

Gauteng farmers' market strategies of Indigenous Leafy Vegetables post COVID- 19 outbreak

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LIST OF ABBREVIATIONS

COVID-19	Corona Virus
OECD	Organization for Economic Cooperation and Development
ILV	Indigenous Leafy Vegetables
SPSS	Statistical Package for Social Sciences

ABSTRACT

Indigenous Leafy Vegetables (ILVs) have a high economic potential but there is little information on how to market them. Marketing strategies, how individuals seek information, communication and purchasing of goods have changed due to the COVID-19 pandemic outbreak in the country of South Africa. As a result of a shock like COVID-19, farmers must reconsider how they market their produce to customers given various government restrictions which came about with the implementation of National State of Disaster which was effective from the 5th of April 2020. The study investigated the marketing strategies of leafy vegetable farmers in response to what appeared to be their stringent COVID-19 restrictions, making it difficult for them to market their produce. Data was collected from one hundred and five (105) farmers using a structured questionnaire, which included socio-economic characteristics. Collected data was captured in Excel Spreadsheet and analyzed using Statistical Package for Social Scientists (SPSS). By running a multinomial logistic regression model, descriptive statistics was used to examine farmer's marketing strategies. The study revealed that level five was the hardest lockdown level that appeared to be difficult to go through as indicated by ILV farmers, followed by level four and then level three of COVID-19 restrictions (lockdown levels). In this case the above-mentioned lockdown levels (five, four and three) were taken as a dependent variable and marketing strategies as independent variable. Marketing strategies include price marketing, direct and indirect marketing. The study found that Lockdown restrictions imposed by the government have affected ways how farmers used to market their produce. The study also revealed that farmers preferred a marketing strategy of selling at a reduced price 5.474 times in lockdown level four (4) than in level 5 lockdown restrictions (reduced price was found to be is positive and significant ($b=5.574$, $S.E = 1,694$ and $p>0,001$). While food provision was always considered as an important service, there was some confusion over which food-related operations might continue. Cultivation of Indigenous leafy vegetables was mainly practiced by smallholder farmers who mostly use direct form of marketing. ILV farmers were disproportionately harmed by COVID-19 and government responses to the pandemic. Due to the severe lockdown, restaurants and street vendors were unable to operate, and lost their usual clients. As a result, ILV farmers (26%) experienced a drop in demand as well as a drop in the price of their produce while other farmers (24%) did not market and sell their produce. The study found that many Indigenous leafy vegetable farmers before and amidst COVID-19 outbreak, were rarely supported by the government with finance and were hampered by a variety of obstacles

which include inability to access to modern markets and absence of market information. The study recommends that Farmers should actively participate in various marketing channels so they can reach many consumers in various locations. Policymakers should prioritize promoting farmer's access to market information, increasing the number of members in farmer associations, and improving road systems in rural areas.

Key words: Marketing. Indigenous leafy vegetables. COVID-19. Lockdown restrictions. Independent variable. Dependent variable

CHAPTER ONE

1.1 Introduction

Indigenous leafy vegetables are essential to food security, especially during pandemics and natural disasters, two scourges that are now common in sub-Saharan Africa (SSA). To lower the high rate of malnutrition and food insecurity in South Africa, it is necessary to foster an awareness-raising environment that would promote industrial production and consumption of Indigenous leafy vegetables (Njume *et al.*, 2004).

Due to many obstacles, ILVs continue to be under-exploited and under-utilized including lack of understanding of effective techniques for preservation and treatment of ILVs postharvest. According to Van Rensburg *et al.* (2004), the future of ILVs depends on further study on how to enhance handling procedures, postharvest care, and ILV processing technology in terms of food safety, dietary needs, and health considerations. Encouragement of growing ILV among local farmers is insufficient without effective marketing strategies and postharvest processing practices. The successful postharvest processing and preservation of ILVs is crucial to build sustainable livelihoods because ILVs have the ability to improve food security, generate significant foreign currency through exports, and present options for import substitution (Van Rensburg *et al.*, 2004).

Currently, food is not easily accessible around the world (Shiundu and Oniang'o, 2007). To meet the growing demand of the growing population, consistent and sustainable yield improvement is required. Africans have long utilized and relied on ILVs for their food and survival daily and ILVs were mostly frequently found in the homes of the poorest households, used for both income generation and household food consumption (Shiundu and Oniang'o, 2007). Since ILVs were growing wild and being harvested for free, people eventually began to take them for granted. Knowledge was passed down to the younger generation to preserve seed of specific species. Unfortunately, these systems no longer exist in many countries due to numerous social, political, and economic reasons (Van Rensburg *et al.*, 2007).

South Africa is blessed with agro-biodiversity, which includes a variety of ILVs with good health advantages and a plentiful supply of nutrients to feed over a million people who are malnourished and in need of food (Njume *et al.*, 2004). Several studies have pointed out various benefits of ILVs, and these include their high micronutrient content, medicinal qualities, and number of agronomic benefits (Mahlangu *et al.*, 2020). However, the absence of storage facilities, inconsistent market arrangements, lack of market structures, and transportation are some of the obstacles facing ILVs marketing. The COVID-19 disease has had a great impact on human behavior and agriculture. Due to mobility issues and decreased purchasing capacity, there is a strong demand for food and a lack of food security, particularly for the most disadvantaged groups of people (Siche, 2020). Food demand has declined because of uncertainty and a reduction in consumer spending power due to COVID-19. If the COVID-19 pandemic persists, the situation will get worse because people will lose their employment and have lower incomes (Siche, 2020). Many smallholder farmers are having difficulties in accessing the supplies, labor, transportation, markets, and technical assistance that they require to grow their crops (Babapour and Ebrahimi, 2021).

Mahlangu *et al.* (2020) indicated that there are good opportunities that can arise from taking a greater advantage of ILVs as valuable local food resources. Shiundu and Oniang'o (2007) discovered that ILVs, which are frequently disregarded, are crucial for both nutrition and economic survival. Indigenous leafy vegetables are important to South Africa but have been neglected due to inadequate research and development (Van Rensburg *et al.*, 2004). While in other African countries, particularly in East African countries like Kenya, there is growing consumer demand and awareness for ILVs (Gogo *et al.*, 2016); Shiundu and Oniang'o, 2007).

In South Africa's rural areas, *Amaranthus* species, *Cucurbita pepo*, *Bidens pilosa*, *Chenopodium album*, and *Solanum nigrum* seem to be the most well-liked and frequently found green vegetables (Njume *et al.*, 2014). Vegetable Amaranths are the most common leafy vegetable in many rural areas of South Africa. They often grow wild and weedy throughout southern Africa. Due to the high nutritional content of some species that are significant sources of food, either as vegetables or grains, *Amaranthus* has attracted significant interest in many nations (Mnkeni, 2007).

Despite all these impressive qualities, the study's primary issue is the serious threat that the agriculture sector faces from restrictions on movement during a lockdown. As a result, farmers have been unable to market their harvest. More work is needed to protect the disadvantaged groups, which traditionally dominated the ILV market, from the incoming large and medium commercial competitors. If not, the vulnerable groups will inevitably be exploited and lose their means of subsistence if this does not change (Shiundu and Oniang'o, 2007). Therefore, due to ILV's ability to thrive in challenging environmental conditions, ease of cultivation, and resistance to pests and diseases, it is necessary to increase the market awareness for ILVs.

1.2 Problem statement

Today Food security is a problem worldwide. Indigenous leafy vegetables are valuable nutrients that can significantly reduce hunger and malnutrition. Marketing strategies of before COVID-19 outbreak are known but marketing strategies of ILVs post COVID-19 outbreak are not known. However, it is therefore important to investigate on market strategies and raise knowledge of the remarkable nutritional qualities of the vegetables and the worth of ILVs (Mnkeni, 2007). To identify and understand marketing strategies used among farmers of ILVs post COVID-19 outbreak is essential because ILVs are helpful in resolving nutritional shortages and preventing infections because their nutritional qualities. African leafy vegetables (ILVs) have gained significant cultural and nutritional significance in South Africa over the past few years. Recent research has also supported similar concerns, causing the Agricultural Research Council to include African vegetables in its primary business (ARC). There is a need to create an atmosphere of awareness that would encourage consumption and industrial production of Indigenous leafy vegetables in a bid to curb the high level of malnutrition and food insecurity in South Africa.

Babapour and Ebrahimi (2021) reported that the COVID-19 regulations imposed by the government during the COVID-19 lockdowns, have a negative impact on farmers who are growing or harvesting crops and more farmers could be disadvantaged the longer the pandemic lasts. Market of ILVs is a major problem in the use of ILVs and often the omitted link (Maseko *et al.*, 2018). Due to COVID-19 restrictions it is not easy for smallholder farmers to access markets and to produce. Small scale- farmers have a hard time accessing marketplaces to sell their produce. COVID-19 is complicating supply and

demand because it poses a serious threat to food security in the world's poorest countries, where agricultural production systems are more labour intensive and have lower ability to withstand a severe macroeconomic shock (OECD, 2020). On a commercial basis, ILVs are rarely available. They do, however, can provide cash, but owing to a lack of awareness, they cannot compete with exotic types (Njume *et al.*, 2014). According to the trend-lines of African vegetables, the availability and consumption of ILVs is declining due to several reasons. The negative public perception of ILVs and rising consumption of exotic vegetables like Spinach and Cabbage are the two main reasons (Elisha *et al.*, 2016). Following the COVID-19 pandemic, poor postharvest handling, lack of storage and transportation facilities, improper processing techniques, inadequate market hygiene standards, and poor infrastructure all contribute to significant losses along the “field to consumer” chain (Elisha *et al.*, 2016).

1.3 Theoretic assumption

1.3.1 Hypothesis

Null hypothesis: There is no significant relationship existing between farmers marketing strategy and characteristics such as age, level of education and level of income amidst COVID-19 pandemic.

Alternative hypothesis: There is significant relationship existing between farmers participating in formal markets and characteristics such as age, level of education and level of income amidst COVID-19 pandemic.

1.4 Research aim

The study seeks to analyze aspects that influence marketing strategies of Indigenous leafy vegetables among farmers and exploring new marketing strategies amidst COVID-19 pandemic.

1.5 Research question

- I. What are demographic and socio-economic characteristics of Indigenous Leafy vegetable farmers in the study area?
- II. What are the constraints on marketing ILVs faced by farmers in the study area?
- III. What are the factors which affect marketing strategies adopted by ILV farmers amidst COVID-19 pandemic in the study area?

1.6 Research objectives

- I. To analyse demographic and socio-economic characteristics of Indigenous leafy vegetable farmers in the study area.
- II. To determine constraints of marketing ILVs by farmers in the study area.
- III. To identify factors which affect marketing strategies adopted by ILV farmers amidst COVID-19 pandemic in the Gauteng province.

1.7 Significance of the study

Studying marketing strategies used by ILV farmers during the COVID-19 pandemic, helps improving marketing of ILVs in the future when event shocks such as COVID-19 pandemic may occur. ILV marketing has various challenges, but COVID-19 has shown to have a great impact on marketing of ILV due to COVID-19 restrictions through lockdown levels. For instances, farmers were unable to bring their agricultural produce from farm to market due to COVID-19 lock down. Farmers had to leave their produce on their fields during this lockdown because they lacked cold storage facilities to keep their produce from spoilage. Therefore, the study will be helpful for Government to take necessary steps to build required storage warehouses during the lockdown post COVID-19 pandemic. Adequate understanding of the factors affecting marketing strategies among ILV farmers will help the researcher to develop a model which will enhance marketing strategies of ILVs to uplift and improve economic development in the farming and agricultural industry. The findings of the study might again assist the ILV farmers to identify their needs and sustain their livelihoods.

ILV have historically been viewed as small crops and have consequently received little market attention. However, Indigenous leafy vegetables have economic promise, but there hasn't been much knowledge about how to market them, therefore it is essential to study and improve the marketing strategies because effective agricultural marketing improves production and wages, drives up agricultural producer prices, and lowers consumer prices (Mahlangu *et al.*, 2020). The study provides beneficial knowledge for farmers having investing ideas that have the potential to succeed based on customer preference and what the market lacks (Olabode *et al.*, 2017). The study is essential for identifying markets and geographical regions that can be expanded. The study can benefit the ILV farmers by providing them with a template of possible opportunities for implementing creative solutions that promise least risk and greatest reward.

1.8 Chapter summary

This chapter explained Indigenous leafy vegetables and presented a background on history and consumption of ILVs. It also covered other sections including the research problem, aim of the study and the objectives that are aimed to be achieved upon the conclusion of the study and hypothesis.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature to investigate marketing strategies of leafy vegetable farmers in response to what appeared to be their stringent COVID-19 restrictions, making it difficult for them to market their produce. This chapter identifies from both national and international literature, several major constraints affecting marketing strategies of ILVs .

2.2 History and consumption of ILVs

According to Pitso (2009) plants that have evolved organically in a certain area are known as indigenous vegetables. The leafy parts of leafy vegetables, such as succulent stems, blossoms, and young fruit, which are also utilized as vegetables, are the primary reason why they are grown (Van Rensburg, 2007). In South Africa, leafy vegetables are produced by more than 100 different plant type. In South Africa all these indigenous plant species found throughout the country are referred to as "morogo" also known as South African Spinach. Although, valuable sources of nutrition, ILVs are underused in South Africa, (Voster and Van Rensburg, 2005; Mnkeni *et a.*, 2007). Despite their rich nutrient and mineral content, which includes proteins, carbs, minerals, and dietary fiber that are helpful in the maintenance of good health and illness prevention, these plants are disregarded and derided (Njeme, 2014). They are categorized as food for the underprivileged in the Eastern Cape and other regions of the nation, and real knowledge about them is limited, and traditional appreciation of them considered “outdated”, which makes young people reluctant to associate with these crops. However, in South Africa and other areas of the world, eating indigenous leafy vegetables (ILVs) could help solve the issue of food insecurity and imbalanced diets among households, according to Njeme (2004).

According to Mahlangu *et al.* (2020), if urbanization and population growth continue, there will be a growing demand for vegetables, giving farmers the chance to explore the market. In Kenya, Shiundu and Oniang'o (2007) discovered that the market share of ILVs has been increasing both in urban markets and in rural regions, compared to other vegetable species. Additionally, customers were prepared to spend an average premium of 79%. According to Mahlangu *et al.* (2020), South African households showed a high level of demand and preference for African green vegetables. Since ILVs do not require a lot of

input to grow and are ready for harvest two to four weeks after planting, indigenous vegetables have historically played a significant role in Africa's farming and consumption systems. ILVs are also known to be particularly suitable crops for poor farmers (Pitso, 2009). Most of the farmers in rural areas, however, live in poverty and lack the capital resources necessary to secure their livelihoods (Mahlangu *et al.*, 2020). ILV production by smallholder farmers is particularly impacted as most smallholder farmers rely on labor to produce their crops since they lack equipment (Pitso, 2009). The lack of resources faced by most South African smallholder farmer's accounts for their inability to produce a consistent amount of output each year. It is challenging for farmers to enter contracts with traders in the market due to inconsistent production (surplus) (Makhura, 2001). Smallholder farmers are typically more exposed to risk and transaction costs because of their low output surpluses these is because most farmers in rural areas sell their produce mostly at their farm gates and at village markets (Kyaw *et al.*, 2018).

Decisions regarding the quantity of output to sell is frequently influenced by marketing data, produce prices, and distance to the market (Kyaw *et al.*, 2018). When farmers generate marketable surpluses, their inability to obtain contracts becomes an issue since they will be forced to keep these surpluses. In addition, smallholder farmers in South Africa are dispersed and run independently (without organization), which exposes them to significant transaction costs when they can access official markets (Kherallah and Kirsten, 2001). However, farmers that cultivate traditional food crops typically rely on institutions, markets, and sustainability. Markets can be divided into informal and formal categories.

Kherallah and Kirsten (2001) defined informal marketplaces in the context of agriculture as including unofficial exchanges between farmers as well as direct sales from farmers to consumers. On the other hand, official markets have formally determined pricing as well as well-defined grades, quality standards, and safety requirements. Smallholder farmers therefore struggle to gain access to these formal marketplaces, and they are the subject of this study. For smallholder farmers in particular, marketing is still a crucial component of farming because it is one of the industry's restrictions (Maseko *et al.*, 2007). Formal markets and informal markets are the two main categories of marketing engagement. Smallholder farmers frequently find themselves selling their produce to the informal market (Kherallah and Kirsten, 2001). Farmers believe that informal marketing is most convenient market for them, because smallholder farmers lack adequate storage facilities leading to

produce damage (Makhura, 2001); farmers are unable to travel because of COVID-19 travel restrictions; and they have a smaller workforce because of workers who have been infected with Corona virus.

2.3 Lack of knowledge

According to Njeme *et al.* (2014), the lack of knowledge leads to the elimination of the Indigenous leafy vegetables because they are referred to as weeds. Survival of ILVs is precarious because vegetables are often chemically eliminated because they are treated as weeds which eventually result in the loss of valuable species. Njeme *et al.* (2014) believes that knowledge about ILVs needs to be gathered, preserved, and documented to help with agricultural improvement and the preservation of regional customs and traditions. There is a myth that eating purple leaves from ILVs, such as those of some varieties of *Amaranthus*, can make people insane. (Mnkeni, 2007). While others believe that indigenous leafy vegetables are for poor people. Therefore, there is a need for research and to document knowledge about ILVs to promote awareness and to educate people. Lack of information about *Amaranthus*' potential as a high-nutrient source is probably the cause of the crop's under-utilization. Unfortunately, due to carelessness and a lack of proper production practices to increase yield, quality, and adaptability of valued species, the use of these vegetables is decreasing at an alarming rate. According to Kimiywe *et al.* (2007), exorbitant pricing and lack of knowledge about how to prepare the Indigenous leafy vegetables, particularly those from neighboring tribes, are two reasons why people do not eat Indigenous vegetables. Kimiywe *et al.* (2007) discovered that more than 60% of respondents believed that the leafy vegetables had a therapeutic benefit associated to them, and several were said to treat many diseases. ILVs are sometimes referred to as weeds or vegetables consumed by underprivileged rural homes by others. Therefore, the only way to alter the public's perspective is to provide information and educate them about local leafy vegetables. The research supports initiatives to encourage the consumption of native African leafy greens as a food-based strategy to reduce micronutrient deficiencies and poverty through premium value addition incentive schemes.

Scholars rarely conduct studies aimed at enhancing ILV production since they are at a significant intellectual distance from one another and have not been able to agree on any significant issues. However, over the past four or five years, this has significantly

improved. Also, it is worth noting that organizations frequently duplicate their efforts because there is no clear policy for these vegetables (Shiundu and Oniang'o, 2007).

2.4 Factors affecting marketing channels of Indigenous Leafy Vegetables

A marketing channel is a process that is required to distribute produce from one location of production to another (Grewal and Dharwadka 2002). This tool is beneficial because it connects producers and buyers, influences a pricing strategy, and improves an industry's performance through sales, advertising, and promotion. Marketing of crops is crucial in improving food security, poverty reduction, and sustainable agriculture, particularly for farmers that poor and based in developing countries (xaba, 2013). Despite market importance, smallholder farmers still find it difficult to participate in markets, especially when faced with market liberalization demands. Informal and formal markets are the two types of markets in which ILVs can be sold (Agbugba *et al.*, 2011). Generally, there is only limited percentage of smallholder farmers that sell their produce in formal markets (xaba, 2013). Supermarkets, wholesale markets, free markets, and retail shops all fall within the category of formal marketplaces. Door-to-door and roadside markets are examples of informal marketplaces (Agbugba *et al.*, 2011). Small farmers and other market player's ability to gain from indigenous vegetable markets, whether in domestic marketplaces or for high-value market sectors, is largely determined by how the market is organized (Grewal and Dharwadka, 2002).

Informal markets, according to (Chalwe, 2011), include not authorized transactions between farmers and direct sales from producers to customers, whereas formal markets have precisely defined grades, quality standards, and safety rules, as well as formally set pricing. Small-scale farmers generate much of the indigenous leafy vegetable supply to the market in developing ILVs, but their production periods are short and their productivity per unit area is low. Sanyang, Kao, and Huang (2009) found it challenging for low-income farmers to be self-sufficient in terms of market supply of indigenous green vegetables (Agbugba *et al.*, 2011). Due to high transaction costs, high risks, lacking markets, and a lack of collective action, smallholder farmers find it difficult to break into official markets (Xaba, 2013).

According to Jaleta (2007), factors influencing agricultural commercialization include inadequate market channels and a lack of price information. Additionally, Emanu and Gebremedhin (2007), in their study on their study that on market chain analysis showed that a lack of local markets, a subpar pricing system, low produce prices, an excess of intermediaries, marketing institutions, and ineffective farmer coordination all have an impact on the marketing of horticultural crops.

Emanu and Gebremedhin (2007) went on to say that inadequate product handling facilities and packaging, poor pricing, and information asymmetry all impair crop marketing. The price variable has been found to have a considerable influence on both the choice to sell and the type of marketing channel (Chalwe, 2011). Producers are more likely to take part in ILVs marketing and choose wisely on a suitable channel if they have knowledge of prices. ILV pricing information should, therefore, be always made available to farmers, depending on the best methods for ILV farmers to quickly obtain market information that have been explored.

Producers and traders who do not depend only on their vegetable business for a consistent income often sell their products nearly at any price offered, resulting in disorderly markets (Xaba, 2013). Due to such actions, industries in the long run may be affected because selling at any price encourages inconsistent supply and unrealistic pricing. Market information is useful for helping farmers with planning prior to planting and selling surplus produce whereas if in the retail sector they do not adjust to supply and demand in the absence of market information, their price is artificially fixed and remains static. One must first comprehend who is engaged in supply chains, what their functions and objectives are, and what hurdles to entry there are in order for poor farmers to have access to the market and even for market competition, middlemen, and retailers to have a livelihood (Grewal and Dharwadka, 2002).

Limited supply of indigenous vegetables, particularly during the off season, higher market prices, and a lack of information about their intake are the main reasons limiting vegetable consumption in the developing countries (Pitso, 2009). The distribution of vegetables to marketplaces has been severely hampered due to infrastructure restrictions. Horticultural products have also suffered large losses due to poor road networks. Poor road conditions

also make input markets inaccessible, resulting in poor market participation (Machethe, 2004). Infrastructure such as roads, markets are crucial for speeding agricultural output and product marketing. Solid road network speeds up the supply of agricultural farm input, lowers transportation costs and enhances agricultural productivity and distribution (Wudad *et al.*, 2021). Makhura (2001) found that smallholder farmers' marketing is limited by poor infrastructure, distance from the producers to marketplaces, and a lack of assets (such as owning vehicles), hence farmers prefer using direct marketing systems where distance between producers and consumers is short to avoid transportation costs.

Distance to markets, community road networks, transportation costs, and market visiting frequency are all variables that influence the ability to reach the marketplaces for input and products. Faber *et al.* (2007) state that South Africa has a large variety of Indigenous leafy vegetables, but that consumption of these vegetables is hampered by factors like social unrest, urbanization, poverty, and access to markets for fresh food. Poor people frequently have only limited access to underutilized marginal land, while others have little plots of land in their backyards (Pitso, 2009). Using inherited agricultural techniques and locally adapted traditional crops, these gardens can be transformed into a productive service of food and economic stability. Smallholder farmers with access to farmer support services can proceed to commercial agriculture and overcome challenges, according to evidence from other regions of the world. Faber *et al.* (2007) indicated that due to lack of financial means households prefer consumption of leafy vegetables more than the wealthier counterparts. Mooketsi (2011) agrees that the usage of ILVs increases with the degree of unemployment or during the periods of drought since they can grow in harsh conditions where exotic vegetables cannot.

The leafy vegetables of Africa have been displaced in many areas, leading to a decline in the production, use and diversity of the vegetables being grown. This trend will clearly have a detrimental impact on the nutritional status of households and the income particularly of the women farmers who constitute the primary producers, as well as consumers and sellers of these vegetables. Many African communities had depended on ILVs for survival before introduction of exotic crops (Mahlangu *et al.*, 2020). According to Van Rensburg *et al.* (2007) modern vegetables such as carrots, cabbage, green beans were actively promoted from 1960's by agricultural research and extension services. Crops such as cabbage and spinach have almost completely replaced the African leafy green

vegetables in areas where extension was active. Furthermore, extension services actively discouraged the selective weeding practices by many farmers and told the farmers to remove the “weeds”. According to Mahlangu *et al.* (2020) several studies have shown that indigenous plants continue to play an essential role in the livelihoods of rural communities. However, the trend lines on the availability and utilization of African Vegetables clearly shows that the use and availability of African Leafy vegetables are declining (Van Rensburg *et al.*, 2007). Two major reasons for this decline are the negative image of the African Leafy Vegetables and the promotion and increased use of “exotic” vegetables like spinach and carrots. For instance, in South Africa, morogo is regarded as a poor man’s food or famine food, especially by the youth. Young children hate morogo and prefer eating from fatty food restaurant franchises like Spur and McDonald’s. The younger generation of South Africans are used to the taste and textures of the fattier foods popularized by the media. However, Van Rensburg *et al.* (2007) reported that this perception is, however, changing.

However, the knowledge of appropriate packaging for ILVs is limited. Farmers still store ILVs in normal non-perforated clear polythene bags. Due to the high physiological activity of ILVs, for example, high transpiration and respiration rates, water condenses inside such polythene bags, thus creating avenues for microbial development. One of the factors to this limited marketing is caused by the fact that most farmers produce ILVs for their own consumption with a small amount of the produce reaching the informal market where sales are through sales handled by women (Mahlangu *et al.*, 2020). Poor resources despite the crucial role they play in the poor rural economy mostly attribute ILV farmers. However, one of the ways to ensure that the status of ILVs is enhanced, particularly their contribution towards sustainable production is when the African leafy vegetables can be promoted and marketed as a healthy alternative to the modern vegetables (Van Rensburg *et al.*, 2007). Therefore, as more people are equipped with information about indigenous leafy vegetables there would be change in the perception and the mindset of the people and overall improvement in food security status at a household level. Leafy vegetables will benefit farmers across Africa and help to improve the nutritional status of the vulnerable groups. It will also help to generate a better income for women farmers (Van Rensburg *et al.*, 2004). Such information is vital in formulating an appropriate package for introducing this crop in the rural areas. Such a package should also include domestic processing and preparation of the food, which is often an area left out of food crop development. The

African vegetables should also be recognized as an extremely important part of our African heritage (Van Rensburg *et al.*, 2007). The poor state of infrastructure, particularly roads, that is found in most of the rural areas where ILVs are cultivated worsens during the rainy season (Elisha *et al.*, 2016). There is much wastage because of unavailability or limited means of transport to reach the markets at such time (Elisha *et al.*, 2016). Even those vegetables that manage to get to the markets are poor in quality due to delay and subsequent biological deterioration during transportation and distribution processes. Khapayi and Celliers (2016) indicated that poor physical infrastructure, such as roads, lack of transportation, marketing skills and lack of information, poor market infrastructure, lack of land availability to expand production, lack of agricultural implements to improve production, poor production and farm management skills, and low education levels are among the specific limiting factors faced by small scale farmers.

2.5 Marketing strategies

There are various types of marketing strategies, but direct marketing in particular is the most used type. Any marketing strategy that involves farmers selling their goods directly to consumers is referred to as direct marketing (Adanacioglu, 2017). Uematsu and Mishra, (2011) defines direct marketing as a strategy that focuses on selling items or services through interacting with customers directly. There are numerous reasons why farmers like direct marketing in particular. Direct marketing is a preferred marketing strategy that helps farmers get a higher return on their crops and direct-to-consumer sales of produce might have prices that are significantly higher than standard wholesale rates (Adanacioglu, 2017). Another issue is that producers value their relationships with consumers and the opportunity to receive timely feedback on their products. Customers enjoy the fresh, high-quality products as well as the opportunity to support local farms (Adanacioglu, 2017).

Direct or contract marketing has the advantage of lowering marketing margins, allowing the producer to achieve a greater product price, and ensuring sales volume (Adams, 2004). The disadvantage is that the farmer should constantly make sure that there is enough good quality product available to satisfy the customers, and that the quality of the fruit matches retailer standards (Van Rensburg *et al.*, 2007). Some farmers rely on middlemen for resources like as quick finance, little bureaucracy, and timely payment of their goods, as well as superior organizational abilities (Kisamba-Mugerwa, 2005). For

products that need to be dried, stored, transported, processed, and packed, among other things, middlemen are still needed before they can be distributed. An effective marketing system guarantees higher levels of income for farmers by reducing the number of middlemen, cutting the cost of marketing services, and eliminating fraud in the sale of agricultural products. Farmers are encouraged to invest their surpluses in cutting-edge inputs to increase productivity and efficiency by an efficient system, which guarantees them a greater price for their products. An effective marketing system ensures that farmers will earn more money by reducing the number of middlemen, the cost of marketing services, and fraud in the sale of agricultural products. An efficient system gives farmers higher prices for their goods and encourages them to invest their surpluses in cutting-edge inputs to increase productivity and efficiency (Pingali *et al.*, 2019). This increases the farmers' marketed surplus and revenue (Gale, 1997). If a producer does not have an easy-to-access market outlet where he can sell his excess produce, he or she would have no incentive to create more. Both rural and urban areas can benefit from direct selling's economic and social benefits. The direct transfer of income from customers to farmers has the most evident effect. Instead of relying on metropolitan wholesale and retail firms for transportation and marketing, farmers maintain more of the value contributed to their crops by selling directly to customers (Adams, 2004).

ILVs are not commercialized, therefore small-scale farmers selling directly to customers can benefit small farms and rural communities overall by redistributing more of what urban consumers spend on food and recreation back to the regions where food is grown. Gale (1997), indicated that direct purchases from farmers provides local communities with an opportunity to reconnect with the land source of fresh produce as well as a chance to re-establish a connection with the land.

2.6 Effect of COVID-19 on Indigenous leafy vegetables market

In general, the agricultural and food industries' global supply systems have struggled to keep up, first with panic buying and shifting consumer pattern (Kerr, 2020). Agricultural economy is affected by COVID-19 pandemic. As a result of changes of negative impacts of the disease, many parts of the country and international trade change the pattern of development of national income (Babapour and Ebrahimi, 2021). The economic effect of Corona Virus is being felt strongly by crop production farmers. Babapour and Ebrahimi

(2021) reported that the constraints imposed by the government during the COVID-19 lockdowns, have had a negative impact on farmers who are in a process of planting or harvesting crops, and as the pandemic spreads, more farmers would be severely affected and suffer serious consequences the longer the pandemic lasts. Many farmers are finding it difficult to access supplies, labour, transportation, market and technical assistance that they need in order to grow the crop (Babapour and Ebrahimi, 2021). However, Wegerif (2022) reports that, in line with other studies, traders who kept their doors open during the pandemic saw a 65% reduction in trade volume.

Both supply and demand, according to Siche (2020), were impacted, however demand was hit more because of the mobility restrictions that limit people's access to food. Due to uncertainty and a decline in consumer spending power, there is a fall in the demand for food. If the pandemic lasts longer, the situation would get worse because people would lose their jobs and have less money (Siche, 2020). Farmers now have to pay extra to buy crucial agriculture supplies like fertilizer and seeds as a result of supply chain interruptions. The effects of supply chain disruption are much more pronounced in markets for perishable goods, such as those for fresh produce (Terero, 2020). Inability to get food from the field to customers in a timely manner can result in enormous amounts of food loss and waste, with many farmers likely to suffer. During lockdowns vegetables prices are affected as most of the buyers are hotels and restaurants. Apart from the factors mentioned above, COVID-19 has affected agricultural market severely among the smallholder farmers. The virus is still spreading throughout the nation, and its economic effects have not yet been completely understood (Varshmey *et al.*, 2020).

According to Ntshangase (2014) the smallholder farmers in underdeveloped countries have limited access to resources including equipment, financial options like credit facilities, as well as government assistance. During the COVID-19 pandemic problems faced by farmers became worse as the government only focused mainly on large scale production equipped farmers and overlooked the smallholder farmers. According to Kirsten and van Zyl (1998), a small-scale farmer can be defined as one whose scale of operation is too small to attract the provision of the services one needs to be able to significantly increase one's productivity. According to Ntshangane (2014), smallholder farmers vary among nations and agro-ecological zones, but land size shouldn't be the only factor taken into consideration. Ntshangase (2014) went on to say that land size should not be the only

factor considered because it may produce misunderstandings about whether or not some farmers qualify as smallholder farmers. Compared to smallholder farmers in semi-arid areas who cultivate more than 10 hectares of land, favored places may allow smallholder farmers to harvest greater quantities of produce from less than one hectare of land.

2.7 Transport

Farmers are constrained by their ability to market their produce due to geographical position and physical infrastructure, such as highways, which hinder them from selling their produce Makhura (2001). The major elements influencing developing farmers' participation in profitable agricultural markets have been discovered to be transportation logistics. Farm-gate marketing has the benefit of avoiding transportation costs and having the products sold directly by the farmer, reducing transaction costs even when prices are low Makhura (2001). However, Farmers utilizing farm-gate practices have issues including being forced to accept the local price for produce even when they are making a profit (Senyolo *et al.*, 2006), which is what most of are currently facing. The movement of agricultural goods, their sale, and the supply of agricultural inputs all depend on transportation (Wudad *et al.*, 2021).

Poor roads and increased transportation costs, limit access to high-quality inputs and restrict the use of local markets to produce sales. It also makes it more difficult to buy consumer products and find off-farm work. As a result, improving road conditions could expose the people in living in the rural areas to a greater opportunity to engage in the market economy and therefore rise out of poverty.

ILV farming depends mostly on rain-fed agriculture (Shiundu and Oniang'o, 2007). As a result, the market's availability of ILVs fluctuates. The rural regions of the where production takes place, are significantly impacted by this. Rural farmers in developing countries lack the resources to transport their produce to far-off and lucrative metropolitan markets, the majority of small-scale farmers are exposed to middlemen. Value-adding methods, such as solar drying and good packaging, can help with this. However, this compromises the hygienic conditions and quality of ILVs because they are frequently handled by consumers who want to purchase the produce and are exposed to excessive sunlight, dust, and dirt

as a result of poor sanitation in marketing outlets and sometimes they are packed in gunny bags for long distance transport Shiundu and Oniang'o (2007). When ILVs are fresh and brittle they can be easily vulnerable to damage when transported from one place to the other. ILVs are mostly harvested during the rainy season and are in short supply during the dry season. To ensure that ILVs are available all year long and are of a suitable quality, it is crucial to look for suitable preservation techniques (Kendall *et al.*, 2003)

Inefficient marketing, according to Makhura (2001), reduces smallholder farmers' prospects of competing in formal markets. COVID-19 has also harmed smallholder farmers' marketing methods by imposing restrictions on the free movement of farm goods from farmers to customers (direct marketing); secondly transporting farm products to markets is more difficult due to a lack of marketing infrastructure (Makhura, 2001). According to Crawford (1997), managing a fleet of cars or a single vehicle must generally include cost monitoring of operations on various types of roads, fuel and lubrication consumption, and scheduled and corrective maintenance and repair. To preserve produce quality, meet deadlines, and save transporting cost, transportation needs alternate routes that are in good condition (Crawford, 1997).

The COVID-19 outbreak, however, severely impacted the agricultural trade (OECD, 2020). Lockdowns and restrictions on people's movement slowed down both internal and foreign trade in goods. Without effective transportation management there is no efficient marketing. Lockdowns have made it harder to find workers at ports to discharge ships and carry out various trade procedures, including physical inspections, testing, and certificates. At the same time, a lot of nations amended the rules governing port access, causing delays due to port closures and demands for additional documentation and quarantine procedures. Vehicle operations significantly contribute to effective marketing, particularly in terms of optimal routing, scheduling, loading, and unloading; maximizing shift hours available; maintaining the vehicle fleet at an ideal size; accounting for time constraints on delivery, and collection times; and prudently managing vehicle replacement and depreciation (Crawford, 1997). Additionally, some nations imposed temporary export restrictions, which further slowed down global trade. Lockdowns and travel restrictions have now been lifted in a number of nations, but it is believed that they will soon be reinstated in nations where the virus has begun. Transportation is important for agriculture. Transporting goods to locations where consumers can purchase them conveniently also

adds value. In other words, adding value to a product or service involves any action that makes it more useful to potential customers.

2.9 Storage

A major constraint for improvement in South African agriculture, is the country's poor physical infrastructure, particularly in homeland areas (Kirsten *et al.*, 1998). According to Elisha *et al.* (2016) ILVs need to be ready for market or preservation as soon as feasible after harvest. Given how quickly they spoil due to their high perishability, ILVs should be stored in the refrigerator. The quickest possible transportation must be made in order to bring these vegetables to a nearby shade or cold storage facility. Given their low financial resources (Yadav and Sehgal, 2002), the majority of farmers who grow ILVs are unable to purchase traditional cold storage. Approximately 30 to 50 percent of the produce is lost at the postharvest stage (Shiundu and Oniang'o, 2007). Inadequate production conditions and quickly degrading products during shipping, storage, and marketing are the key contributors to that (Muchoki *et al.*, 2007). The majority of farmers typically prepare their crops in open fields or in regular markets. In order to swiftly eliminate field heat and keep the vegetables fresh for a longer period of time, some farmers may occasionally spray cool water on them and can cleaned, and packaged in accordance with the needs of the farmer and the consumer. To get rid of any residue or filth, cleaning is required. Unfortunately, a lot of farmers don't often dry the leaves after they have been cleaned, which leads to a higher incidence of disease growth, particularly molds. Along the value chain, there is still little understanding of ILV low temperature storage. According to reports, ILVs can be damaged.

2.10 Irrigation

A crucial part of agriculture around the world is irrigation. It involves in the production of 40% of all of our food and is practiced on approximately 270 million hectares around the world. 70% of all freshwater utilization is used for agricultural purposes (De Pascale *et al.*, 2011). One of the main barriers to increasing production has been the reliance on rain-fed agriculture for ILV production (Elisha *et al.*, 2016). Vegetables are always overproduced during the rainy season, which frequently drives down their prices and causes significant

losses for farmers and traders. When there is a lack of supply on the market, irrigation for ILV production during the dry season is very helpful to farmers' returns (Elisha *et al.*, 2016). Irrigation during the dry season is particularly beneficial to ILVs as it can increase harvest production, quality, and uniformity. The profit generated from ILVs in semi-arid areas has grown as a result of irrigation technology (Krause *et al.*, 2019). Similarly, irrigation production provides sustained supply, which maintains market price stability and allows even low-income populations to acquire ILVs (Elisha *et al.*, 2016). ILV farmers' ability to market their products is improved by irrigation of AIV cultivations. However, ILV farmers frequently lack access to irrigation technology, primarily due to a lack of funds to invest (Krause *et al.*, 2019). Despite the fact that investment capital and liquidity are crucial for the seasonal nature of agriculture, Kenyan AIV farmers frequently struggle to access even the most basic financial services (Krause *et al.*, 2019).

2.11 Traditional Processing of Indigenous Leafy Vegetables (ILVs)

2.11.1 Fermentation

It is possible to increase the availability of several trace elements, vitamins, and antioxidants by fermenting green vegetables and fruits, which may also improve safety and extend shelf life (Elisha *et al.*, 2016). ILVs like *Amaranthus*, their plant leaves, as well as different fruits, have the capacity to ferment to generate vinegars or fruit, brews, and wines. The creation of fermentation protocols, staff training, and a scaling-up of production techniques are required to expedite efforts to produce fermented leaves and vegetables. Researchers have shown that fermentation, one of the oldest known ways of food preparation and preservation, enhances food items' palatability, taste, aroma, and texture as well as their keeping quality, nutritional content, and safety (Shiundu and Oniang'o, 2007). Oguntoyinbo *et al.* (2016) noted that food fermentation continues to play a significant role in preventing food deterioration and food-borne illnesses, which are common in many of Africa's resource-poor regions. Although fermented vegetables and fruits could help improve nutrition and food security on this continent, where many people are still undernourished and experience hidden hunger, fermentation of these foods is not widely practiced in Africa (Elisha *et al.*, 2016).

2.11.2 Drying

When the rainy season ends in the tropics, ILV production is at its peak, and it is incredibly scarce during the dry season (Lyimo *et al.*, 2003). ILV make up a significant portion of the diets of some rural communities, meeting the majority of the population's nutritional needs. Indigenous vegetables that had previously been dried serve a significant role in ensuring household food security during times of scarcity, particularly during the dry season (Lyimo *et al.*, 2003). The majority of ILVs are semi-cultivated species or crops that require very little input and management. Women and children occasionally handle, utilize, and sell these vegetables most frequently (Lyimo *et al.*, 2003).

Vegetables can be preserved by drying or dehydrating. Drying is the deliberate removal of water vegetables. Removal of water should take place under controlled circumstances with little to no modifications to the food's characteristics (Elisho *et al.*, 2016). According to Dweba and Mearns (2011) vegetables lose a lot of their nutrients when they are dried in the sun without first being blanched (Dweba and Mearns, 2011). Dehydrated meals must, among other things, be almost identical to the original food source when they are reconstituted in water. This is a key indicator of their quality (Shiundu and Oniang'o, 2007). Any food substance that lacks water will generally have its weight and volume reduced, making it easier to handle, transport, and distribute it while also extending its shelf life. Dehydration or drying has been used to preserve foods from the dawn of time.

The most common application for dried vegetables is to make Isigwampa, which is a dish of mixed vegetables served with porridge vegetables (Dweba and Mearns, 2011). More instruction on processing of ILVs is necessary because it may improve people's access to and use of traditional ILVs (Dweba and Mearns, 2011). Younger people show a low level of respect for traditional vegetables. The introduction of exotic vegetables that has led to a change in food tastes, which in turn leads to a shift in eating habits, is mostly to blame for the lower intake of traditional vegetables. Another factor that may be to blame for the youth's observed decline in traditional vegetable consumption is a shift in lifestyle. According to Dweba and Mearns (2011), young people are supposedly less eager to travel great distances to harvest vegetables and firewood than they used to in the olden days.

2.12 Chapter summary

This chapter presented overview or background on history and consumption of ILVs. The chapter presented literature review on lack of knowledge, factors affecting marketing strategies of Indigenous leafy vegetables, marketing strategies, effects of COVID-19 on Indigenous leafy vegetables, transportation, irrigation, traditional processing of ILVs, fermentation and drying.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter focuses on the research methods that were used in conducting the research and the specific research tools. These are study area, research design, empirical research method and data analysis.

3.2 Description of the study area

The study was conducted in Gauteng province. With a total area of 18,178 km^2 Gauteng is the smallest province in the country of South Africa with 1.7million hectares of land surface area. It occupies only 1.4% of South African land surface area. The 20% of the land is covered by irrigated and rain fed commercial agriculture. In South Africa, Gauteng is the province with the highest population, home to an estimated 15 million people. The largest city in the country, Johannesburg, and its capital city, Pretoria, are both located in the highly urbanized province of Gauteng. Most ILV farmers were found in Lenasia, which is in south of Soweto in Gauteng and various townships in Tshwane Municipality in Gauteng. The study was conducted in Gauteng province in two metropolitan municipalities (Johannesburg and City of Tshwane Metropolitan Municipality). The regions are chosen due to famer's ability to produce crops and the farmers' willingness to take part in the interviews.



Source: Web.dev

Figure 3.1 Map of the Gauteng province

3.3 Research design

Galvin (2009) sees a research design as a blue-print or a detailed plan of how a research study should be conducted. Jaccard and Becker (2010) recommend that when choosing a suitable empirical research design, an overall consideration should be made, such as whether the design provides the most reliable responses to the research question. According to Mazibuko (2013), selecting the most appropriate design for attaining the study's goals is critical for the researcher to achieve the study's aims and objectives. The researcher combines quantitative and qualitative research methods while creating the empirical design of the study in order to fulfil the goals and objectives of the study as to address its problems.

3.4 Sampling size

The sampling method for this study was a simple random probability sample of farmers managing the ILVs farms in Gauteng province. Probability sampling, according to Antwi *et al.* (2017), helps reduce biases and errors in quantitative research. According to Antwi *et al.* (2017), probability sampling helps minimize biases and errors in quantitative research. The best method for obtaining a representative sample, according to Sanders (2010), is random sampling. Sanders (2010) agrees that random sampling is the best way to obtain a representative sample. A sample size of 105 respondents in the province of Gauteng was discovered using Raosoft Calculator. These farmers fit the aforementioned sampling requirements and were open to taking part in the study. Seven months were spent gathering the 105 individual items of empirical research data, which came through participants visits to their homes or farms. Random sampling was used to pick respondents or farmers for interviews in different sections of the province of Gauteng. Data was obtained by actual measurements and qualitative observations. Interviews were conducted with the people directly who were responsible for the management of ILV farms if there were not farmers.

3.5 Data collection

Primary data was gathered using a standardized questionnaire that asked questions about the farmer's demographics (name, age, sex, education, etc.) and the availability and resource features as well such as infrastructure found in the area (storage, roads) and lastly measuring and observing the marketing strategies that are currently being used during the COVID-19 Pandemic in Gauteng province by Indigenous leafy vegetable farmers.

3.6 Data analysis

Data analysis is a crucial component of the research design since it helps make sense of the data before it is presented to the reader. Data analysis, according to Pilot and Beck (2010), is the systematic arrangement and synthesis of research data as well as the use of such data to test a research hypothesis. Based on the data that was gathered, a descriptive analysis was performed. The ability to condense, summarize, and characterize quantitative data gained from empirical evidence makes descriptive analysis crucial (Mazibuko, 2013). Following data collection, the empirical data obtained from a sample of ILV farmers in the Gauteng province was run using the Statistical Package for Social Scientists. Descriptive statistics and multinomial logistic regression analysis were used to analyse empirical data and evaluate the hypotheses. Frequencies were the key descriptive indicator used. The frequency was calculated from the data and displayed as tables, pie charts, and bar graph.

To address the first and second objective (Analysis of demographic and socio-economic characteristics of Indigenous leafy vegetable farmers in the study area and to determine constraints of marketing ILVs by farmers in the study area) data was collected through the use of a structured questionnaire, that was gathered and was entered into Statistical Package for Social Sciences (SPSS) before being analysed.

The analysis of frequencies and percentages of the variables was done using descriptive statistics. Age, education attainment, occupations other than farming, land ownership and gender of ILV farms were among the variables that were examined. Other variables included the demographic and socioeconomic profile of the farmers. Resources such as

arable land, extension officers, market and transport, as well as the issues that may be associated with farmers were measured. Descriptive statistics were used to examine the constraints that ILV farmers are faced with, limiting them to marketing of ILVs. Issues associated to these following resources was measured, for instances Infrastructural needs such as, roads, telephone, storage for products were measured.

Addressing the third objective (Identify factors which affect marketing strategies adopted by ILV farmers amidst COVID-19 pandemic in the Gauteng province) was performed using multinomial logistic regression. Binary logistic regression can be easily extended to multinomial logistic regression, which supports more than two categories of the dependent or outcome variable (Starkweather *et al.*, 2013). Multinomial logistic regression evaluates the likelihood of categorical membership using maximum likelihood estimation, such as binary logistic regression (Starkweather *et al.*, 2013). In fact, Jaccard and Becker (2010) recommend that when choosing a suitable empirical research design, an overall consideration should be made, such as whether the design provides the most reliable responses to the research question. According to Mazibuko (2013), selecting the most appropriate design for attaining the study's goals is critical for a researcher to achieve the aim and objectives of the study.

According to Prasad and Vaidya (2016), A generalization of simple logistic regression for problems with more than two discrete outcomes is multinomial logistic regression. This model can be used to predict a set of independent variables that can be continuous, binary, or categorical and a dependent variable or response variable that is categorically distributed. Multinomial regression was utilized by Suryanwanshi *et al.* (2015) to examine a nominal dependent variable with more than two categories. The multinomial logistic regression is used to model the nominal outcome variables, and the log chances of the outcomes are modelled as a linear combination of the predictor variables (Suryanwanshi *et al.*, 2015). Prasad and Vaidya conducted a study of a comparative analysis using the Multinomial Logistic Regression approach on factors influencing the performance appraisal system among women and men. This is an approach using multinomial logistic regression to examine the variables affecting how men and women are evaluated for their performance. The findings by Sudhir Chandra Das (2016) used multinomial logistic regression analysis to describe the findings on the predictors of work-family conflict and employee engagement among employees in Indian insurance companies. Several scholars used multinomial logistic regression to publish their findings on occupational

stress and related factors, including Suryavanshi et al. (2015) and Masoud Lotfizadeh (2014). Sudhir Chandra Das (2016) in their study reported the results on predictors of work-family conflict and employee engagement among employees in Indian Insurance Companies applying multinomial logistic regression analysis. Several researchers (Suryavanshi et al., 2015 and Masoud Lotfizadeh (2014) reported their results on occupation stress and associated factors using multinomial logistic regression.

A generalized linear model is called a multinomial logistic regression model, is used to calculate probabilities for the m categories of a qualitative dependent variable Y using a set of explanatory variables X: as seen in equation (1) below:

$$\Pr Y_{ik} = \Pr Y_i = k \mid x_i; B_1, B_2, \dots, B_m = \frac{\exp B_{0k} + x_i B_k}{\sum_{j=1}^m \exp B_{0j} + x_i B_j} \text{ with } k=1,2,\dots,m \dots\dots\dots (3.1)$$

Where B_k is the row vector of regression coefficient of X for the kth category of Y.

The multinomial logistic regression method is an alternative to least-squares regression that ensures the fitted probabilities will be between 0 and 1. We choose group k, the final group, as the baseline category at random. Equation (2) indicated below:

$$\log \frac{\Pr(y=k|x)}{\Pr(y=k|x)} = B_0^{(k)} + B_1^{(k)}x_1 + \dots + B_p^{(k)}x_p \dots\dots\dots (3.2)$$

The ratio of any two group membership probability, as determined by this model, is a log-linear function of x, as shown in the equation(3) below:

$$\log \frac{\Pr(y=k|x)}{\Pr(y=k|x)} = (B_0^{(k)} + B_1^{(k)}x_1) + (B_1^{(j)} - B_1^{(k)})x_1 + \dots + (B_p^{(j)} - B_p^{(k)})x_p \dots\dots\dots (3.3)$$

If we use =0 for i=0,1..., a convenient option to verify model identifiability, for all j and k, including the baseline category k. Equation (4) below shows how to directly solve the group membership probabilities:

$$\Pr(y=k|x) = \frac{\exp(B_0^{(k)} + B_1^{(k)}x_1 + \dots + B_p^{(k)}x_p)}{\sum_{j=0}^K \exp(B_0^{(j)} + B_1^{(j)}x_1 + \dots + B_p^{(j)}x_p)} \dots\dots\dots (3.4)$$

According to Suryawanshi et al. (2015), the maximum likelihood approach is used to estimate the unknown parameters. Maximum likelihood estimates can be found with ease using any statistical software program. A new observation x_0 is classified in the classification problem as belonging to the group k for which $\Pr(y=k|x_0)$ is maximum.

3.7 Motivation

To identify and understand marketing strategies used among farmers of ILVs post COVID-19 outbreak is essential because ILVs are helpful in resolving nutritional shortages and preventing infections because their nutritional qualities. African leafy vegetables (ILVs) have gained significant cultural and nutritional significance in South Africa over the past few years. Recent research has also supported similar concerns, causing the Agricultural Research Council to include African vegetables in its primary business (ARC).

3.8 Ethical research considerations

Before conducting the study, the research proposal was sent for approval at the North-West University, Mafikeng campus, to the committee of faculty of Natural and Agricultural Sciences. Considerations were necessary for the purpose of ensuring the privacy and safety of participants. Significant ethical consideration in the process of the research included confidentiality of respondents and explaining all details of the study, including the aim and objectives of the study to participants.

3.9 Chapter summary

This chapter gave an overview of how the study was conducted. The methods that were used to collect data were reviewed. Data was collected from one hundred and five (105) farmers using a structured questionnaire, which included socioeconomic characteristics. Collected data was captured in Excel Spreadsheet and analyzed using Statistical Package for Social Scientists (SPSS). By running a multinomial logistic regression model, descriptive statistics was used to examine farmer's marketing strategies. The results of the research are analyzed and interpreted in the next chapter.

CHAPTER FOUR: RESULTS

4.1 Introduction-Section 1

This chapter consists of three sections. The study was interested in discussing socio-economic factors and demographic characteristics of ILV farmers in section one, addressing the first objective. Section two discusses the constraints of marketing ILVs among farmers in Gauteng province addressing the second objective and section three addresses the third objective, identifying factors which affect marketing strategies adopted by ILV farmers.

4.1.1 The socio- economic and demographic characteristics of the respondents (ILV farmers).

Table 4.1 demonstrates most respondents, both male and female, were aged 60 and older. Interviews with the respondents and the information from the ILV farmers indicated that involvement of farmers in ILVs is not appealing to young people as compared to the older generation. The results (tables 4.1) agree with Njeme (2014) that ILVs are seen as food for the underprivileged in some regions and the information linked with them is referred as backward knowledge which makes young people reluctant to work with them.

The study found that the majority people involved in ILV farming are women (56%). The results agree with the statement by Satyavathi *et al.* (2010) that women play an important role in all farm related activities, from land preparation to marketing and women work in the agricultural sector at a higher rate than men.

Total Number of Respondents (Male= 46, Female= 59)

Age group (in years)	Female	Male
<20	0	0
20-40	5	7
40-50	10	7
50-60	15	11
>60	29	21
TOTAL	59	46

Source: Author's computation

Table 4.1: Age and Gender distribution of Leafy indigenous vegetable Farmers (Respondents).

Table 4.2 depicts that men are the majority (59%) of farmers that have the tertiary education and the minority (2%) of those without education. Tables 4.2 demonstrates that women without education are high in number (5%) than men without education. The study found that the people who are mainly involved in ILV farming are the older generation. According to the results shown in Table 4.2, female respondents with low grades were found to be grater in number than male respondents. When it comes to the older generation in South Africa, girls in households were expected or required to help with common household activities, such as fetching water and cleaning in the house and were unable to attend school since they did not have enough time. This, of course, results in a small number of educated women. The highest level of education for females was found to be 39% for both primary and secondary school which contributes to their lack of participating in formal markets due to lack of education. People who lack education frequently fall prey to fraud, and after being taken advantage of, they often reject further change, even when it is for their benefit.

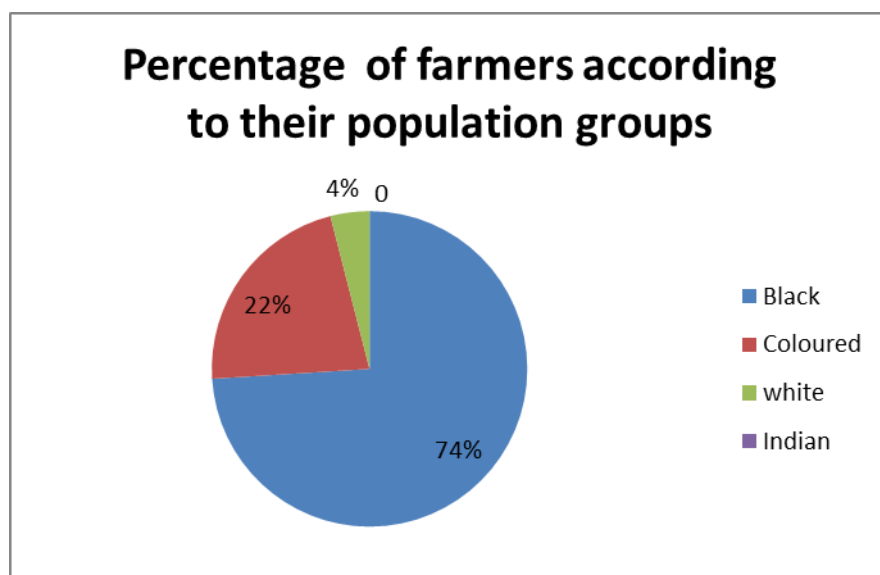
Total Number of Respondents (Male= 46, Female= 59)

Highest education level	Female	Male
No education	3	1
Primary school	23	6
Secondary school	23	12
Tertiary	10	27
TOTAL	59	46

Source: Author's computation

Table 4.2 Distribution of farmers by the level of education

As depicted in figure 4.1 most farmers (74%) are black, followed by coloured (22%) and white by four percent (4%). These findings support Shiundu and Oniang'o's (2007) assertion that indigenous leafy vegetables were part of the daily diet and source of revenue for Africans. ILVs were also among the most common vegetables in the backyard gardens of the poorest households, which are mainly Africans. Njeme (2014) also has mentioned that ILVs are classified as poor people's food in some regions of the country.



Source: Author's computation

Figure 4.1: Percentage of the involvement of Indigenous Leafy Vegetable Farmers according to their population groups.

Table 4.3 shows that the majority (61% female, male 22%) of farmers were unemployed. The situation of most women being unemployed was made worse by their lack of education. Less men are unemployed as compared to women because in previous times men had an option of looking for work in other commercial farms, urban areas and mines while women had limited job alternatives and relied on subsistence farming, especially growing local vegetables to complement household income and food.

Total Number of Respondents (Male= 46, Female= 59)

Farmer's occupation status	Female	Male
Employed	11	16
Business	12	20
Unemployed	36	10
TOTAL	59	46

Source: Author's computation

Table 4.3: Percentage Distribution of the Occupational Status of Respondents.

Table 4.4, depicts the proportion of farmers who worked as Indigenous Leafy Vegetable farmers by years of farming experience. Table 4.4 reports that the majority of the farmers (32%) have been in ILV farming for sixteen years and more, followed by 36% of farmers who had sixteen years' experience and more, 18% had an experience of six to ten years, and only 4% of farmers had experience more of zero to five years. The greater number of years spent on farming by respondents is a direct indicator of production expertise as well as a measure of experience. This is expected to increase market participation. The lowest level of experience in ILV farmers is low while the maximum level is thirty-five years. The reason for this is because most farmers are older, the farming knowledge and techniques were inherited by them long ago.

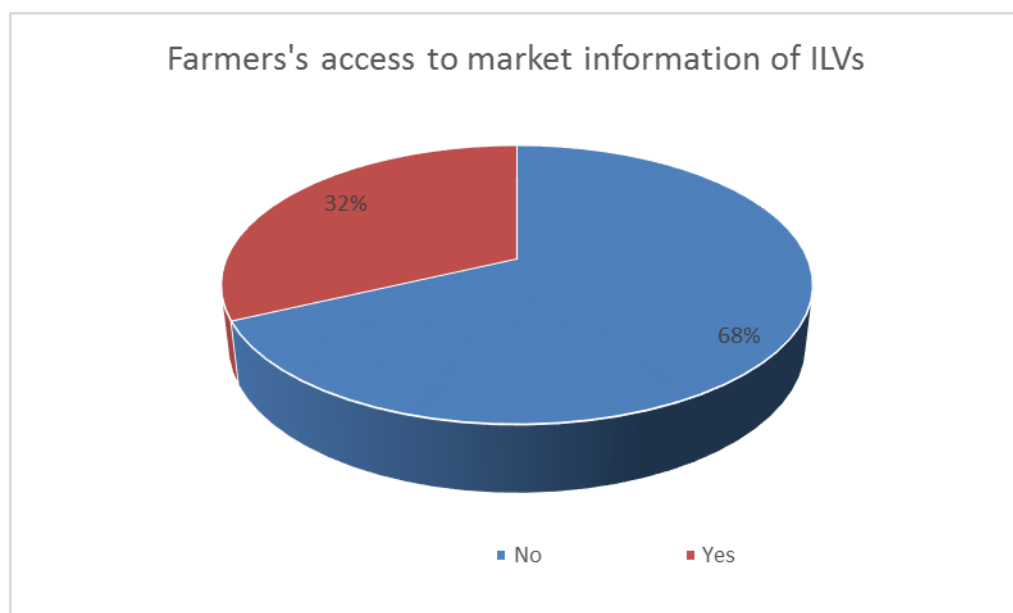
Farm experience (in years)	Frequency	Percentage
0-5	14	13
6-10	19	18
11-15	38	36

16+	34	32
TOTAL	105	100

Source: Author's computation

Table 4.4 ILV Farming experience

As indicated by Figure 4.2 the majority of farmers (68%) lacked access to the market information. It was found that only the minority (32%) of farmers that were updated with market information while the majority stated indicated that they depended on self-research. Most farmers are in isolated villages and the information available is not evenly spread, which makes it a disadvantage that helps to push farmers away from markets. Due to lack of information, farmers are unlikely to participate in the markets. Farmers lack of access to new information because they are still dependent on secondary information sources, they cannot use the technology (internet access) to search for information. Marketing information includes information about market prices, supply, or demand of crops. Farmers are less inclined to participate in the marketplaces when they lack information. For instances as a result of lack of market information farmers often negotiate prices of their produce based on the information given to them by traders or middlemen which is weakening the farmer's bargaining power, allowing uncompetitive marketplaces to evolve.



Source: Author's computation

Figure 4.2: Distribution of farmer's access to market information of Indigenous Leafy Vegetables.

Table 4.5 depicts that many farmers (66%), did not have access to market while the three percent (3%) minority had access to formal markets. According to the results most respondents, who are smallscale farmers, lack access to formal markets because they are impoverished and are semi-commercially orientated and lack the necessary resources such as inputs and skill to meet the changing market demands. Small-scale farmers are regularly taken advantage of by middlemen and lack access to high-value markets like supermarkets. As demonstrated by Table 4.5 there is high percentage of ILV farmers who have no access to markets; this is due to shortage of resources. For instances, the supermarkets standards are market driven and governed by current consumer tastes and desires such as clean ILV that are free from insects. Therefore, when farmers do not have access to resource such as irrigation, it will be unable for them to produce required quality standards and they will eventually become removed from the chain. Therefore, if farmers want to enter the formal market and supply regularly throughout the year, they need inputs and other resources such as irrigation access. The study found that there was 31% of ILV farmers that had access to informal markets. However Mahlangu *et al.* (2020) believes that since most farmers produce ILVs for their own consumption and only a small portion of their output enters the informal market, where sales are handled by women, informal marketing is growing more than formal marketing. In addition to that, consumers have become more conscious of the nutritional value of Indigenous vegetables in recent years. As a result, demand has increased particularly in the cities. However, benefits of ILVs have not yet been adequately analyzed and appreciated in the context of South Africa. If the advantages of ILVs had been looked into in greater detail, their potential value to the African food system would have grown and they would have eventually had more access to formal markets.

Total Number of Respondents (Male= 46, Female= 59)

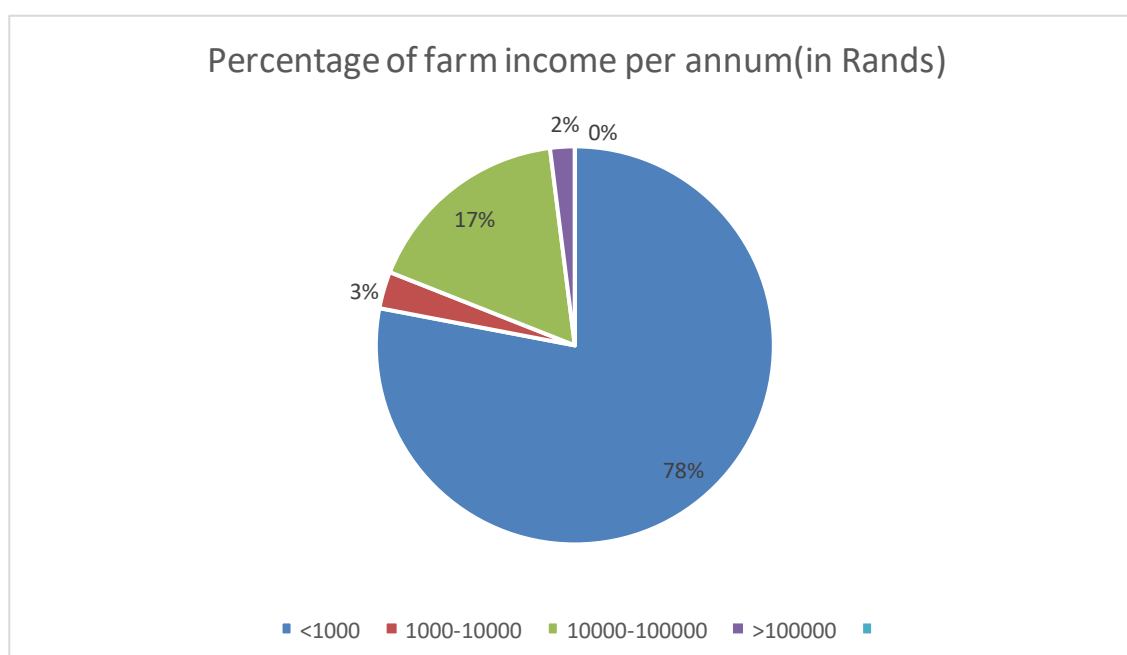
Farmer's access to market	Frequency	Percentage
None	69	66
Formal markets	3	3
Informal markets	33	31
TOTAL	105	100

Source: Author's computation

Table 4.5: Percentage of ILVs farmer's access to markets

As demonstrated figure 4.3 the majority of ILV farmers with the of percentage 78% their income per annum is between 0 and R1000 while only the minority (2%) their income per annum is R1000000 and more. The farm income is low for most farmers since these plants (ILVs) have a negative image among significant prospective consumer groups in South African society, especially the young people and the urbanized who equate the consumption of ILVs with poverty. For many years South Africa research and policy makers overlooked indigenous leafy vegetables, but that has changed in the last two decades hence there is a low percentage of farmers with farm income over Hundred thousand. Due to lack of resources farmers cannot compete with other commercial farmers. The results demonstrated by figure 4.3 are in support of the statement said by Van Rensburg *et al.* (2007) that since 1960s, agricultural research and extension services have actively promoted exotic vegetables in South Africa. In areas where extension was active, exotic vegetables like cabbage have entirely replaced ILVs; hence there is lack of farm income from ILVs as compared to exotic vegetables. Farmers in South Africa's undeveloped rural areas face a number of challenges that make it challenging for them to compete in commercial marketplaces. Lack of infrastructure, insufficient property rights, low education levels among farmers, a lack of credit, lack of innovative production implements prevent farmers from successfully marketing their products

Total Number of Respondents (Male= 46, Female= 59)



Source: Author's computation

Figure 4.3: Farmer's distribution of farm income per annum

As depicted by Table 4.6 the majority of ILV farmers (50%) are located far from marketplace and the minority (16%) are farmers close to markets. Many of the farmers are located away from the marketplaces in rural areas where they engage in agricultural activities and where poverty is a problem. However, farmers that desire to commercialize may be discouraged by long distances to market. For instances the advantage of selling at farm markets is that it may provide other channels, such as special orders and subscriptions farmers markets are generally located at busy and central places that are publicized. The further the distance of the farm from the marketplace, the less likely a farmer is to engage in that marketing of ILV due to high transport costs and limited access to market information.

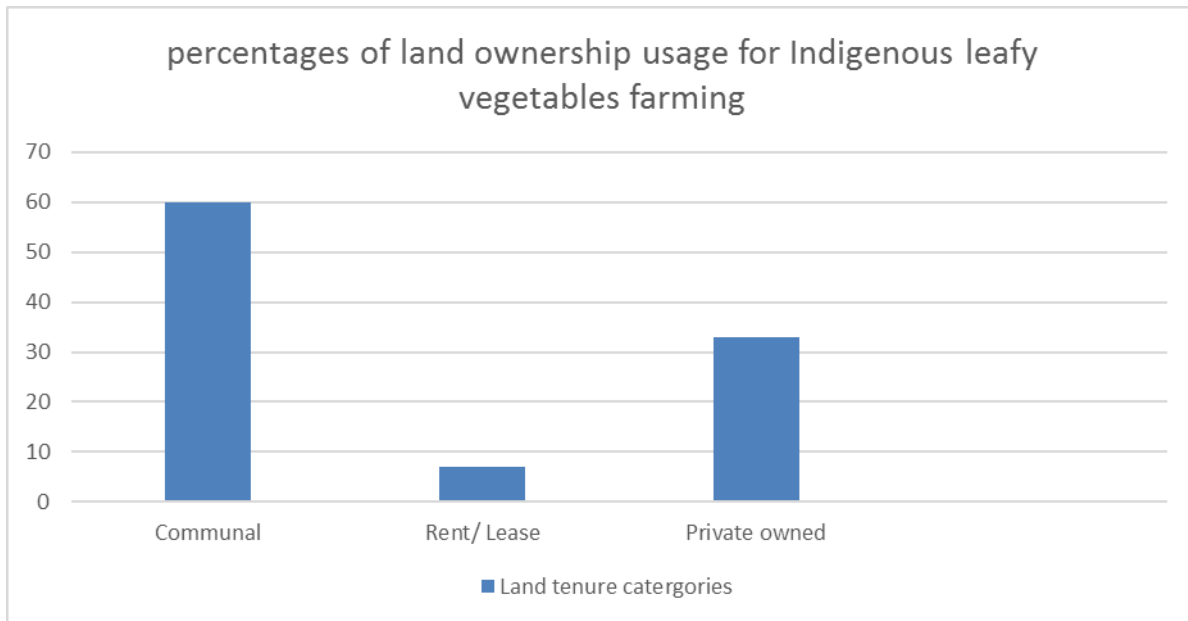
Distance from farm to marketplace (in Kilometres)	Frequency	Percentage
< 5Kilometres	17	16
5-10 Kilometres	36	34
>10 Kilometres	52	50
TOTAL	105	100

Source: Author's computation

Table 4.6: Distance of farmers from farms to a nearby marketplace.

As depicted in figure 4.4 majority of ILV farmers (60%) use communal land for production of indigenous vegetables. Interviews with the respondents indicated that as they do not have enough space in their homes for production of indigenous leafy vegetables they use communal land. Farmer's land availability appears to be an issue in market participation. This has a serious consequence for farm income and sustainability. For instances if farmers wish to engage in commercial agricultural markets, they need enough land to produce on. Even though South Africa's land reform program has been in place for over 20 years, the number of land beneficiaries to rural people remains dismally low. This shows

that land scarcity is a serious issue in South Africa. Due to past the apartheid laws black people were prohibited from owning or leasing resulting in majority of South Africa's agricultural land owed by white people. Farmers that use their own land to grow ILVs only produce small-scale and primarily for subsistence purposes within rural farming communities.



Source: Author's computation

Figure 4.4: Distribution and tenure systems by ILV farmers

According to Table 4.7, the vast majority of farmers (97%) have never accepted a loan for agricultural use because most smallholder farmers lack official employment and live in communal settings, as shown in table 4.5 and figure 4, farmers lack collateral to utilize when borrowing money from financial institutions like banks. Farmers require access to some form of external financing in order to purchase agricultural inputs, working tools, and labor in order to produce enough crops to sell to markets.

Bank loan	Frequency	Percentage
Yes	3	3
No	102	97
TOTAL	105	100

Source: Author's computation

Table 4.7: Distribution of loan received by farmers

4.2 Section 2

4.2.1 Constraints of marketing ILVs amidst COVID-19.

Farmers have indicated that they have learned to work around the market constraints. Commercial farmers have indicated that they had to sell their products to local markets more regularly to make up for the loss of sales to restaurants and hotels as a result of COVID-19 control measure. They used word of mouth of mouth advertising for their crops. Farmers that sold their produce at marketplaces such as taxi stations or pension pay-out stations through middlemen or farm workers were known around the neighbourhood. People around the community would buying from the farmer's house. Therefore, small holder farmers who are in local areas were already known around the neighbourhood and it was easy for them to continue producing and purchasing their produce while those in urban areas were forced to let their harvest decay due to lack of demand when the restrictions were harsher.

Increased price production was caused by the drop in people's spending ability on food. Due to the pandemic and extended lockdowns, the situation worsened up due to reduced income and job losses that let to farmers having to low their prices. Low prices were a typical complaint, and some farmers complained about unexpected price drops and payment delays, while others liked the continuous demand, and they enjoyed the cash payments. Also, reduction in price of the produce was caused by limited storage and avoiding waste of the products due to lack of buyers.

4.2.2 Lack of access to high value market

Those selling next to the roads have experienced a reduced number of indigenous vegetables buyers because many costumers were working at home. Due to the fact that many people were working from home as a result of lockdown restrictions, those selling ILVs by the roadside noticed a decrease in the number of people purchasing indigenous products. Restaurants, hotels and street outlets closures have eliminated a vital market

for farmers resulting in oversupply and production reduction. Farmers' markets provide adaptable venues where sellers can sell a variety of produce.

The findings in table 4.8, show that many farmers (75%), indicated that the problem of lack of government support was severe before COVID-19, while 19% stated that government support was needed during COVID-19 and 6% of farmers which stated that they do not need the government support, they have received government assistance in the form of water, during droughts, and fertilizers. The majority indicated that support from the government was needed before COVID-19 because most of the farmers grow for their own consumption and did not have the pressure to compete with other farmers. The president of South Africa moved the country to lockdown Levels 4 and 5 towards winter, a season when many local farmers do not grow indigenous vegetable because of the nature of ILVs. However, for the commercial farmers government financial aid was to sustain the business and pay the workers and to supply the regular consumers. It was indicated by the farmers that government's focus and financial aid was mainly to helped big commercial agricultural companies during the lockdown, it overlooked at the farmers in the disadvantaged areas.

	Frequency	Percentage (%)
Supported by the government	6	6
Lack of government assistance before the COVID-19 outbreak	79	75
Lack of government assistance during the COVID-19 pandemic	20	19
TOTAL	105	100

Source: Author's computation

Table 4.8 Financial support from the government

Table 4.9 demonstrates that majority of farmers (75%) do not have a problem with transport because they produce near informal markets. While those who are having

problems with transportation before COVID-19 and during COVID-19 have a smaller percentage (25%) as compared to those who do not have a problem at all. That shows that many farmers grow ILV for their own consumption and not for purchase. Transporting food to markets may be difficult for smallholder farmers who lack transportation, raising transaction expenses. Because of improper storage, packaging, handling, and transportation, produce quality is occasionally subpar. Farm-gate marketing offers the benefit of eliminating transportation costs and allowing the farmer to sell the goods directly to customers, which lowers transaction costs even when prices are low. Table 4.9 shows that the majority (64%) of ILV farmers needed the technology before COVID-19, while 36% needed it more during the pandemic. Lacking technology, agriculture in developing countries is particularly sensitive to pandemic shocks due to its strong reliance on human labour. Productive labour is reduced during pandemic due to disease and mortality. Furthermore, pandemic containment methods like social distancing and self-isolation decrease labour mobility, resulting in labour shortages, lower productivity, and higher wages. Containment efforts also cause disruption in food supply and chains, making it difficult for proper operation of agricultural markets for both inputs and outputs. As a result of labour shortages machinery has become essential for the farmers.

	Frequency	Percentage
Do not have a problem at all	79	75
Need of transport before and during COVID-19	26	25
TOTAL	105	100

Source: Author's computation

Table 4.9: Effect of COVID-19 on shortage of transportation during COVID-19

	Frequency	Percentage
Lack of Technology before COVID-19	67	64
Lack of technology during	38	36

COVID-19		
TOTAL	105	100

Source: Author's computation

Table 4.10: COVID-19's impact on farm Technology

4.2.3 Changes in Inputs price

As depicted by table 4.11 many farmers were found to be faced with a challenge of high prices of inputs such as seeds and fertilizers as a result of COVID-19 outbreak. This was caused by lack of the availability of the inputs and reduced farm income. Farm inputs had become more challenging for farmers to access and more expensive as a result of the COVID-19 emergence. For instance six farmers indicated that they could not access farm inputs in time. COVID-19 has removed casual agricultural labourers temporarily due to illness or death, disrupting input sourcing, planting, and harvesting, and rising farm salaries

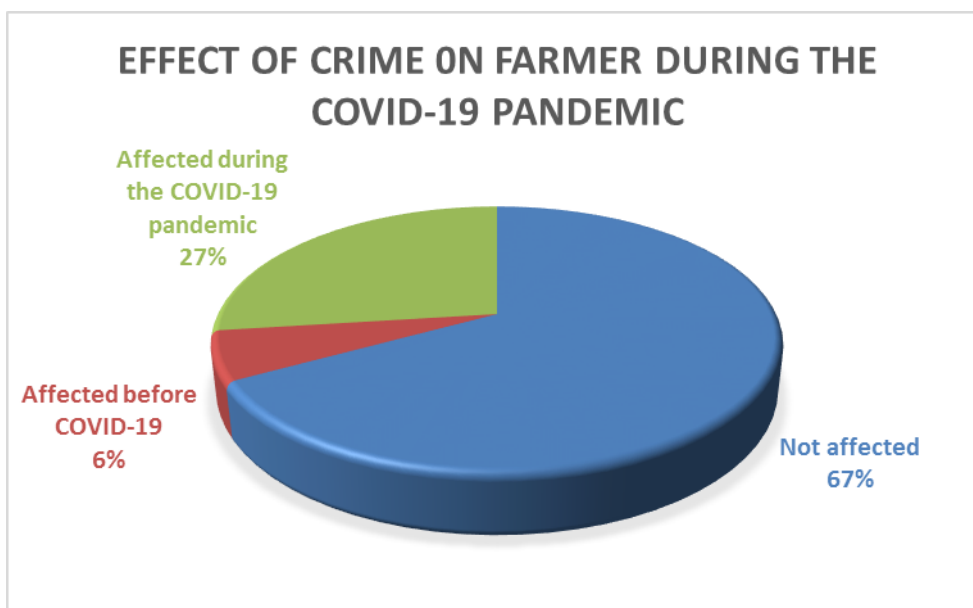
	Frequency	Percentage
COVID-19 has impact on input	58	55
Not affected by inputs during COVID-19 pandemic	47	45
TOTAL	105	100

Source: Author's computation

Table 4.11: Impact of COVID-19 on farm inputs

. As illustrated by figure 4.5 the study found that the majority (67%) of the farmers were not affected by crime during the COVID-19 pandemic, while 27% were affected by theft and only 6% were affected by theft before COVID-19 outbreak. Human behavior and

actions, particularly those of the most vulnerable populations in rural area, have been significantly impacted by COVID-19. Mobility restriction has led to job losses and purchasing power which led to crime. A farmer who used school land for production was affected. Due to theft, there was loss of equipment and fencing. These theft incidents were connected to the fact that schools were closed during the COVID-19 pandemic and that theft and damage at schools were frequent during lockdowns. According to Wegerif (2022) after one of the farmers quit utilizing the land, the school "sold" it to another person. She is now just producing in her personal garden while the other farmer moved production to a different location.



Source: Author's computation

Figure 4.5: Effects of Crime on farmers during the COVID-19 Pandemic

Table 4.12 demonstrates that farm workers were declared important to keep the public fed, yet farm works consists of many people that are migrant and were at a high risk of contracting COVID-19. The study found that there was 16% of farmer workers who have died, 11% of farm workers migrated and 73% of the farmers had no shortages of labour. Farmers have reported more severe repercussions at the restrictions were becoming more severe (level 4 level 5). The government of South Africa introduced licenses for agricultural access that were difficult to get. The Pandemic has let to insecurity, poverty and loss of jobs resulting to hunger and increased criminality, shortages in food, increased prices and increase in theft in the Gauteng province, Farmers have indicated that COVID-19 has

affected them with reduced earnings due to decrease in consumers. Travelling limitations to other provinces also had an impact in marketing.

	Frequency	Percentage
No shortages of labour	77	73
Migration of labour	11	11
Death of the farm workers	17	16
TOTAL	105	100

Source: Author's computation

Table 4.12: Farm workers' experiences with COVID-19

Table 4.13 shows that many farmers (39%) experience Lockdown level 5 as difficult to go through. 27% of farmers experienced lockdown level 4 as the hard while 36% has indicated lockdown level three (3) as the hardest. These are the lockdowns levels which have contributed to farmers having to change their market strategies to adapt and respond to the COVID-19 restrictions.

COVID-19 restrictions	Frequency	Percentage
Lockdown level 3	36	34
Lockdown level 4	28	27
Lockdown level 5	41	39
TOTAL	105	100

Source: Author's computation

Table 4.13: The hardest lockdown levels farmers have experienced.

The several Indigenous leafy vegetable varieties grown by farmers and consumed by various communities as food and medicine are listed above in Table 4.14. The plant that is mostly grown by farmers (25%) is *lulurbapepo*. While the one that is grown by the minority (11%) according to the results was *Corehorus olitorius*. Most of these plants were available throughout the summer rain season, according to interviews with respondents.

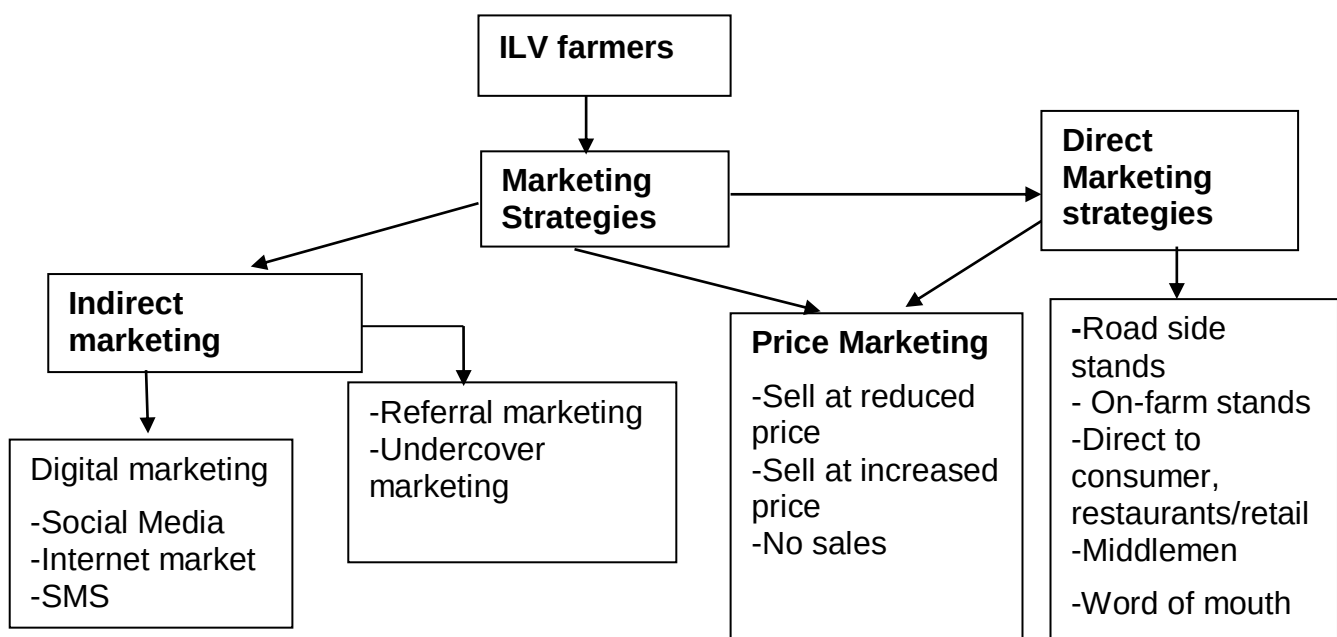
Biological Name	Frequency	Percentage
<i>Corehorus olitorius</i> ,	12	11
<i>Amaranthaceae</i>	26	25
<i>Jew's mall</i>	25	24
<i>Cleome Gynandra</i>	16	15
<i>Lulurbitapepo</i>	26	25
TOTAL	105	100

Source: Author's computation

Table 4.14: Distribution of types of African Indigenous Vegetables Cultivated by ILV farmers

4.3 Section 3

The study was interested in investigating marketing strategies utilized by farmers under the most severe lockdown they experienced (in their opinion). Given one or more independent factors, a nominal dependent variable was predicted using multinomial logistic regression. It was chosen because, like other types of regression, it allow for th prediction of the dependent variable using both nomial and/or continous independent variables as well as their interactions.



Source: Author's computation

Figure 4.6 : Distinguishing market strategies that ILV farmers use in response to COVID-19 restrictions.

4.3.1 Marketing strategies

Figure 4.6 shows the typical marketing strategies used by ILV farmers on a daily basis. Marketing strategies were categorised into three groups, indirect, direct and price marketing as illustrated above. The study found that most ILV farmers were smallholder farmer who used direct marketing while only a few used indirect marketing such as digital marketing to sell their produce. In response to the Pandemic, farmers using direct marketing in particular had difficulties to adjust and reconsidering how they market their produce to customers given various government restrictions which came about with the implementation of the National State of Disaster. It was found that the majority of the farmer's production stays on the farms and is usually not sold because of a shortage of transportation and a drop in ILV demand during lockdown. The study found that majority of the farmers experienced problems mostly related to transportation and movement restrictions as well as price drops for agricultural products caused by consumer's decreased demand of ILVs during the lockdowns. Due to the lockdown's interruption of the supply chain, farmers were unable to sell and protect their agricultural produce from rotting because there were no warehouses and cold storage facilities nearby. Farmers said they were anxious to visit the markets, especially with the start of COVID-19 limitations, so they chose to stay at home. COVID-19 regulations had a significant impact on smallholder farmers' day-to-day operations, which conceivably influenced the level of food security in their households.

Lockdown restrictions imposed by the government has affected ways how farmers used to market their produce. As the lockdown limitations were eased, South Africa moved into stages 4 and 3, when much of the economy reopened and movement restrictions were greatly lessened. The pandemic peaked during level 3. The pandemic began to subside as the country reached level 2. Therefore, marketing strategies slightly changed with different COVID-19 restrictions (lockdown levels). However the farmers have indicated that they have learned the importance of being self-sufficient during the COVID-19, which has also given them a variety of options for selling their agricultural products in hard times.

4.3.2 Summary of COVID-19 pandemic restriction

Level 5 lockdown restrictions

Except in exceptional circumstances, migration between provinces and metropolitan and district areas were forbidden, only those employees who were absolutely necessary could go to and from work. Unless rendering a significant service, performing an important service, obtaining a social grant or pension, receiving immediate medical care, or receiving a social grant or pension, every person was bound to his or her residence. Retail establishments and malls were shut down, with the exception of those selling essentials and only if the store manager made sure that all hygienic and COVID-19 regulations were fulfilled and that patrons maintained a social distance of at least one square meter from one another. Except for companies or organizations engaged in the production, distribution, or provision of a need good or service, all businesses and other entities had to stop operating, unless the procedure was carried out remotely from a location outside of South Africa or by a person who normally resided there. During the lockdown, all the South African borders were closed, except the ports of entry for the transfer of fuel, cargo, and merchandise chosen by the relevant Cabinet member.

Lockdown level 4 lockdown restrictions

Everyone was limited to their homes from 21H00 to 04H00 each day unless if you were granted a permission. The places such as grocery stores were allowed to stay open till 20H00 must close. Hotels, resorts, and guest homes were permitted to accommodate 50% of the rooms, with people keeping distance of one and a half meters(1,5m) between them when in common areas. Only hotels, lodges, bed & breakfasts, timeshare properties, resorts, and guest houses were permitted to operate restaurants and other in-house dining facilities for off-site food and non-alcoholic beverage use.

Level 3 lockdown restrictions

Hotels, lodges, timeshare facilities, resorts, and guest homes were permitted to fill all available rooms, with guests with their face masks on and maintaining distance of 1,5m between them in common areas. Restaurants were only allowed to seat a maximum of 50 patrons indoors and 100 patrons outside, and only half of the venue's capacity could be

used if it couldn't accommodate those numbers while maintaining a separation of at least one and a half meters between patrons. The 20 fully operable land borders were permitted to operate, while the 33 land borders remained closed. Transportation of goods for import and export was permitted by rail, ocean, air, and road.

Lockdown level 2 restrictions

Unless a person was allowed or given the permit, everyone is confined to their home from 23H00 to 04H00 every day. Employers must comply. In order to encourage physical separation of employees, managers had to take certain actions, such as allowing employees to work from home or minimizing the requirement that they be physically present at work, providing enough space, restricting face-to-face meetings, and allowing for free movement.

During the level 1 lockdown period

The curfew was removed. As a result, there were no limits on people's movement during certain hours. Data captured was used to examine farmers marketing strategies responses to different lockdown levels using the multinomial logistic regression. Farmers were asked which of the COVID-19 restrictions imposed by the government were the most difficult to get through. Lockdowns levels were presented in a form of lockdown levels. Therefore, lockdown levels in this case were taken as a dependent variable. Dependent variable Lock down restriction, is coded 3=level three, 4=Level four, 5=Level five. The pandemic began to subside as the country reached level 2. Hence farmers have indicated to have been affected severely by level three, four and five of lockdowns restrictions. The independent marketing strategies include Direct marketing, Price marketing, and Indirect marketing. Independent variables Direct marketing code 1= word of mouth; 2= social media; 3= Referrals.

Table 4.15 is called the Model Fitting Information table which contains a likelihood ratio chi-square test, comparing the model containing all predictors against a null model.

		N	Marginal Percentage
Levels	Level 3	36	34.3%

	Level 4	28	26.7%
	Level 5	41	39.0%
Price	Reduced prices	27	25.7%
	No, Sales	26	24.8%
	Normal price	52	49.5%
Direct marketing	Road- side sands	20	19.0%
	On-farm stands	67	63.8%
	Middlemen	18	17.1%
Valid		105	100%
Missing		0	
Total		105	
Subpopulation		43^a	

Source: Author's computation

Table 4.15: Case Processing Summary

The Chi-square statistic was used to determine the model's fitness. Chi-square analysis revealed a value of 70.859, and the p-value was less than 0.05. This demonstrates that in the final model, the dependent variable and independent variables have a significant relationship.

Model Fitting Criteria			Likelihood Ratio Test		
AIC	BIC	-2 Log Likelihood	Chi-square	Df	Sig
179.891	185.19	175.891			
133.032	170.188	105.032	70.859	12	.000

Source: Author's computation

Table 4.16: Model Fitting Information

Goodness of fit table (table 4.17 above) contains the Deviance and Pearson Chi-square tests, which are useful for determining whether a model exhibits good fit to the data. The Pearson (106.665) suggests that the model is not fit since the p value is less than 0.05. Deviance (80.751) statistic test proves that the model is fit since the test is not statistically significant, that is the p-value is greater than 0.05.

	Chi-Square	Df	Sig
Pearson	106.665	72	.005
Deviance	80.751	72	.225

Source: Author's computation

Table 4.17: Goodness of fit

The likelihood ratio test (table 4.18 above) demonstrates the significance of independent predictor variables including income, price, and direct market, demonstrating their significant contribution to the final model.

Model Fitting Criteria				Likelihood Ration Test		
Effect	AIC of Reduced Model	BIC of Reduced Model	-2Log Likelihood of Reduced Model	Chi-Square	Df	Sig
Intercept	133.032	170.188	105.032^a	.000	0	
Age	137.274	169.121	113.274	8.242	2	.016
Income	142.193	174.040	118.193	13.18760	2	.001
Price	142.963	169.503	122.963	17.931	4	.001
Direct Marketing	159.819	186.359	139.819	34.787	4	.000

Source: Author's computation

Table 4.18: Likelihood Ratio Tests

Level		B	Std. Error	Wald	df	Sig	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower bound	Upper Bound
3	Intercept	-14.104	6.946	4.124	1	.042			
	Age	3.217	1.409	5.211	1	.022	24.962	1.576	395.339
	Income	-.514	.173	8.849	1	.003	.598	.426	.839
	Price=1	4.666	1.711	7.438	1	.006	106.241	3.716	3037.217
	Price=2	11.123	3.923	8.040	1	.005	67735.186	31.012	147945442.686
	Price=3	0^b		.	0		.	.	.
	Direct Marketing=1	-.219	.870	.063	1	.	.803	.146	4.422
	Direct Marketing=2	-2.601	.851	9.345	1	.801	.074	.014	.393
	Direct Marketing=3	0^b	.	.	0	.002	.	.	.
4	Intercept	-16.832	6.902	5.947	1	.		.	
	Age	3.217	1.380	5.434	1	.015	24.951	1.669	373.022
	Income	-.288	.123	5.519	1	.020	.750	.589	.953
	Price=1	5.474	1.694	10.435	1	.001	238.350	8.607	6600.400
	Price=2	9.801	3.758	6.812	1	.009	18162.754	11.501	28682662.885
	Price=3	0^b	.	.	0	.		.	.
	Direct Marketing=	-1.056	1.447	.533	1	.465	.	.020	5.930

1									
Direct Marketing= 2	.869	1.008	.745	1	.388	.348	.331	17.190	
Direct Marketing= 3	0 ^b			0	.	2.386	.	.	

The reference is: Level 5 The parameter is set to zero because is redundant

Table 4.19: parameter Estimates

4.3.3 Interpretation of results

According to the respondents, lockdown level three, four and five (3-5) three, were chosen to be the most difficult to go through. Therefore, in this case lockdown levels were taken as a dependent variable. Dependent variable Lock down restriction, is coded :3=level three; 4=Level four; 5=Level five; Independent variables includes Direct marketing code 1= word of mouth; 2= social media; 3= Referrals, and Price where code 1=Reduction of price; 2= No sales and 3= Normal price. Lockdown level 5 was taken as a reference category.

According to the outcomes displayed in table 4.19 above, age was found not to have a significant relationship existing with farmer's marketing strategies amidst COVID-19 pandemic. Therefore, for the Hypothesis in terms of age, the null hypothesis was accepted, and alternative hypothesis was rejected. As shown by table 4.19 above, income predictor is negative and significant ($b = -.514$, $S.E. = .173$, $p > 0.003$). It indicates that for every unit rise in this variable, a .512-unit decline in the log-odds of an income case is expected. According to the odds ratio of .598, the likelihood of earning a certain amount of money changes by a factor of .598 as predictor scores rise. As a result, the null hypothesis is rejected in terms of income.

Price reduction was positive and significant ($b = 4.66$, $S.E. = 1.711$, $p > 0.006$). The log-odds of preferring the "reduce pricing strategy" plan are anticipated to grow by 4.666 units for

every unit increase in this variable. Therefore, farmers who are selling at a reduced price are preferring to use this strategy 4.666 times more than in lockdown level 5. Consumers were less likely to spend more because of the coronavirus pandemic's restrictions, with many expecting their household income to continue to decline in the months ahead but as lockdown levels subside there was free movement of people and high competition among the producers which resulted in farmers reducing their price of produce (Ellison,2021). Indigenous leafy vegetables also compete with exotic vegetables like Cabbage. The major disadvantage of Covid-19 for farmers has been a decline in demand for their products which has been accompanied by reduced pricing at times (Wegerif, 2022). Two key processes are responsible for the decrease in demand. One is the halting of major events. The second is, the closing of restaurants and hotels, during the rigorous lockdown, and then their restricted operations under later limitations (Wegerif, 2022).

No sale- is positive and significant ($b=11.123$, $S.E.=3.923$, $p>0.005$). Farmers who have chosen no sale of the ILV have preferred to use that strategy 11.123 times more in lockdown level 3, than in lockdown level 5. The restrictions enforced by the South African government slowed the activities of viable and industrial segments, resulting in employment losses or underpayment for a variety of income-earning persons (Gursoy and Chi, 2020). The agricultural industry, as well as small and major businesses, were unable to operate. As expected, this had a negative impact on service delivery, posing a serious threat to the food supply chain's affordability (Wegerif, 2022).

Social media is negative and significant ($b=2.601$, $S.E.=.598$, $p>.002$) which means that Farmers are preferring social media as a marketing strategy 2.601 times less in level 3 lockdown level than Lockdown level 5. From having to practice social distancing, people did not have any other choice but to use digital marketing in the form of social media to market their products. Since people avoided intimate contact as a result of COVID-19 restriction, farmers using traditional marketing strategies were disadvantaged, such methods being difficult to use in reaching people because people did not leave their houses except for going to grocery stores (Gursoy and Chi 2020).

Reduced price is positive and significant ($b=5.574$, $S.E. =1,694$ and $p>0,001$). Farmers prefer a marketing strategy of selling at a reduced price 5.474 times in lockdown level four

(4) that of in level 5 lockdown restrictions. While food provision was always considered as an important service, there was some confusion over which food-related operations might continue. On the retail side, despite selling food, street sellers and spaza stores were initially barred from functioning, and there were also difficulties obtaining licences required for those working in the food industry (Middendorf *et al.*, 2021). ILV farmers are mainly small-scale farmers with lack of input resource (Middendorf *et al.*, 2021), however ILVs grow well in summer but the Lockdown level four (4) was imposed towards winter and people's movement was still restricted, which led farmers preferring not to sell. Hence there was reduction of price.

Selling at a reduced price is negative and significant ($b = -.219$, S.E. = .870, $p < 0.05$). Which means that one unit increase of this variable, the log-odds of a case not to sell under lockdown level 3, will decrease by .219 units. The odds ratio is .801, indication that with increasing scores on farmers choosing not to sell in level 3 the odds of being affect by level 3 category is changing by 0.801. Overall, this suggests that farmers who have chosen level 3 and not selling as a strategy are less likely to choose Level no sales are less likely of believing that level 3 is harsh.

The table 4.20 below indicates how the model performs in correctly predicting category membership. The classification accuracy for a given category was reflected in the row of percentages. Table 4.20 above shows that the model correctly predicted farmers being affected by Level 3 at the rate of $25 / (25 + 3 + 8) \times 100 = 69.4\%$. The model correctly predicted farmers affected by Level 4 at the rate $4 / (4 + 11 + 13) \times 100 = 39.3\%$. The model correctly predicted farmers being affected by Level 5 at the rate of $8 / (8 + 4 + 29) \times 100 = 70.7\%$. The overall classification accuracy of the model was 61.9%.

Observed	Level 3	Level 4	Level 5	Percent
Level 3	25	3	8	69.4%
Level 4	4	111	13	39.3%
Level 5	8	4	29	70.7%
Overall Percentage	35.2%	17.1%	47.6%	61.9%

Source: Author's computation

Table 4.20: Classification

4.4 Chapter summary

Marketing strategies were categorised into three groups, indirect, direct and price marketing as illustrated above. The study found that most ILV farmers were smallholder farmer who used direct marketing while only a few used indirect marketing such as digital marketing to sell their produce. In response to the Pandemic, farmers using direct marketing in particular had difficulties to adjust and reconsidering how they market their produce to customers given various government restrictions which came about with the implementation of the National State of Disaster. It was found that the majority of the farmer's production stays on the farms and is usually not sold because of a shortage of transportation and a drop in ILV demand during lockdown.

CHAPTER FIVE

5.1 Introduction

This Chapter provides the discussions, conclusion, and recommendations from the study.

5.2 Discussions

COVID-19 pandemic has affected ILV farmers in so many ways. Farmers had to adapt to new marketing strategies and adapting to new ways of marketing. Particularly farmers who were used to a direct form of marketing had to try other forms of marketing like digital marketing as a result of level five and four of lockdown. Due to COVID-19 pandemic there has been increased acts of theft in farms, and low financial income. The study found that the cultivation of ILV is mostly practiced by smallholder farmers. and there are various obstacles that discourages and limit them from marketing their produce. Smallholder farmers typically have limited finances to support and to safeguard their families and as a result of the enforced lockdowns restrictions by the government, the majority indicated that they can longer grow or sell their produce at local markets. Many of these farmers were denied government assistance because their labour is not deemed a recognized occupation, they are not properly registered in their areas of residence, or they are denied for other bureaucratic reasons.

Without suitable farmer support services, ILV farmers who fall into the category smallholder farmers, cannot be able to commercialize their produce (Quayson *et al.*, 2020). Farmers can contribute to enhanced agricultural growth, rural development, and farm income if they have proper access to farmer support services (Wegerif, 2022). According to the results it was evident that the revenue of even those farmers who could still labour on their land and harvest, decreased drastically because most smallholder farmer's markets were closed and transportation between villages and cities was limited, and it was difficult for farmers to sell their produce in public places such as at taxi-ranks and pension stations. The government's response to Covid-19, as well as the support measures put in place to mitigate its negative effects, have not considered the unique circumstances of black farmers and the production and distribution networks they are a part of, particularly the informal sector of small businesses that play an important role in

food systems but are frequently overlooked. This was most clearly demonstrated by early lockdown measures, which caused huge disruptions to these networks, which despite these disruptions having continued, are still characterized by a lack of effective support for black farmers (Wegerif, 2022).

Farmers have indicated that they have learned to work around the market constraints. Commercial farmers have indicated that they had to sell their products to local markets more regularly to make up for the loss of sales to restaurants and hotels as a result of COVID-19 control measure. They used word of mouth of mouth advertising for their crops. Farmers that sold their produce at marketplaces such as taxi stations or pension pay-out stations through middlemen or farm workers were known around the neighbourhood. People around the community would buying from the farmer's house. Therefore, small holder farmers who are in local areas were already known around the neighbourhood and it was easy for them to continue producing and purchasing their produce while those in urban areas were forced to let their harvest decay due to lack of demand when the restrictions were harsher. Increased price production was caused by the drop in people's spending ability on food. Due to the pandemic and extended lockdowns, the situation worsened up due to reduced income and job losses that let to farmers having to low their prices. Low prices were a typical complaint, and some farmers complained about unexpected price drops and payment delays, while others liked the continuous demand, and they enjoyed the cash payments. Also, reduction in price of the produce was caused by limited storage and avoiding waste of the products due to lack of buyers.

High market pricing for food, a lack of funds to buy food, and access issues due to either closed markets or a lack of transportation choices were the most common causes of food purchase disruptions (Quayson *et al.*, 2020). Contradictory reports of low selling prices for agricultural items and high purchase prices for groceries were commonly observed and could suggest market failures or traders attempting to mitigate their own risks during a period of uncertainty. Reduced transportation whether to markets or to purchasers has appeared to be a bigger barrier to sales and purchases than physical marketplace closures and as a result farmers stopped marketing and selling their produce.

CONCLUSION

The results in terms of socio-economic factors have shown that most respondents, both male and female, were aged 60 and older. Interviews with the respondents and the information from the ILV farmers indicated that involvement of farmers in ILVs is not appealing to young people as compared to the older generation. The results agree with Njeme (2014) that ILVs are seen as food for the underprivileged in some regions and the information linked with them is referred as backward knowledge which makes young people reluctant to work with them. The study found that the majority people involved in ILV farming are women (56%). The results agree with the statement by Satyavathi *et al.* (2010) that women play an important role in all farm related activities, from land preparation to marketing and women work in the agricultural sector at a higher rate than men.

Respondents indicated that the major constraint was the problem of lack of government support which was severe before COVID-19, while 19% stated that government support was needed during COVID-19 and 6% of farmers which stated that they do not need the government support, they have already received government assistance in the form of water, during droughts, and fertilizers. There is still a high percentage of farmers who are not receiving any financial assistance from the government. Farmers who have chosen not to sell their produce, have preferred to use that strategy 11.123 times more in lockdown level 3, than in lockdown level 5. The restrictions enforced by the South African government slowed the activities of viable and industrial segments, resulting in employment losses or underpayment for a variety of income-earning persons (Gursoy and Chi, 2020).

Leafy vegetable marketing remains low in South Africa, with dried items being the only option. ILVs are hardly stocked in stores supermarkets or groceries stores and that has led to lower usage. Due to a lack of awareness presentation and the availability of consistent and dependable sources, those who presently consume these indigenous leafy vegetables have not expanded their desire. Farmers must be trained, so that they can be equipped with knowledge on standardization of selling units, and then be connected to markets to open up market outlets for ILVs in supermarkets and grocery stores. "

RECOMMENDATIONS

Farmers should form networks to share information to enhance the quality of their products to meet market demands. Updating the research's relevance by making publications available electronically in languages that are understood by farmers could help farmers improve their marketing strategies. Farmers should be exposed to other marketing strategies like digital marketing where they can use platforms like social media to market their produce and reach out to consumers that are far away. Distance between the farm and the market has shown a significant impact on the market channel choice amidst COVID-19 pandemic; as a result, the government should make sure that emerging ILV marketplaces are reachable and easy to access. This will motivate numerous farmers to join the ILV supply chain, improving their revenue and, consequently, their ability to support themselves. In rural areas, the government should improve marketing effectiveness by developing new marketing channels by implementing vegetable packaging techniques to reduce vegetable waste. Policymakers must be involved in the promotion of ILVs so that they can be included into government policies and programs. Indigenous vegetable production should be taken into account by policymakers when developing new and updated food security and nutrition plans. In order to integrate ILVs into the educational curriculum, policymakers can also influence how curriculum is developed in universities and schools.

To promote ILVs, coordinated programs between the government, commercial sector, and NGOs are required. Researchers should conduct more research into the nutritive value of indigenous vegetables for long-term community livelihood and development; As most farmers were elderly, the study revealed a little percentage of youth participation. As a result, increasing awareness of ILVs and youth participation in agricultural efforts would help to revitalize the local economy while also boosting agricultural sustainability.

5.3 Limitations of study

The pandemic introduced a new risk of possible contraction of COVID-19 during participation in a study which made it difficult for farmers to allow contact with the interviewer. COVID-19 has also delayed the progress of the completing the study on time.

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QUESTIONNAIRE

THE AIM OF THIS QUESTIONNAIRE IS TO GATHER INFORMATION TO ANALYSE MARKET STRATEGIES OF INDIGENOUS LEAFY VEGETABLES (ILVs) ADMIST COVID-19 PANDEMIC AMONG FARMERS IN GAUTENG PROVINCE.

Note to respondents: The information that will be captured in this questionnaire is strictly confidential and will be used for research purpose at the Northwest University, Mafikeng campus.

Name of the Interviewer: _____

Area: _____

All sections should be filled preferably by farmers (use Ticks in the table to answer where necessary).

SECTION A

1.1 What are socio-economic characteristics of farmers in the local area?

1. Age					
2. Gender	Male		Female		
3. Highest level of education	No education	Primary school	Secondary School	Tertiary institution	
4. Population group	Black	Coloured	Indian	White	
5. Disable	Yes			No	
6. Health Status	Poor	Good		Very Good	
7. Farm size					
8. Distance from farm to the market (km)?					
9. How long have you been farming?					
10. Technology of my new product is promising	Strongly agree	Agree	Strongly disagree	Disagree	
11. Farm Income per annum in (R)					
12. Farm expenditure monthly in (R)					
13. Do you receive any financial assistance of the government	Yes	No	If yes how much?		

14. Have you received any loan	Yes	No	If yes how much?	
15. Do you communicate with extension officers?	Yes		No	
16. Are you involved in non-farm activity	Employed	Business	Unemployed	Other(specify)
17. Do you have access to markets?	None	Formal markets	Informal markets	Other(specify)
18. Land tenure system	Communal	Rent/Lease	Private owned	Other(specify)

1.2 Human capital endowments

Farmer knowledge	Poor	Average	Good
------------------	------	---------	------

1.3 Market Information

	Yes	No
Do you have access to market information during COVID-19 pandemic?		
Do you have access to market information prior to sales during COVID-19?		
Do you participate on high value markets?		

1.4 Indigenous Leafy Vegetables

1. Name of the Indigenous Leafy Vegetable		
2. How many workers do you employ to take care of the crops?		
3. How many liters of water do you use per day?		
4. How much do you spend on irrigation/water?		
5. Do you use fertilizers?	Yes	No

SECTION B

1.5 What specific training you need at your farm during different levels of lockdown?

	Reason why do you think is important
Marketing	
Budgeting	
Record keeping	
Other(specify)	

1.6 Constraints to marketing Indigenous Leafy Vegetables faced by farmers before and during COVID-19. (Tick the appropriate box)

	Before COVID-19 outbreak	Amidst COVID-19
Unfavorable weather conditions		
Low rainfall		
Drought		
Very high temperature		
Very low temperature		
Flood		
Finance		
Credit cost		
Lack of support by the Government		
Inflation		
Changes in interest rate		
High input cost		
Land rent		
Government policies		
Changed government programs		
Unfavorable government policies		

Changes in environmental regulations		
Further land redistribution/restitution land reform		
Possible loss of tenure rights		
Bureaucracy		
Uncertainty of property rights		
Others(specify)		
Marketing		
Lack of access to high value market		
Lack of finance		
Lack of access to market information		
Poor market structure		
Small size production		
Not finding your market segment		
Lack of storage		
Lack of transport		
High transport cost		
Deregulation of domestic product market		
Consumer preference		
Death of farm operator		
Problem of family relations		
Lack of equipped technology		
Others(specify)		
Crime		

Problems associated with crime		
Corruption		
Lack of commercial department		
COVID-19 lockdown restrictions		
Other(specify)		

1.7 Indicate the type of infrastructure you have access to amidst COVID-19.

Infrastructure	Condition		
	poor	Average	Good
Value adding machinery			
Telephone			
Electricity			
Computer			
Water			
Other (Such as:)			

SECTION C

1.8 What method of communication are you using during COVID-19.

☐ Facebook ☐ Emails ☐ Fax ☐ Cell phones ☐ Chats

How do you advertise your products (Tick the appropriate box)

	Before COVID-19 outbreak	Amidst COVID-19
Radio		
Television		
News paper		
Leaflets		
Word of mouth		

No advertisement		
Others(specify)		

1.9 Where do you sell most of your produce amidst COVID-19?

Place	Tick as appropriate	Reason
Farm gate		
Around the village		
Roadside		
Nearest town		
Other countries(export)		

1.10 What specific marketing strategies used during different levels of lockdown.

	Level 5	Level 4	Level 3	Level 2	Level 1
Direct to consumers					
Through middlemen					
Sell at reduced price					
Raise the price of your produce					
No sales					
Government emergency credit					
Paid advertising					
Word of mouth marketing					
Undercover marketing					
Internet marketing					
Retargeting					

Inbound marketing					
Market around neighbourhood					
Roadside market					
Others(specify)					

APPENDIX

Case Processing Summary

		N	Marginal Percentage
Level	3	36	34.3%
	4	28	26.7%
	5	41	39.0%
Price	Reduced prices	27	25.7%
	No, sales	26	24.8%
	Normal price	52	49.5%
Direct Marketing	road-side-stands	20	19.0%
	On-farm-stands	67	63.8%
	Middlemen	18	17.1%
Valid		105	100.0%
Missing		0	
Total		105	
Subpopulation		43 ^a	

- a. The dependent variable has only one value observed in 31 (72.1%) subpopulations.

Model Fitting Information

Model Fitting Criteria			Likelihood Ratio Tests		
AIC	BIC	-2 Log Likelihood	Chi-Square	df	Sig.
179.891	185.199	175.891			
133.032	170.188	105.032	70.859	12	.000

Goodness of fit

	Chi-Square	Df	Sig.
Pearson	106.665	72	.005
Deviance	80.751	72	.225

Pseudo Square

Cox and Snell	.491
Nagelkerke	.554
McFadden	.311

Likelihood Ratio Tests

Effect	Model Fitting Criteria			Likelihood Ratio Tests		
	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	133.032	170.188	105.032 ^a	.000	0	.
AGE	137.274	169.121	113.274	8.242	2	.016
Income	142.193	174.040	118.193	13.160	2	.001
Price	142.963	169.503	122.963	17.931	4	.001
Direct Marketing	159.819	186.359	139.819	34.787	4	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Effect	Model Fitting Criteria			Likelihood Ratio Tests		
	AIC of Reduced Model	BIC of Reduced Model	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	133.032	170.188	105.032 ^a	.000	0	.
AGE	137.274	169.121	113.274	8.242	2	.016
Income	142.193	174.040	118.193	13.160	2	.001
Price	142.963	169.503	122.963	17.931	4	.001
Direct Marketing	159.819	186.359	139.819	34.787	4	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

Parameter Estimates							95% Confidence Interval for Exp(B)	
level ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	Lower Bound	Upper Bound
3	Intercept	-14.105	6.946	4.124	1	.042		
	AGE	3.217	1.409	5.211	1	.022	24.962	1.576 395.339
	Income	-.514	.173	8.849	1	.003	.598	.426 .839
	[price=1]	4.666	1.711	7.438	1	.006	106.241	3.716 3037.217
	[price=2]	11.123	3.923	8.040	1	.005	67735.186	31.012 147945442.686
	[price=3]	0 ^b	.	.	0	.	.	.
	[Direct Marketing=1]	-.219	.870	.063	1	.801	.803	.146 4.422
	[Direct Marketing=2]	-2.601	.851	9.345	1	.002	.074	.014 .393
	[Direct Marketing=3]	0 ^b	.	.	0	.	.	.
4	Intercept	-16.832	6.902	5.947	1	.015		
	AGE	3.217	1.380	5.434	1	.020	24.951	1.669 373.022
	Income	-.288	.123	5.519	1	.019	.750	.589 .953
	[price=1]	5.474	1.694	10.435	1	.001	238.350	8.607 6600.400
	[price=2]	9.807	3.758	6.812	1	.009	18162.754	11.501 28682662.885
	[price=3]	0 ^b	.	.	0	.	.	.
	[Direct Marketing=1]	-1.056	1.447	.533	1	.465	.348	.020 5.930
	[Direct Marketing=2]	.869	1.008	.745	1	.388	2.386	.331 17.190
	[Direct Marketing=3]	0 ^b	.	.	0	.	.	.

a. The reference category is: 5.

b. This parameter is set to zero because it is redundant.

Classification				
Observed	Predicted			Percent Correct
	Level 3	Level 4	Level 5	
Level 3	25	3	8	69.4%
Level 4	4	11	13	39.3%
Level 5	8	4	29	70.7%
Overall Percentage	35.2%	17.1%	47.6%	61.9%

