wholesalers and retailers are the ones that determine the producer price for vegetable products, which at the end of the day is not feasible given that they are not familiar with the production price for vegetables. Even in situations where farmers can try to determine the producer price, they still find some challenges in selling at that price, given that there are various aspects that come into play, for instance, the aspects of quality of process that small-scale farmers do not meet.

This conclusion by the researcher is supported by Mutwiwa et al. (2022) observation that farmers ' ability to decide on producer price is usually affected by the type of crop, the education of the farmer and farm size. In this instance, the research was looking at small-scale farmers, and it can be concluded that they do not have any bargaining power in the market; the other players in the market tend to benefit more than farmers, as they charge high prices after they

order produce at lower prices. This assertion is also supported by the stakeholder influence model by (Mourtaka and Sabar 2022), where coercive pressure exists from other players in the industry. In this instance, buyers had coercive pressure as they could determine the producer price.

Additionally, the quantities available in the market, thus in this case when they is excess supply of commodity it pushes the production price down to such an extent that some farmers fail to cover production costs, however if there are limited commodities in the market the producer price will go up benefiting the farmers income and possibly making huge profits. These findings, therefore, show some vulnerabilities within the horticulture sector, which has also resulted in other farmers leaving the industry to join grain farming as they are assured of getting the stipulated price before planting the commodity. The prices that they will get for grains are known and are dependent on the quality of the grain produced. The markets are also known, and it is also a protected industry because when farmers try to sell to other players, there are heavy penalties that are charged.

During research, it was also noted that other players in the horticulture supply chain were not willing to offer offtake contracts to farmers because of various risks that are involved in farming, such as drought, floods, climate changes like frosts that can damage crops, among other factors. Some processors pointed out that it is now expensive to engage farmers locally in Zimbabwe, hence they did not find it feasible to use local farmers. With a lack of support from other supply chain players, farmers are left to take the risk alone, resulting in them being affected the most if a crisis occurs, and this leaves farmers exposed. This conclusion is supported by Abegunde et al. (2019), who propose that climate extremes negatively impact

farmers' capacity to ensure consistent income via agricultural methods, potentially causing processors to be reluctant in establishing offtake agreements. The horticulture industry in Zimbabwe is also very slow in adopting IT systems in processing their produce. Most small-scale farmers have not yet adopted inventory management and order processing software. They still use traditional methods of inventory management.

5.1.2 Collaboration in ensuring the successful implementation of an integrated horticulture supply chain process efficiencies

The researcher concludes that there is minimal collaboration among players in the horticulture industry. The least powerful player in the supply chain is the farmer, as they are not able to determine the producer price or cover production costs when they sell their produce. The researcher observed that the processors, wholesalers and retailers have higher bargaining power because they can either accept or reject farmers' produce using any criteria like size, quality, quantity or price. In some instances, the researcher also observed that there is a lack of coordination among the horticulture supply chain, which is caused by different goals and agendas. Mukherjee et al. (2022) emphasize the difficulties encountered by Farmer Producer Organizations (FPOs) in efficiently managing supply chains, particularly stressing the limitations created by insufficient storage and processing infrastructure. They argue that this shortcoming in supply chain management not only reduces farmers' negotiating power but also intensifies price volatility, ultimately impacting farmers' profitability and access to markets.

While farmers were trying to produce commodities to raise some income, the processors are also trying to buy products at a low cost to minimize the costs of production. The researcher also concluded that the roles and mandates of various horticulture associations are not known by players in the industry. Some players have a misconception about the role of the Horticulture Development Committee, and this caused a lot of confusion in the research. Additionally, there was duplication of duties by players in the industry, where you would find, for instance, input suppliers like Prime Seedco would provide agronomists to farmers, and government agronomist would still visits the same farmers to provide them with information. The researcher then concludes by observing that there is a gap in collaboration among the horticulture supply chain, which is causing some supply chain inefficiencies in the industry.

5.1.3 Certification in horticulture affects horticulture supply chains

The research showed that there are various agriculture standards that are available for horticulture players; however in Zimbabwe, most players have not adopted these standards because they deem them as expensive. One of the respondents shared that the cost of certification for Global GAP costs over 6000 pounds when one is initially starting. These fees are extremely high for farmers who are financially constrained. For other players like processors, there have adopted a few standards from SAZ which are less expensive. Gichuki et al. (2020) emphasize that adopting Global GAP standards demands considerable investment from farmers, particularly pointing out that farmers who are more affluent have a greater ability to invest in essential resources for compliance, like storage equipment and generators. This suggests that the certification process does involve significant expenses, which can pose an obstacle for farmers with fewer resources.

The researcher also concluded that despite the high fees of standard certification, most small-scale farmers were not familiar with the different quality standards available locally and internationally. It is therefore clear that some horticulture service organisation are not publishing this information to the people in this industry, and hence horticulture players will continue to lack vital information to grow their business.

5.1.4 Current constraints hindering the implementation of an integrated horticultural supply chain model in Zimbabwe

Research results showed a number of reasons that were communicated by respondents as to why it is difficult to have an integrated horticulture model in Zimbabwe. The researcher concludes by identifying a lack of financing as the major obstacle in fostering an integrated horticulture supply chain. Most institutions and farmers in Zimbabwe find it difficult to secure finance from the banks, and in situations where loans are available, the interest rates are high. Some processing companies are now even opting to borrow funds from other countries when they have adequate collateral. However, farmers continue to lack the finances to expand or reinvest in cases where they incur some financial losses. As observed earlier, other players in the industry are adamant about providing backwards integration in fear of experiencing losses in case the crops do not grow to the anticipated growth. Abdullahi and Gupta (2022) emphasize the difficulties encountered by smallholder farmers in Nigeria, pointing out that inadequate documentation and the absence of collateral frequently impede their capacity to obtain loans from banks. They suggest that these obstacles lead to elevated default rates, effectively deterring banks from providing loans to the agricultural sector, thereby resulting in restricted access to essential funding for farmers.

The slow uptake of IT systems was also seen as a major challenge in the implementation of an integrated horticulture supply chain. It is critical that all players in the industry adopt inventory management and order processing systems to ensure information flow within the industry. The researcher observed that in most cases, farmers were the ones lagging, with some horticulture associations also failing to put up-to-date information on websites that could benefit the players. For most processors and retailers, they have quickly adopted these systems because they already sell other merchandise like foodstuffs that need to be captured and manufacturing companies notified when stocks are running low. Drechsler and Holzapfel (2022) offer an understanding of the challenges involved in deploying Enterprise Resource Planning (ERP) systems in horticultural supply chains. They observe that uncertainties and the ever-changing nature of planning processes obstruct the creation and implementation of customized ERP systems. This halt in embracing advanced IT solutions limits the productivity and efficacy of horticultural activities, highlighting the necessity for tailored strategies to improve IT integration.

Another challenge for the implementation of an integrated horticulture system in Zimbabwe was the presence of disaggregated markets that cut across regions. The researcher concludes that because of variance in produce price, quantity demanded, type of products required and market, the products being sold to you would find that the same product costing $2 in Pick n Pay markets will be costing 50 cents at Mbare Musika. These disparities affect farmers mostly because if a farmer does not have direct access to sell at Pick n Pay, which may be offering a better producer price, they will not benefit much from selling to agencies at Mbare Musika. There is a need to regularise these markets and prices such that farmers and the players in the industry benefit from selling the commodities or processed products, and prices are the same throughout markets to wide off arbitrageurs.

5.1.5 Design an integrated horticultural supply chain model that is agile, which can be adopted in Zimbabwe to reduce supply chain vulnerabilities

In order to design an integrated horticulture supply chain that is agile, respondents shared their insights, which included establishing partnerships among horticulture supply chain members. It is the researcher's view that because we are dealing with a very perishable product, farmers, horticultural associations, horticulture service providers and end users of commodities such as processors and wholesalers should come together and develop a supply chain system that is efficient and known with minimal disruptions. Supply chain players need to support each other and provide off-take contracts to farmers, provide inputs, as well as financing options that are flexible to ensure the smooth flow of the process.

It was also observed that the establishment of aggregated centers would help in ensuring stable storage facilities and management of produce to reduce supply chain vulnerabilities. It is the researcher's view that establishing these centers in different regions can stop profiteering individuals from taking advantage of people, and everyone will have access to food, promoting the SDGS agenda. While establishing partnerships and ensuring aggregated markets and providing financial access to supply chain members are all necessary strategies for ensuring adoption of an integrated horticulture in the industry, the researcher also concludes by saying that training all players in the industry on best practices can boost the horticulture sector. Farmers can be taught the modern methods of farming that are environmentally friendly, while processors and retailers also learn aspects such as social licenses to operate, where they learn to give back to the community in which they operate. All players need to be trained on the local and international standards that they require to sell their produce and access high-value markets. When the horticulture industry manages to bring in some foreign currency into the country, it boosts GDP, and as a country, we can put Zimbabwe on the map again as the

“Breadbasket of Africa”. It is my hope that with the recommendations given therein in the following sections, the Ministry of Agriculture and the horticulture industry in Zimbabwe implement these strategies to address the supply chain vulnerabilities that are present now, and we can create a sustainable model that is used for the next generations to come.

5.3 Limitations of research

- The research was qualitative in nature; hence, quantitative data collection methods could have provided some statistical inferences for some aspects, such as price variances. However, the research made sure to use triangulation to ensure that research instruments were reliable. Future studies could look at a mixed method approach to gather bother the views and opinions of the supply chain players as well as obtain quantitative data on the supply chain process performance such as cost analysis, profits and revenues.

- The research study also used non-probability sampling methods, disregarding the use of probability methods. To ensure that the sampling method chosen would not affect research results, the researcher went on to use different methods for each targeted sample frame to ensure the validity of the research. Census methodology was also employed to make sure that the research is saturated with the required research data. In future further studies can also be done that include probability sampling techniques with a larger sample size to advance the subject of integrated horticulture supply chain further.

- Zimbabwe has nine provinces, but for the purpose of research, agricultural regions were used to categories research participants. Given this anomaly, one would say that all the

provinces were not adequately covered. However, to resolve this gap, the researcher mainly got more respondents in agricultural regions that are mainly active in horticulture production, that is, regions 1 and 2. Future studies could incorporate cross-country comparisons (e.g., Zimbabwe's horticultural boards) to enhance generalizability of findings once the board is established."

- The other limitation stemmed from difficulty in accessing hard-to-reach farming regions. The researcher managed to overcome this obstacle as we were familiar with the territory and used other alternative roads since l work in the industry and have been to the farms several times. In future those that wish to carry out research in horticulture industry need to have a plan in place of how to reach some of the communal areas that are situated in hard to reach areas so as to have the general overview of how horticulture supply chains are distributing products to end markets.

5.4 Research contribution

5.4.1 The body of knowledge

This research has contributed to the integrated horticulture supply chain phenomenon in identifying the different adoption characteristics that ensure the successful implementation of the phenomenon. For the effective implementation of an integrated horticulture board, there is a need to have supply chain member partnerships so that there is no duplication of roles. IT systems should be put in place for the efficient inventory and order processing systems to function well, and real-time reporting to be achieved. Additionally, there is a need to have an integrated centre where produce is stored that has cold chain facilities and that is governed by solid agriculture policies to protect all the players in the industry. This research also identified

that farmers need to be adequately supported through the provision of off-take contracts or supply of farming inputs so that they produce the required commodities in the right quantities, price and quality. These characteristics, together with research findings, helped the researcher to develop a model that can be used in horticulture to ensure that the players in the industry are not manipulated by unscrupulous businesses.

5.4.2 Business Practice

This research intends to contribute to the development of a horticulture marketing board that embodies all players in the industry from farm to fork. The establishment of a horticulture board will ensure that all horticulture processes are governed to address supply chain vulnerabilities. Below is a proposed roadmap of how this can be achieved;

- Farmers are the backbone of agriculture; as such, there is a need to ensure that these aspects are present so that they supply their produce to the rest of the players in the chain.
    - Availability of market information before engaging in planting: producer price, production costs, quality required, variety of produce required (organic/highbred/), local or export markets,
    - Facilitate training in best practice: soil management, best crop variety
    - Provide inputs: finance, fertilisers, machinery, seeds, chemicals, etc.
    - Provide transportation: from the field to the storage facility

- After these requirements are met, the government, in collaboration with AMA, should have established a horticulture marketing board that governs the farmers' interests and ensures that the other players in the horticulture industry are not abusing them. Some of the most important faculties this board should have are;

- Infrastructure: establishing cold chain facilities across all 9 regions in Zimbabwe
- Departments: Procurement, Marketing, Transportation, Export and local processing departments
- Processing facilities: e.g. processing of natural juices like carrot or apple juice, drying other produce that may be lost due to short life spans, adding value to some vegetable crops through packaging and preserving freshness.

➢ When this board is established, it will therefore mean that processors, wholesalers, and retailers will need to contact the board when they want to purchase the various commodities. Establishing such a board also ensures that IT systems are integrated and supply chain processes are put in place that resulting in an efficient supply chain across regions in Zimbabwe.

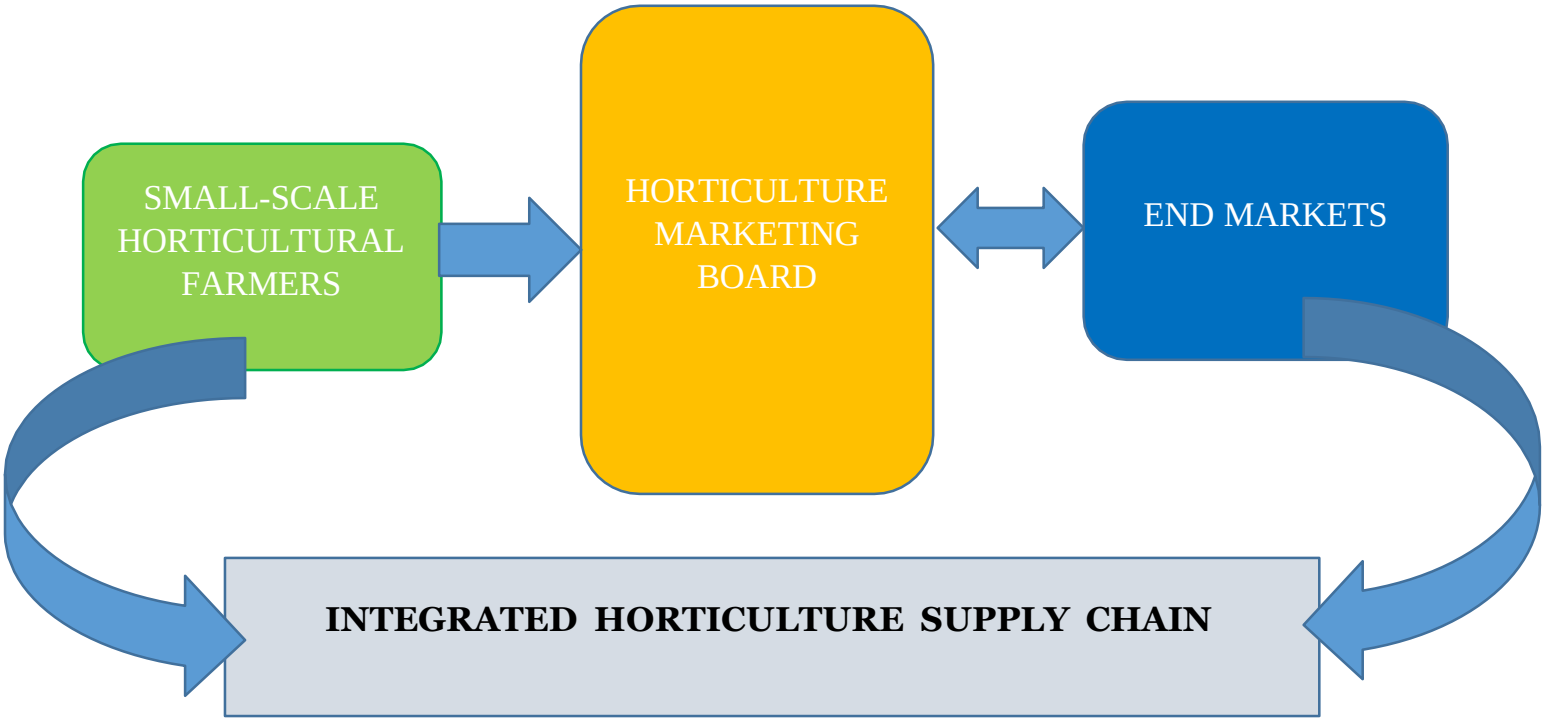


Figure 5.1: Diagrammatically represents the connection between farmers, the board and the rest of the supply chain members.

5.5 Recommendations for future studies

The researcher recommends that future research should be done that looks at the application of sustainable development practice in horticulture supply chain management and its integration with technological advancements. Most researches in agriculture portray that supply chain players are always seeking economic gains, neglecting the social and environmental impact assessments when measuring an organisation's success. Horticulture supply chain members need to contribute to the community, e.g. build clinics, schools, and digital centers, especially in rural areas. Supply chain members also need to engage in activities that preserve the environment, like using modern organic farming methods, using natural preservatives in vegetables, among other strategies.

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APPENDICES

APPENDIX	Forms
A	Participant Information Sheet
B	Sample consent form for studies involving human participants.
C	Interview questions for farmers.
D	Interview questions for Farmers Associations
E	Interview questions for processors/wholesalers/retailers.
F	Sample interview transcripts for farmer associations
G	Sample interview transcripts for farmers.
H	Sample interview transcript for processors/wholesalers
I	Screenshots for sample codes.
J	The Application of Consolidated Criteria to Report Qualitative Research (COREQ).
K	Quality Standards for Fruits and Vegetables SAZ

APPENDIX A: PARTICIPANT INFORMATION SHEET

Title of research: **'**Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe'.

You have been identified as a key participant in this study. It is important that you understand the purpose of this study and your commitment to participate before making a decision. Kindly take your time to go through the purpose of the study given below, and if there are any questions or clarification am available to answer. Please take some time to consider whether or not to take part in this research.

Thank you for your time and patience.

What is the purpose of this research?

The study seeks to investigate how an integrated horticultural market can be established to stabilize supply chain vulnerabilities that are now found in Zimbabwe since its demise from its former glory, 'Bread Basket of Africa', in the 1980s. Thus, the study is aimed at achieving the following objectives:

- To determine the influence of sharing market information on precision horticulture supply chain.
- To examine the role of collaboration in successful implementation of an integrated horticulture supply chain process efficiency.
- To investigate how certification in horticulture affects horticulture supply chains.
- To assess the current constraints hindering the implementation of an integrated horticultural supply chain model in Zimbabwe.

- To design an integrated horticultural supply chain model that is agile, which can be adopted in Zimbabwe to reduce supply chain vulnerabilities.

Do I have to take part?

It is at your discretion to participate in this research. If you decide to participate, you will get an information sheet that you will need to sign, and this will be considered as the participant consent form. If you agree to participate in the research, you are, however, not obliged to complete it if, at some point, you feel you have other things to do instead. You have the right to withdraw at any moment without giving any explanation to the researcher. A decision to withdraw at any time, or a decision not to take part at all, will not affect any treatment/care that you may receive.

Is there any age or other restrictions that may prevent me from participating?

Yes! Participants should be 18 years old and above.

How long will l take to complete the research?

If you plan to participate in this research, you will be involved in it for 40 to 50 minutes.

What will happen to me in case l choose to participate?

The first thing to happen will be a discussion about how the interview would take place. You would also be informed about the advantages of gaining new knowledge about the research through the questionnaires. Apart from this, nothing terrible would happen.

What are the challenges, possible disadvantages, risks or side effects of taking part?

There are no possible severe disadvantages, risks or side effects in taking part. Still, there is the possibility that you would get tired during the interview, however, you are free to signal me to stop or to take short breaks if you need them. Also, bear in mind that the questions are general and very simple, and I am at your disposal to explain any questions that you any feel are difficult to understand.

What are the anticipated benefits of taking part in the study?

- You would gain knowledge about issues concerning integrated horticultural supply chain management.
- You would be able to understand some theories of horticultural supply chain processes.
- You would also obtain some information on the importance of planning, collaboration, and coordination in integrated horticultural supply chain management.
- In the end, you would get to understand the need to have an integrated horticultural board in Zimbabwe that helps in managing horticultural produce to ensure supply chain efficiencies.

How will my taking part in this research be kept confidential?

Under no circumstances would any information obtained from you be revealed to anyone. Your information would be kept confidential for this research only, and no names or identities would be revealed, additionally, pseudonyms have been used to protect your identity. Hence, everything would be anonymous. In cases where further studies are to be done, I would seek your further consent first, but then the same rules governing confidentiality would be applied.

Who has reviewed this research?

This research has been reviewed by: Swiss School of Business and Management, Geneva Sarl

Whom could I contact, supposing I have any questions?

Supposing you might need further information or would like to discuss any details personally, please get in touch with me, in writing, by phone or by email: kanyepi.masimba@gmail.com;

+263 77 281 3232

Supposing you have issues regarding any aspect or way you have been approached or treated during the course of this research, please write to the University's Secretary and Registrar of the Swiss School of Business and Management Geneva Sarl.

Thank you very much for reading this information and giving consideration to taking part in this research.

Yours faithfully;

Researcher

Masimba Kanyepi

APPENDIX B SAMPLE CONSENT FORM FOR STUDIES INVOLVING HUMAN PARTICIPANTS

I, the undersigned, from (Name withheld) Company, Zimbabwe, hereby freely agree to take part in the research entitled: 'Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe'

I confirm that I have been given a Participant Information Sheet (a copy of which is attached to this form) giving particulars of the research, including its aim(s), methods and design, the names and contact details of key people, and as appropriate, the risks and potential benefits, and any plans for follow-up studies that might involve further approaches to participants. I have been given details of my involvement in the research. I have been told that in the event of any significant change to the aim(s) or design of the research, I will be informed and asked to renew my consent to participate in it.

I have been assured that I may withdraw from the research at any time without any disadvantage or having to give a reason.

In giving my consent to participate in this research, I understand that my voice may be recorded.

I have been given information about the risks of my suffering harm or adverse effects. I have been told about the aftercare and support that will be offered to me in the event of this happening, and I have been assured that all such aftercare or support would be provided at no cost to myself.

I have been told how information relating to me (data obtained in the course of the research, and data provided by me about myself) will be handled: how it will be kept secure, who will have access to it, and how it will or may be used.

I understand that if there is any revelation of unlawful activity or any indication of nonmedical circumstances that would or has put others at risk, the University may refer the matter to the appropriate authorities.

I have been told that I may at some time in the future be contacted again in connection with this or another research.

Name of participant (Pamela), pseudo

APPENDIX C: INTERVIEW GUIDE FOR FARMERS

The following information demonstrates the interview guides used to collect the data from farmers.

C1. Research Topic

'Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe'.

C2. Introduction (Interviewer's background) and General Information

First, I introduced myself, the research context and the purpose of the research participants. Afterwards, I gave the research participants an information sheet for them to read through and understand the research. Afterwards, l asked them to sign the consent form if they were willing to participate in the interviews. I also introduced them to the materials to be used during interviews, including the use of a voice recorder in other interviews.

C3. Participants Background

Participants were asked to include the following information in responding to the questions thus gender, age group, educational background and years that they have been farming. These aspects were important in understanding the dynamics that exist in the horticulture industry of Zimbabwe.

C4. The Interview Process and Duration

The interview process with each farmer took approximately forty minutes. The interviews were face-to-face as the respondents did not have time to talk over the phone or check their emails. The researcher recorded interviews of those farmers who were willing to have their voices

recorded, whilst the other respondents we not free to accept recordings. The research participants had the freedom to ask questions and even talk while they were in their fields.

C5. Interview questions for farmers

1. Which vegetable crops do you mainly grow and why?
2. What type of information do you receive from horticulture farmers' associations like Fresh Produce Producers Association of Zimbabwe, Horticulture Development Council, Horticulture Promotion Council, SAF, etc.?
3. How does this information in question (3) above assist you in your pre-planning and coordination of the horticulture supply chain?
4. What kind of services do you get from institutions like the Standards Association of Zimbabwe, Zimtrade, Banks, HDC, etc.?
5. Which factors influence your supply chain management decisions?
6. What are the main challenges you face in managing your supply chain?
7. How do you typically transport your products to market?
8. Do you use any technology or software to track your supply chain activities?
9. What are your views and opinions on having an integrated horticulture board established in Zimbabwe (in the five different agricultural regions), that is responsible for aggregating, storing, and dispatching of horticulture produce?

APPENDIX D: INTERVIEW QUESTIONS FOR FARMERS ASSOCIATIONS

The following information demonstrates the interview guides used to collect the data from farmers' associations.

D1. Research Topic

'Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe'.

D2. Introduction (Interviewer's background) and General Information

I wrote an email to the horticulture associations introducing myself, my research context and the purpose of the research to participants. I asked them to go through the information sheet and made a follow-up email after three days to check if they understood the research that l intended to carry out. Afterwards, I checked if they had filled in the consent form that was attached to the consent form so l could note them down for further inquiries. Once l was done with preparing my list of respondents, l emailed the participants with interview questions and asked them to send me feedback within that same week.

D3. Participants Background

Participants were asked to include the following information in responding to the questions thus gender, age group, educational background and number of years they had been in that profession. These demographic profiles assisted the researcher in understanding the nature of participants who provided information about the supply chain vulnerabilities in horticulture in Zimbabwe.

D4. The Interview Process and Duration

The interview process with horticulture associations took two weeks because it was done through emails and follow-up phone calls. Once respondents consented to doing the research, they were sent interview questions to fill out via email, and a follow-up was made within five days, followed by a phone call the following week. For those who did not manage to fill in the interviews over email, phone call interviews took 25 to 30 minutes of their time.

D5. Interview questions for farmers' associations

1. As a horticulture association institution, what marketing information have you managed to provide to small-scale farmers who are doing vegetable crop production like tomatoes, onions, beans, green peppers, cabbages, carrots, etc.?
2. What kind of difficulties do farmers encounter in producing their commodity to accessing markets that are linked to supply chains?
3. What do you think is your role as an institution in managing supply chain efficiencies for small-scale horticultural farmers?
4. Based on your institutional experience, what do you think can be done to help farmer supply their produce and limit financial losses that they incur through spoilage, decay or under-pricing of their produce?
5. Would you say there is some coordination among all horticulture associations and farmers that has been beneficial for every stakeholder in the supply chain?
6. What are your views and opinions on having an integrated horticulture board established in Zimbabwe that is responsible for aggregating, storing and dispatching of horticulture produce?

APPENDIX E: INTERVIEW QUESTIONS FOR PROCESSORS/WHOLESALERS AND RETAILERS

The following information demonstrates the interview guides used to collect the data from processors/wholesalers and retailers.

E1. Research Topic

'Towards an integrated horticultural market to stabilize supply chain vulnerabilities in Zimbabwe'.

E2. Introduction (Interviewer's background) and General Information

I had to visit this category of participants and conduct a face-to-face interview with them, as well as conduct some observations, because they are always busy. I started by introducing myself, explaining my research aim and how this industry will benefit from my research. I then went on further to share the information l had on the information sheet so that they don't spend more time reading the paper. Afterwards, l asked for consent and if the participants were willing, l went on to carry out the research.

E3. Participants Background

Participants were asked to include the following information in responding to the questions thus gender, age group, educational background and number of years they had been in that profession. These demographic profiles assisted the researcher in understanding the horticulture processing landscape and distribution in Zimbabwe.

E4. The Interview Process and Duration

The interview process with processors/wholesalers and retailers took at most 20 minutes. This was because the participants were always busy and did not have more time to speak to the interviewer. However, to combat this gap, the researcher sort for further consent to observe what was happening in their companies. Areas of observation included: the commodities they were selling in terms of variety, quantity, price, merchandising, and customers' purchase behaviour to determine how effectiveness of their distribution strategies and market response. With the additional observations done at outlets, it took approximately 50 minutes to complete the research with one participant.

E5. Interview questions for processors/wholesalers and retailers

1. As a distributor of horticulture commodities, where do you get information on horticulture produce required by the market and prices?
2. When purchasing horticultural produce, does your company have estimated purchase prices or are prices determined through negotiation at the time of sale?
3. Does your organisation engage in backwards or vertical integration with any players in the horticulture supply chain? Yes/No. b. If yes, what are the terms of the contract?
4. Which IT application system does your company use for capturing horticulture consignment?
5. What type of information does your company share with your suppliers to ensure supply of horticulture produce is processed efficiently? Which criteria does your company use to assess the quality of produce you receive from suppliers?
6. Does your company face any challenges in facilitating an integrated horticulture supply chain in the industry?

7. What are your views and opinions on having an integrated horticulture board established in Zimbabwe that is responsible for aggregating, storing and dispatching horticulture produce?

APPENDIX F: SAMPLE TRANSCRIPTS FOR FARMER

Date: 15/01/2025; Time: 12:00 -12:36 = 36 Minutes

Gender: Male

Age: 45- 55

Level of education: Bachelor's Degree

Number of years in the profession: 4-6 years

Masimba: **Which vegetable crops do you mainly grow and why?**

George: Cabbages, Tomatoes and Potatoes

Masimba: What type of marketing information (production price, quality, certification, demand, varieties required, and production costs) do you receive from horticulture farmers associations like Fresh Producers Association of Zimbabwe, Horticulture Development Council, Horticulture Promotion Council, Sisonke Agriculture Fresh Farmers' Association, etc.?

George: There is no information I get because I am not a member of all the above

Masimba: Do you pay any horticulture institution service/membership fees to access any horticulture information (If Yes, how much)?

George: NO

Masimba: How does this information in question (6) assist you in pre-planning and coordination of horticulture supply chain networks?

George: If I know in advance the available markets and prices, then I will be able to produce products for a ready market and also produce according to the quality required.

Masimba: How have certification requirements like Global GAP, SAZ ISO 19000, organic production standards, and social and environmental impact requirements affected horticulture production?

George: The costs of having those certifications are very high, and some of us cannot afford them

Masimba: What are some of the main challenges you have faced in managing supply chain efficiencies from production to the supply of produce to the market?

George: We are selling produce to middlemen and Mbare Musika, and these middlemen peg prices for our products, and at times we are forced to sell at very low prices, and as a result, we are making huge losses

Masimba: How do you transport your products to markets (processors/ end markets)?

George: Sometimes we hire some trucks, sometimes we use our own small cars, and sometimes some middlemen come to the farm to buy

Masimba: Do you use any technology or software to track your supply chain activities?

George: No, very much though, at times we get information from some WhatsApp groups on prices, etc

Masimba: What are your views and opinions on having an integrated horticulture board established in Zimbabwe (in the five different agricultural regions), that is responsible for aggregating, storing, and dispatching of horticulture produce?

George: I think that is the way forward. Farmers need to know where to deliver their produce without incurring post-harvest losses. Like the Cotton and Grain Marketing Boards.

APPENDIX G: SAMPLE TRANSCRIPT: FARM ASSOCIATION

Date: 20/01/2025; **Time**: 09:40 – 10:10 = **30 Minutes** over the phone

Gender: Female

Age: 55-65

Level of education: Master's

Number of years in the profession: 10 years and above

Masimba: As the horticulture association institution, what marketing information have you managed to provide to small-scale farmers who are doing vegetable crop production like tomatoes, onions, beans, green peppers, cabbages, carrots, etc?

Tabeth: Seed-related information (availability, varieties, suppliers) from ZSA. Product profile information and potential markets from breeders/ ZPBA

Masimba: What kind of difficulties do farmers encounter between producing their commodity to accessing markets that are linked to supply chains?

Tabeth: For horticulture, it is producing the wrong product for a market, e.g. farmers produce table potatoes without market information, just as they do for most field crops, then try and sell to fast food establishments who make French fries. Most of horticulture requires that the primary focus be on the quality requirements of the markets and, better still, securing the market first before production. Meeting the quality requirements for the markets, and where prices are linked to quality it results in farmers failing to realise the highest price. By its nature, there is a lot of dynamism in the horticulture sector, and without up-to-date info, a farmer may produce a product which has gone out of fashion-it is important to get up-to-date info.

Masimba: What do you think is your role as an institution in managing supply chain efficiencies for small-scale horticultural farmers?

Tabeth: Educating both farmers and markets to exploit the quality attributes of the improved varieties. Raising awareness on good quality seed & improved varieties & seed suppliers. Research and development of improved varieties that address the real needs of the value chain in Zimbabwe. Maybe do what other markets do, develop a product with an end market in mind and then actively participate to supply good seed variety, ensuring traceability along the value chain.

Masimba: Based on your institution's experience, what do you think can be done to help farmer supply their produce and limit financial losses that they incur through spoilage, decay, or under-pricing of their produce?

Tabeth: Choose varieties with good post-harvest handling traits, e.g. good shelf life, transportation. Choose the right variety for the target market and combine that with good agronomic, harvesting and post-harvesting practices to achieve produce of the highest quality, which will command high prices. Farmer training on profitable horticulture production.

Masimba: Would you say there is some coordination among all horticulture associations and farmers that has been beneficial for every stakeholder in the supply chain?

Tabeth: Not to the level that it should be, and this has made it difficult to collect valuable information which would help the seed industry best serve the horticulture sector, e.g. how much area is planted to each horticulture crop; what are the variety needs and/or product profiles of the different horticulture crops.

Masimba: What are your views and opinions on having an integrated horticulture board established in Zimbabwe that incorporates all horticulture stakeholders?

Tabeth: It's already there in the form of HDC, it needs to find effective ways of bringing all stakeholders together as well as promote dialogue between various actors in the value chain.

APPENDIX H: SAMPLE TRANSCRIPTS FOR PROCESSORS/WHOLESALERS AND RETAILERS

Category: Retailers

Gender: Female

Age: 26-35

Level of education: Bachelor's Degree

Number of years with organisation: 2 to years

Masimba: As a distributor of horticulture commodities, where do you get information on horticulture produce required by the market and prices?

Amanda: As a distributor of horticulture, I get information on horticulture produce from adverts, online marketplaces and platforms.

Masimba: When purchasing horticultural produce, does your company have estimated purchase prices or are prices determined through negotiation at the time of sale?

Amanda: Prices are determined through negotiation at the time of sale.

Masimba: a. Does your organisation engage in backwards or vertical integration with any players in the horticulture supply chain?

Yes/No

b. If yes, what are the terms of the contract?

Amanda: Our organization engages in vertical integration, particularly in seed production processes from research and development to quality control.

Masimba: Which IT application system does your company use for capturing horticulture consignment?

Explain in detail how it works

Amanda: Digital Platforms and Mobile Apps serve to connect with farmers, track field data, and manage logistics. These tools can facilitate real-time data capture and improve communication throughout the supply chain.

Masimba: What type of information does your company share with your suppliers to ensure supply of horticulture produce is processed efficiently?

Amanda: My Company provides detailed guidance on best farming practices, including optimal planting, cultivation, and harvesting techniques. We offer information on disease control, pest management, and soil health. Our technical support is often delivered through agronomists who work directly with the farmers. We share information on certification standards and the required purity of the seed.

Masimba: Which criteria does your company use to assess the quality of produce you receive from suppliers?

Amanda: My Company uses genetic purity, physical quality, pathology examinations and certification standards.

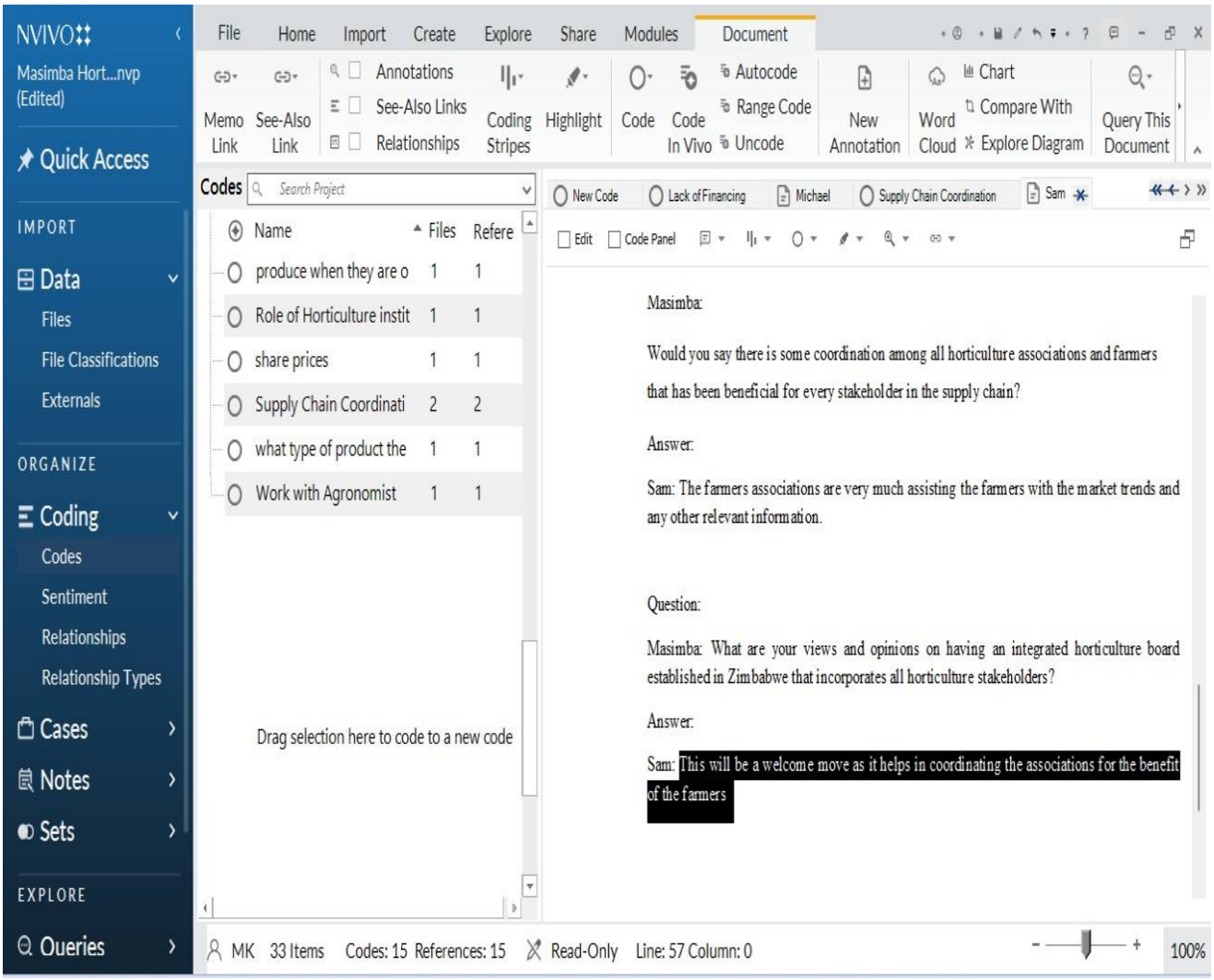
Masimba: Does your company face any challenges in facilitating an integrated horticulture supply chain in the industry?

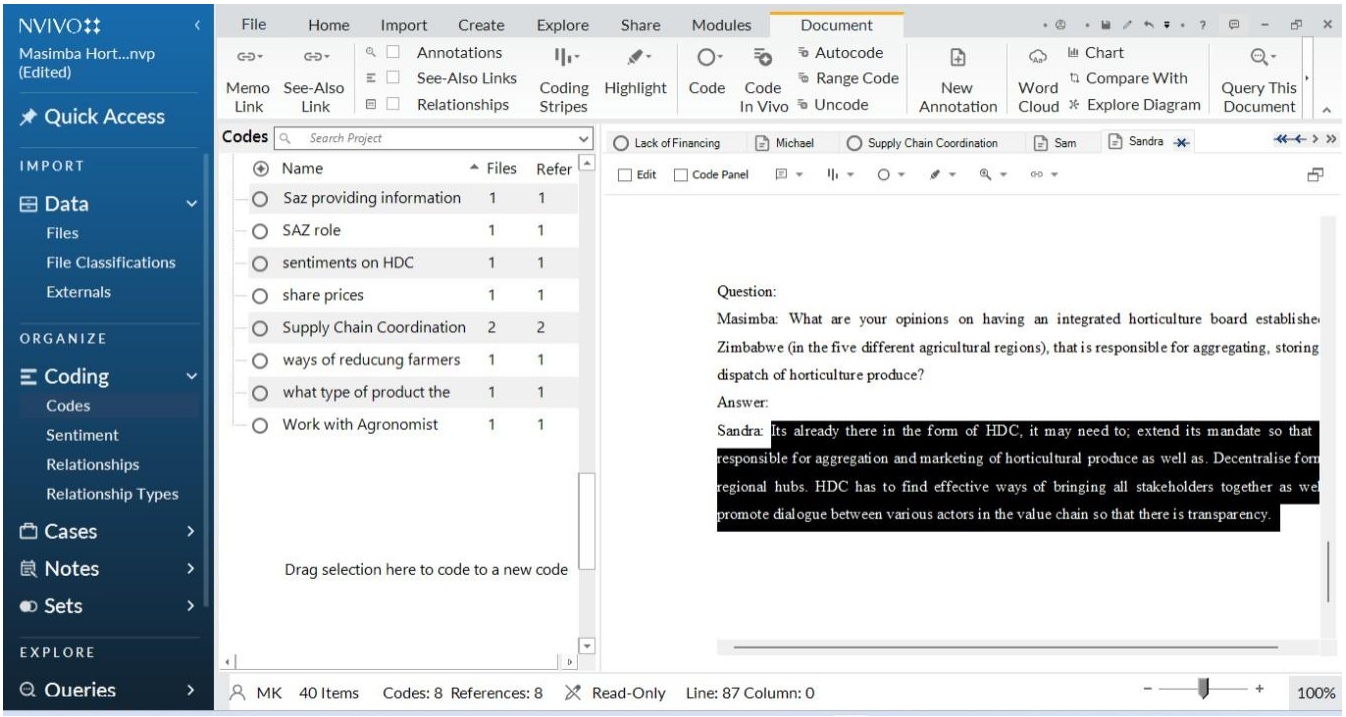
Amanda: My Company faces challenges of climate change, economic instability and financial pressures.

Masimba: What are your views and opinions on having an integrated horticulture board established in Zimbabwe that is responsible for aggregating, storing and dispatching horticulture produce?

Amanda: An integrated horticulture board in Zimbabwe, responsible for aggregating, storing, and dispatching produce, presents a complex set of potential benefits, namely market stabilization, enhanced quality control and increased market access.

APPENDIX I: SCREENSHOTS FOR SAMPLE CODES.

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Michael
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Sam
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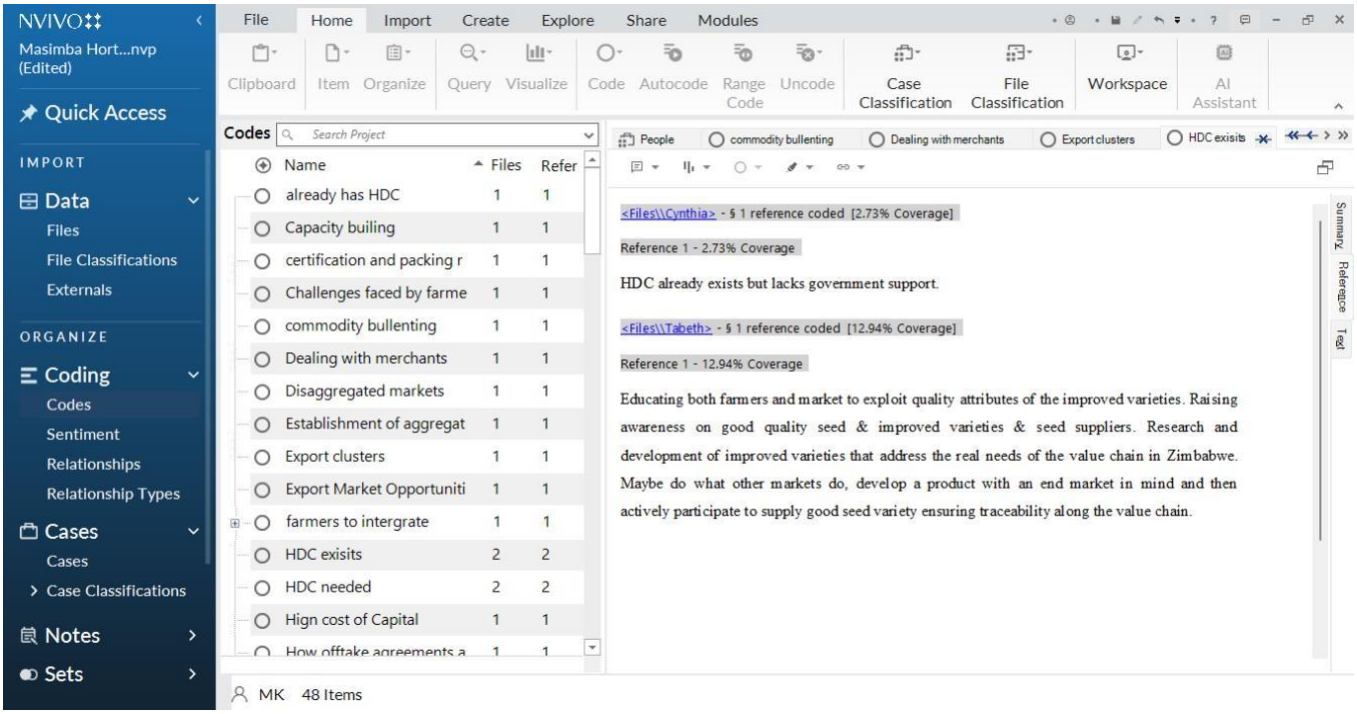
Question:
Masimba: What are your opinions on having an integrated horticulture board establishe
Zimbabwe (in the five different agricultural regions), that is responsible for aggregating, storing
dispatch of horticulture produce?
Answer:
Sandra: Its already there in the form of HDC, it may need to; extend its mandate so that
responsible for aggregation and marketing of horticultural produce as well as. Decentralise for
regional hubs. HDC has to find effective ways of bringing all stakeholders together as wel
promote dialogue between various actors in the value chain so that there is transparency.
MK 40 Items Codes: 8 References: 8 Read-Only Line: 87 Column: 0 100%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Educating both farmers and market to exploit quality attributes of the improved varieties. Raising awareness on good quality seed & improved varieties & seed suppliers. Research and development of improved varieties that address the real needs of the value chain in Zimbabwe. Maybe do what other markets do, develop a product with an end market in mind and then actively participate to supply good seed variety ensuring traceability along the value chain.
Summary
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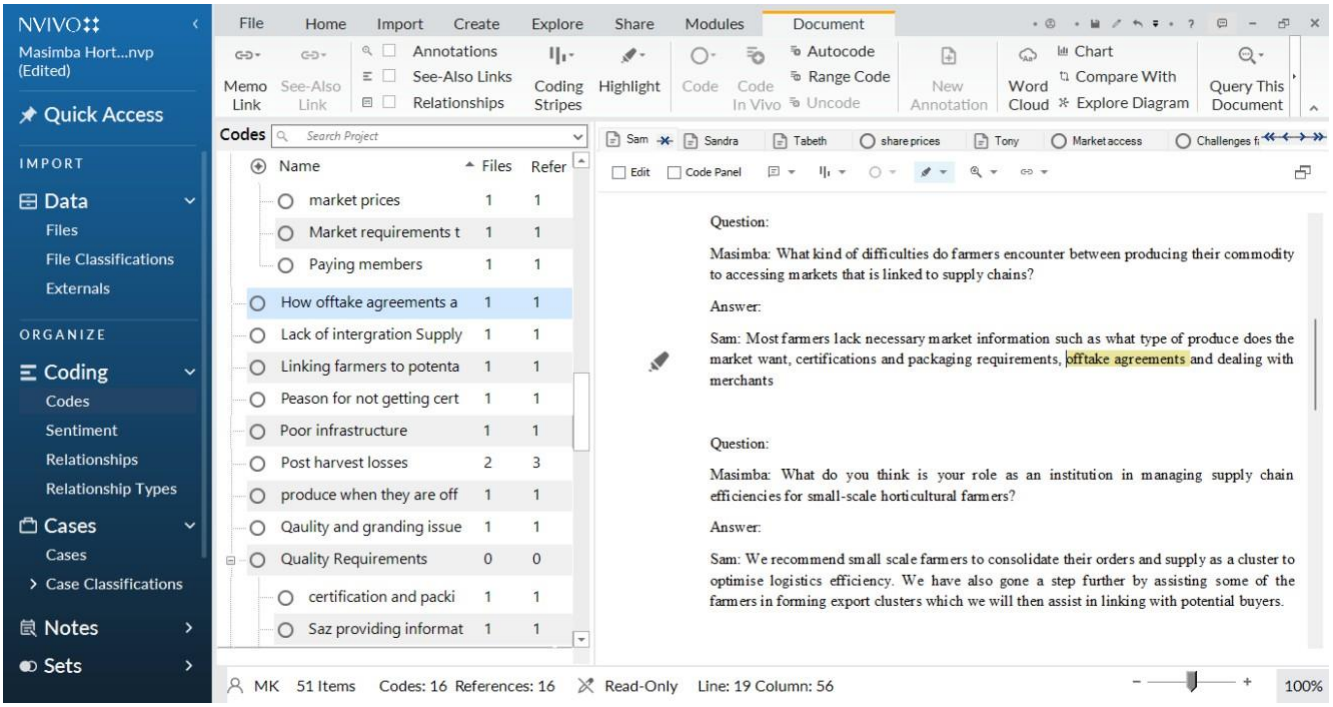
MK 48 Items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Question:
Masimba: What kind of difficulties do farmers encounter between producing their commodity to accessing markets that is linked to supply chains?
Answer:
Sam: Most farmers lack necessary market information such as what type of produce does the market want, certifications and packaging requirements, offtake agreements and dealing with merchants
Question:
Masimba: What do you think is your role as an institution in managing supply chain efficiencies for small-scale horticultural farmers?
Answer:
Sam: We recommend small scale farmers to consolidate their orders and supply as a cluster to optimise logistics efficiency. We have also gone a step further by assisting some of the farmers in forming export clusters which we will then assist in linking with potential buyers.
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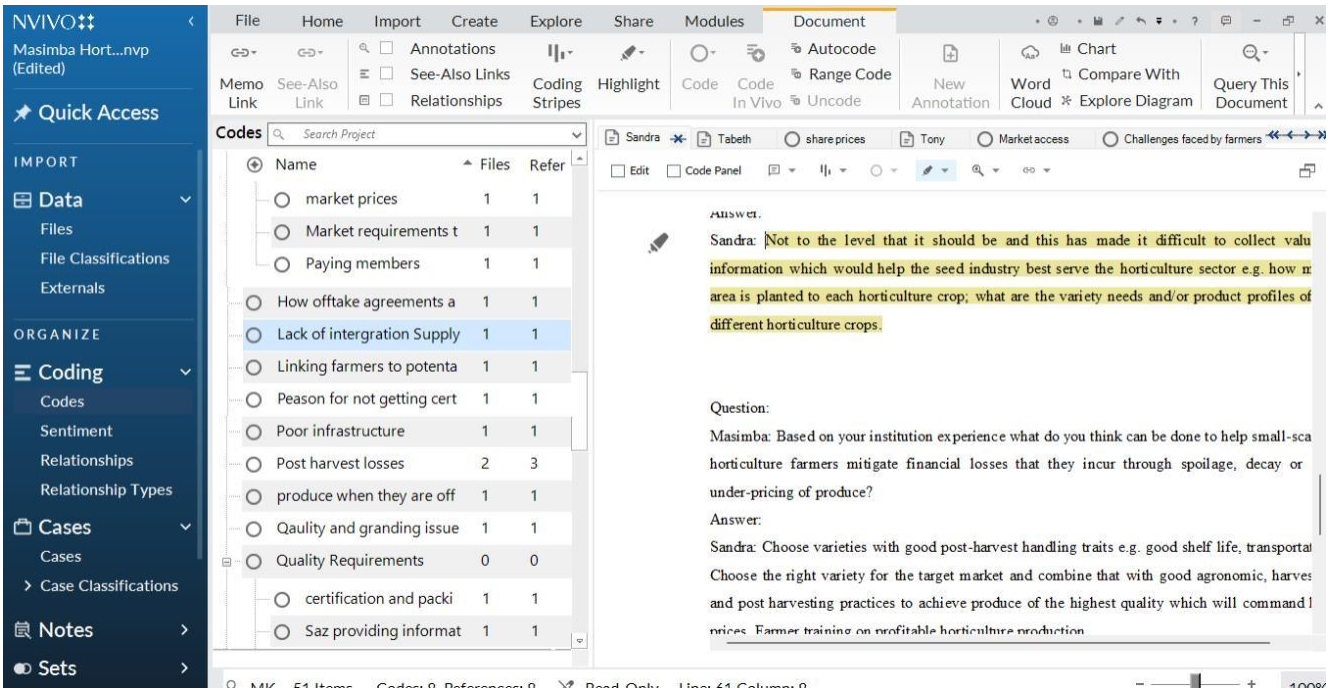
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Answer:
Sandra: Not to the level that it should be and this has made it difficult to collect valu information which would help the seed industry best serve the horticulture sector e.g. how m area is planted to each horticulture crop; what are the variety needs and/or product profiles of different horticulture crops.
Question:
Masimba: Based on your institution experience what do you think can be done to help small-sca horticulture farmers mitigate financial losses that they incur through spoilage, decay or under-pricing of produce?
Answer:
Sandra: Choose varieties with good post-harvest handling traits e.g. good shelf life, transportat Choose the right variety for the target market and combine that with good agronomic, harves and post harvesting practices to achieve produce of the highest quality which will command l prices. Farmer training on profitable horticulture production

APPENDIX J: THE APPLICATION OF CONSOLIDATED CRITERIA TO REPORT QUALITATIVE RESEARCH (COREQ)

No	Item	Guide Questions/Description
Domain 1: Research team and reflexivity		
Personal Features		
1	Interviewer/facilitator	Masimba Kanyepi
2	Credentials	Doctoral candidate
3	Occupation	Operations manager
4	Gender	Male
5	Experience and training	Twenty + experience
Relationship with participants		
6	Relationship established	Yes! through work relations
7	The participant's knowledge of the interviewer	Established
8	Interviewer characteristics	Good and social, open to discussion
Domain 2: study design		

Theoretical framework		
9	Methodological orientation and Theory	Social constructionist theory, the interpretive-qualitative research design and thematic data analysis
Participant selection		
10	Sampling	Convenience and purposive sampling methods
11	Method of approach	Face-to-face, telephone, WhatsApp, email and observations
12	Sample size	15
13	Non-participation	2 dropped due to busy schedules
Setting		
14	Setting of data collection	Work stations
15	Presence of non-participants	No. Only participants and I
16	Description of sample	age, gender, experience, education and natural agriculture regions, etc.
Data collection		
17	Interview guide	I used three interview guides for the face-to-face, email and telephone interviews and an observation guide. In addition, did a pilot study.
18	Repeat interviews	No repeated interviews

19	Audio/visual recording	Not used
20	Field notes	I took field notes
21	Duration	Longest time = 50 minutes and minimum time = 25 minutes
22	Data saturation	Yes, at the 14th respondent
23	Transcripts returned	Not yet. I agreed to provide them with detailed information after the study.
Domain 3: analysis and findings		
Data analysis		
24	Number of data coders	Many codes were done using by NVivo 15 software
25	Description of the coding tree	The NVivo 15 provided detailed knowledge for the model developed
26	Derivation of themes	Some themes were identified during the transcribing process, but most of them were derived from thematic data analysis
27	Software	
28	Participant checking	All participants provided feedback on the findings.
Reporting		

29	Quotes presented	Participant quotations were used to report the research findings, and pseudonyms were used to represent data.
30	Data and findings are consistent	There was a consistency between the research data presented and the findings
31	Clarity of major themes	Key themes were reported
32	Clarity of minor themes	Codes were grouped under key themes to support the findings

APPENDIX K: QUALITY STANDARDS FOR FRUITS AND VEGETABLES SAZ

Source: SAZ, 2019

Topic	Standards
65 Agriculture	ZWS 862:2004 The production, processing, labelling and marketing of organically produced foods
65.020 Farming and forestry	ZWS 915:2012 Organic Farming ZWS 1019:2017 Zimbabwe Horticulture – Good agricultural Practice (GAP) **65.040.10 Farm buildings and installations in general** ZWS 859:2003 Safety – Requirements for electric fence energizers
65.060 Agricultural machines, implements and equipment	**65.060.20 Soil working equipment** ZWS N7:1971 Agricultural discs ZWS 861:2003 Farm-animal drawn plough share **65.060.30 Sowing and planting equipment** ZWS ISO 7256: 2000 Sowing equipment – Test methods **65.060.35 Irrigation and drainage equipment** ZWS 362:994 Aluminium tubes for irrigation purposes ZWS 363:1996 Irrigation equipment – Irrigation sprayers and rotating sprinklers ZWS 531:1996 Polyethylene (PE) pipes for irrigation laterals ZWS 620:1985 Flexible polyvinyl chloride garden hose (metric units) **65. 060.40 Plant care equipment** ZWS 849:1969 Knapsack sprayers **65.060.50 Harvesting equipment** ZWS 209:1992 Sickles **65.060.70 Horticulture equipment** ZWS 679:1999 Power lawnmowers, lawn tractors, lawn and garden tractors, professional lawnmowers and lawn and garden tractors with lawn-mowing attachments
65.080 Fertilizers	ZWS 866:2003 Fertilizers – Magnesium nitrate ZWS 867:2015 Fertilizers – Potassium sulphate ZWS 868:2017 Fertilizers – Magnesium silicate anhydrous ZWS 870:2015 Fertilizers – Potassium nitrate (Nitrate of Potash) ZWS 871:2015 Fertilizers – Ammonium nitrate ZWS 872:2015 Fertilizers – Monoammonium phosphate (MAP) ZWS 874:2015 Fertilizers – Urea ZWS 875:2015 Potassium chloride (muriate of potash) Fertilizer ZWS 1021:2016 The safety of water treatment chemicals for use in the food industry ZWS ISO 8157:2015 Fertilizers and soil conditions - Vocabulary ARSO ZW HS 72:2016 Fertilizers – Sampling from a conveyor stopping the belt

	content ARSO ZW HS 74:2016 Fertilizers – Determination of bulk density (loose) ARSO ZW HS 212:2016 Fertilizers – Marking – Preservation and declaration ARSO ZW HS 213:2016 Fertilizers and solid conditioners – Final samples – practical arrangements ARSO ZW HS 500:2016 Solid fertilizers – Sampling ARSO ZW HS 501:2016 Compound fertilizers – method of test ARSO ZW HS 504:2016 Fertilizers – Ammonium sulphate – method of Test ARSO ZW HS 505:2016 Fertilizers – Ammonium sulphate ZWS ISO 18644:2016 Fertilizers and soil conditioners – controlled release fertilizer – General requirements
65.100 Pesticides and other agrochemicals	ZWS 158:1975 The use and disposal of acaricides (cattle dips) ZWS 224:1978 The handling, storage and disposal of pesticides and their containers ZWS 250:1980 Code of practice for the handling, storage and disposal of pesticides and used pesticides containers ZWS 345:1991 Pesticides in the form of five percent disulfoton granules
65.100.10 Insecticides	ZWS 344:1991 Insecticides in the form of one percent or three percent trichlorfon granules ZWS 346:1991 Insecticides in the form of two and half percent trichlorfon granules
67 Food technology	**67.020 Processes in the food industry** ZWS 126:1997/1999/2001 Food hygiene ZWS 650:1997 Efficacy of cleaning plant, equipment and utensils – Swab technique ZWS 651:1997 Efficacy of cleaning plant, equipment and utensils – Strip technique ZWS 652:1997 Efficacy of cleaning plant, equipment and utensils – Agar sausage technique ZWS 676:1998 Code of practice for the application of pesticides in the food industry ZWS 749:2010 Requirements for a hazard analysis and critical control point (HACCP) Systems 8086:2005 - Dairy plant – Hygiene conditions – General guidance on inspection and sampling procedures ZWS ISO 15161:2003 Guidelines on the application of ISO 9000:2000 for the food and drink industry ZWS ISO 22000:2018 Food safety management systems requirements for organizations throughout the chain ZWS ISO/TS 22002:2009 Technical specification – Prerequisite programmes on food safety – Food Manufacturing
67.040 Agricultural food products in general	ZWS 373:1993 Agricultural food products – Determination of crude fibre content – General method ZWS 375:1993 Agricultural food products – Determination of crude fibre content – Modified Scharrer

	method ZWS ISO/TS 22002:2013 Prerequisite programmes on food safety ZWS ARS AES 02:2017 Fisheries – Sustainability and ecolabelling Requirements
67.060 Cereals, pulses and derived products	ZWS 330:1991 Storage of cereals and pulses ZWS 331:1991 Storage of cereals and pulses
67.020 Processes in the food industry	ZWS 806:2012 Hazardous waste management ZWS ISO/TS 22002:2009 Technical specification – Prerequisite programmes on food safety – Food Manufacturing ZWS ISO /TS 22003:2008 Food safety management systems – requirements for bodies providing audit and certification of food safety management
67.050 General methods of tests and analysis for food products	ZWS 332:2015 Labelling of food and feed that are and not products of genetic modification
67.060 Cereals, pulses and derived products	ARSO ZW HS 864:2015 Dry beans – Specification ARSO ZW HS 865:2015 Dry green grams ARSO ZW HS 866:2015 Dry chickpeas ARSO ZW HS 867:2015 Dry cowpeas ARSO ZW HS 868:2015 Dry pigeon peas ARSO ZW HS 869:2015 Dry whole peas ARSO ZW HS 870:2015 Lentils ARSO ZW HS 873:2015 Faba beans - Specification ARSO ZW HS 874:2015 Dry lima beans – Specification
67.080 Fruits, vegetables	**67.080.01 Fruits, vegetables and derived products in general** ZWS ISO 750:1998 Fruit and vegetable products – Determination of titratable acidity ZWS ISO 751:1998 Fruit and vegetable products – Determination of water in soluble solids ZWS ISO 762:2003 Fruit and vegetable products – Determination of mineral impurities content ZWS ISO 763:1982 Fruit and vegetable products – Determination of ash insoluble in hydrochloric acid ZWS ISO 1026:1982 Fruit and vegetable products – Determination of dry matter content by drying under reduced pressure and of water content by Azeotropic distillation ZWS ISO 1842:1991 Fruit and vegetable products – Determination of pH ZWS ISO 1955:1982 Citrus fruits and derived products – Determination of essential oil content (Reference Method) ZWS ISO 2173:2003 Fruit and vegetable products – Determination of soluble solids – Refractometric method ZWS ISO 5517:1978 Fruits, vegetables and derived products – Determination of iron content – 1,10 – Phenanthroline photometric method ZWS ISO 5518:2007 Fruits, vegetables and derived products – Determination

	ZWS ISO 5519:2008 Fruits, vegetables and derived products – Determination of sorbic acid content ZWS ISO 5520:1981 Fruits, vegetables and derived products – Determination of alkalinity of total ash and of water-soluble ash ZWS ISO 5522:1981 Fruits, vegetables and derived products – Determination of total sulphur dioxide content ZWS ISO 7447:1998 Fruit and vegetable products – Determination of tin content **67.080.10 Fruits and derived products** ZWS 458:1994 Wax emulsion for coating citrus fruits ZWS 746:2004 Fruit jams, jellies and marmalades ZWS 747:1971 Canned fruits COMESA ZWS HS 364:2004 Peanuts COMESA ZWS HS 452:2005 Recommended code of practice for packaging and transport of tropical fresh fruits and vegetables COMESA ZWS HS 453:2005 Avocadoes COMESA ZWS HS 454:2005 Fresh mangoes COMESA ZWS HS 455:2005 Fresh papaya COMESA ZWS HS 456:2005 Dried apricots COMESA ZWS HS 460:2005 Dehydrated fruits and vegetables including edible fungi COMESA ZWS HS 476:2005 Desiccated coconut COMESA ZWS HS 501:2005 Canned mangoes COMESA ZWS HS 516:2005 Canned strawberry **67.080.20 Vegetables and derived products** ZWS S5:1970 Canned vegetables ZWS S6:1972 Quick frozen vegetables ZWS S18:1968 Worcestershire sauce ZWS S19:1968 Cucumber pickles ZWS S25:1970 Canned soups ZWS S33:1971 Potato crisps ZWS S37:1972 Chutneys COMESA ZWS HS 427:2005 Baby corn COMESA ZWS HS 566:2005 Quick frozen broccoli COMESA ZWS HS 635:2005 Canned sweet corn COMESA ZWS HS 638:2005 Canned carrots COMESA ZWS HS 644:2005 Canned tomatoes COMESA ZWS HS 646:2005 Processed tomato concentrates