PERCEPTIONS, DETERMINANTS AND CONSUMPTION PATTERNS OF
INDIGENOUS FRUITS AND VEGETABLES IN RURAL AREAS: EVIDENCE
FROM MUTALE LOCAL MUNICIPALITY, LIMPOPO PROVINCE, SOUTH
AFRICA.

A Dissertation Submitted in Fulfillment of the Requirements for the Degree
Masters of Science in Agriculture (Agricultural Economics)

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DECLARATION

I, Rudzani Nengovhela, declare that this research dissertation is the result of my work. It has not been submitted anywhere else or at any other university for degree purposes or examinations. All the quoted or used sources have been indicated and acknowledged. I also hereby declare that I am fully aware of the institution’s policy on plagiarism and I have taken every precaution to comply with the regulations.

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Signature

....................../....................../2018

Date
DEDICATION

To my family, thank you for all the love, support and encouragement you have shown me.

I love you all.
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I would like to thank God of Mount Zion for always being there for me. He has been with me throughout everything. Thank you Dr. Amon Taruvinga for being the best supervisor, for believing in me, for inspiring me and for all your comments and encouragement. In addition, I would like to extend my profound thank you to my Co-supervisor Prof. Abyssinia Mushunje and all the lecturers in my academic department for sharing their opinions and knowledge during presentations. Thank you Mom and Dad for supporting me and having faith in me. I would also like to thank all my siblings for helping me with data collection and for encouraging me to study. To all my friends, thank you very much guys for your support, for always being there for me when I needed you. I would also like to express my gratitude to all the respondents in my study for their time, attention and co-operation.
ABSTRACT

Rural households across South Africa experience food and nutrition insecurity. Given the fact that indigenous fruits and vegetables (IF&Vs) have numerous health benefits including their wide availability and accessibility in rural areas, these indigenous varieties can significantly contribute to food and nutrition security in rural household. However, the consumption of IF&Vs in recent years has generally remained low and has been declining. The present study investigated the perceptions of IF&Vs, consumption patterns and determinants of IF&V consumption among 200 rural households (n = 200) from 10 villages within the Mutale Local Municipality of Limpopo Province, South Africa. The results revealed that, respondents held overwhelmingly positive perceptions of IF&Vs. The majority of the respondents believed that IF&Vs were healthier, less expensive and more visually attractive than exotic varieties. Consumption of the selected IF&Vs was generally high among the sample size. There were more households that consumed each of the selected IF&Vs than those that did not consume. Most of the selected IF&Vs were consumed only in summer and consumed on a weekly basis rather than daily or monthly basis. Age, marital status, occupation, education level and household size, as well as, perceptions of indigenous fruits’ longevity promotion, health beneficiation and relative visual attractiveness were found to be significant determinants of indigenous fruit consumption. On the other hand, the education level, in addition to perceptions of indigenous vegetables’ comparative healthiness, longevity promotion, health beneficiation and preparative ease were significant determinants of respondents’ indigenous vegetable consumption.

Keywords: Indigenous fruits and vegetables; rural households; food security.
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ABBREVIATIONS

DAFF  Department of Agriculture, Forestry and Fisheries

DSD  Department of Social Development

IF&V  Indigenous Fruits and Vegetables

IF  Indigenous Fruits

IV  Indigenous Vegetables

FAO  Food and Agricultural Organization

OLR  Ordinal or Ordered Logit Regression

OLM  Ordinal Logit Model

IDP  Integrated Development Plan

NGOs  Non-governmental organizations
CHAPTER ONE: INTRODUCTION

INTRODUCTION

Most of the rural areas in South Africa are reported to be characterized by widespread poverty and food and nutrition insecurity at household level (Taleni et al., 2012). This is despite the presence of national food and nutrition security that exists at the national level due to commercial farmers’ high production, which sees the country being self-sufficient in terms of food production (Department of Agriculture, Forestry and Fisheries/Department of Social Development, 2013). Altman et al., (2009) noted that rural households in South Africa tend to spend more money on food. Abugre (2011) suggested that, instead of relying on more expensive food-market purchases, rural households can produce their own food for livelihood and not only for subsistence purposes but, also to produce surplus to sell in the market. Thus, consumption of indigenous food crops by the rural households can play a role in reducing the reliance on more expensive food market and increase food and nutrition security.

Indigenous food crops, according to (DAFF, 2013: 13), refer to “food crops that have their origin in South Africa such as amaranthus, black jack, pigweed, sour plum, wild plum, marula and many more that were introduced in the country and are now recognized as naturalized or traditional crops.” These crops are divided into the categories of grains, fruits and vegetables. Thus, indigenous food crops include indigenous fruits and vegetables (DAFF, 2013). Many rural communities for many generations have heavily relied on some of these traditional plants for their sustenance and to serve their nutritional requirements (Nesamvuni, 2000). Shava (2000) argues that traditional foods which include indigenous vegetables and fruit are mostly associated with health benefits.

Furthermore, these indigenous vegetables and fruit have been noted to hold an important place in well balanced diets and yet, the consumption of these types of foods has not been widely publicized (Nesamvuni, 2000).

This lack of publicity about indigenous fruit and vegetable consumption has resulted in food-insecure households failing to benefit from the nutrition that these foods offer. The nutritional benefits of indigenous fruits and vegetables may positively contribute to the eradication of rural poverty as well as food and nutrition insecurity, hunger and malnutrition.
1.2 BACKGROUND INFORMATION

This research examined the perceptions, determinants and consumption patterns of indigenous fruits and vegetables in rural areas of Mutale Local Municipality, which is located in Limpopo Province, South Africa. This section focuses on the status of indigenous fruits and vegetables (IF&V) in South Africa, public perceptions of IF&Vs and consumption patterns of IF&Vs.

1.1.2 STATUS OF IF&Vs IN SOUTH AFRICA

In Southern Africa, agricultural education in both commercial and communal areas still aims at cash crop production at the expense of indigenous crops (Department of Agriculture Forestry and Fisheries (DAFF), 2013). The same attitude towards indigenous vegetables and fruit still prevails among researchers and extension workers and they still advise farmers to remove them from their fields (Vorster et al., 2007; Shackleton, 2003).

The utilisation of indigenous vegetables is also unsustainable in that, those who are meant to benefit have no control over the availability of these vegetables as they do not cultivate these vegetables. A study conducted by Faber et al., (2010) found that many households perceive IF&Vs to be freely available because they grow naturally in certain areas thus, availability of indigenous plants is unpredictable and variable. Flyman & Afolayan (2006) suggest that reliance on exotic vegetables is the primary reason for the decline in utilization of indigenous vegetable (IVs) in Southern Africa. Lack of knowledge about nutritional composition, cooking methods as well as, ways of preservation have also been highlighted as reasons for low use of indigenous vegetables (Flyman & Afolayan, 2006). The next section presents public perceptions of IF&Vs.

1.1.3 PUBLIC PERCEPTIONS OF IF&Vs

Public perceptions of IF&Vs reported in extant literature indicates that the public has limited knowledge about their benefits (Taleni et al., 2012; Faber et al., 2010; Matenge et al., 2012) as well as, the extent of their consumption. Hence, the perceptions of these fruits and vegetables is largely negative (Smit, 2009). Contradictorily, Taruvinga & Nengovhela (2015) argue that communities share positive perceptions pertaining consumption of indigenous
vegetables and the shared perceptions may mean a valuable source of food for these communities.

In addition, positive perceptions with reference to nutritional value, health benefits and taste palatability are shared by rural communities (Taruvinga & Nengovhela, 2015). Previously, Faber et al. (2010); Husselman & Sizane (2006) argued that positive perceptions with reference to health benefits had helped communities to maintain a balanced diet. Furthermore, popularity of positive perceptions on health benefits indicate that IF&Vs are capable of boosting the human immune system, prolonging life span and acting as a digestive cleansing agent (Faber et. al., 2010; Husselman & Sizane, 2006). The following section focuses on literature with regard to the consumption patterns of IF&Vs.

1.1.4 CONSUMPTION PATTERNS OF IF&Vs

Taruvinga & Nengovhela (2015) argue that indigenous vegetables are a popular source of food in rural areas and they are consumed frequently especially, during winter and early summer periods to compliment declining food reserves. Communities who consume indigenous vegetables on daily or weekly basis obtain these vegetables by cultivating and gathering them. Meanwhile, the communities that consume these vegetables on monthly basis rely on natural harvesting from the forests during winter before the inception of natural rains and in their fields after harvesting the main crop (Mbhenyane et al., 2013).

1.3 PROBLEM STATEMENT

Literature argues that IF&Vs have multiple nutritional benefits (Obel-Lawson, 2006). Taleni et al., (2012) reported that they are capable of significantly contributing to rural household food and nutrition security (World Health Organisation, 2015). However, literature reveals that, despite the availability and claimed benefits, IF&Vs’ consumption is currently very low and is declining (Mwangi & Kimathi, 2006; Jansen van Rensburg et al., 2007; Cloete & Idsardi, 2013). Ruel et al., (2004) found the above indicated concern to be a global problem. It is against this background that this study sought to seek the perceptions of the rural consumers of IF&Vs (Du Toit et al., 2011). The study attempted to reveal why these consumers harbor various IF&Vs despite generally being among the most food-insecure populations.
An understanding of rural consumers’ consumption patterns of IF&Vs normally depicts the relative importance of such food groups (Agricultural Transformation by Innovation, 2014). In addition, consumption patterns may be used to understand availability of IF&Vs across seasons and locations which are worth to understand to inspire strategic consumption based on seasons and location (Ruel et al., 2004). It is paramount to understand IF&Vs’ consumption patterns across locations and seasons for purposes of estimating strategic consumption in line with seasonal differences and location-specific availability. Moreover, it is important to understand the consumption frequency for purposes of estimating importance given to IF&Vs by rural consumers.

The current scenario (low consumption rate) may suggest consumption barriers inhibiting rural communities from consuming IF&Vs. Given the multiple nutritional benefits of IF&Vs especially to rural communities who are prone to food security threats (Du Toit et al., 2011), there is a great need to understand barriers faced by rural communities to ensure high consumption of IF&Vs. To complement consumption of IF&Vs there is also a greater need to explore opportunities for consumption that may be enhanced through policy, research and investment. Thus far, several gaps exist in literature on rural consumers’ perceptions, consumption patterns and determinants of IF&Vs consumption. Furthermore, there are critical factors that need to be taken into consideration such as location and season specific which are worth understanding for purposes of estimating the relative importance given to IF&Vs by rural consumers as well as possible barriers and opportunities they face to promote consumption. With the emerging interest of linking biodiversity to food and nutrition security (Food and Agricultural Organisation (FAO), 2011), more and new knowledge is required on how consumers perceive IF&Vs, their consumption patterns and the determinants of consumptions before claiming their link to food nutrition security. This study therefore focused on three pertinent issues: consumers’ perceptions, consumption patterns, and determinants of IF&Vs consumption.

1.4 OPERATIONAL RESEARCH OBJECTIVES

Operational objective of the study are:

- To assess rural consumers’ in Mutale Local Municipality of their perceptions of indigenous fruit and vegetable consumption.
• To assess rural consumers’ in Mutale Local Municipality of their consumption patterns of indigenous fruits and vegetables.

• To investigate determinants of indigenous fruit and vegetable consumption in rural areas of Mutale Local Municipality.

1.5 OPERATIONAL RESEARCH QUESTIONS

• What are the perceptions of rural consumers in Mutale Local Municipality on the consumption of indigenous fruits and vegetables?

• What are rural the consumption patterns of rural consumers in Mutale Local Municipality on indigenous fruits and vegetables?

• What are the determinants of indigenous fruit and vegetable consumption in rural areas of rural consumers in Mutale Local Municipality?

1.6 HYPOTHESIS

Hypothesis 1: Rural consumers have positive perceptions towards indigenous fruit and vegetable consumption.

Hypothesis 2: Rural consumers frequently consume indigenous fruits and vegetables.

Hypothesis 3: Socio-economic, cultural and perception related factors are some of the factors that influence consumption of indigenous fruits and vegetables in rural areas.

1.7 THESIS STATEMENT

The thesis statement of the study is “Rural consumers’ perceptions of IF&Vs, as well as demographic factors and seasonality influence their consumption patterns.”

1.8 JUSTIFICATION OF STUDY

The low and declining consumption of IF&Vs, and lack of knowledge thereof, despite their multiple nutritional and other benefits necessitated the current study. There is a need to identify the demographic and attitudinal factors contributing to the low and declining demand of the indigenous vegetables and fruits varieties. Despite a considerable existing body of literature on indigenous vegetables, there is a little literature to date on indigenous vegetables and fruits, let alone past individual studies investigating both. The study is of paramount importance and might contribute on the extant literature through the study outcomes.
1.9 THESIS DELINEATION AND ASSUMPTIONS

The study investigated consumers’ perceptions towards IF&Vs and how these affect the consumption thereof.

It is assumed that:

(a) Rural consumers know what IF&Vs are;
(b) Can differentiate between IF&Vs from exotic vegetables and fruits;
(c) Have perceptions towards IF&Vs which is either positive or negative;
(d) Have easy access to IF&Vs; and
(e) Have free access to nearby naturally growing IF&Vs.

1.10 A STATEMENT OF THE LIMITS OF THE PROJECT

This study focused only on rural households residing in rural areas that consume IF&Vs, specifically from Mutale Local Municipality in Limpopo Province.

1.11 ORGANISATION OF STUDY

Chapter 1 presents the background information of the research study.

Chapter 2 reviews relevant literature on consumers’ perceptions, consumers’ consumption patterns of IF&Vs and also factors that influence consumption of IF&Vs.

Chapter 3 gives the map of the study area, methodology (i.e., research design, data collection instrumentation and analytical techniques used in conducting the study), and lastly the conceptual framework of the study.

Chapter 4 discusses the results of the study based on descriptive statistics and also the findings with regard to statistical model.

Chapter 5 sums up the study by providing research summary, conclusions, and policy recommendations.
CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

In order to acquire greater insight into the research problem prior to the field study, it is necessary to conduct a review of the literature. The literature review also allows the researcher to become aware of what is known about the problem and what the current knowledge gaps are (Lubbe et al., 2007). The review of related literature also serves the purpose of being a basis for comparison with the current study’s results so as to identify the similarities and differences. This chapter discussed related literature based on the following concepts: (a) rural consumers’ perceptions of indigenous fruit and vegetable consumption (b) rural consumers’ consumption patterns of indigenous fruits and vegetables and (c) determinants of indigenous fruit and vegetable consumption in rural areas.

2.2 CONSUMER PERCEPTIONS OF IF&Vs

This section focused on literature related to consumer perceptions of IF&Vs.

2.2.1 HEALTH-RELATED PERCEPTIONS

The perceived high nutritional benefits of African leafy vegetables (ALVs) (Faber et al., 2010; Matenge et al., 2012; Taruvinga & Nengovhela, 2015) contribute to consumers’ positive perceptions (Faber et al., 2010; Matenge et al., 2012). The health benefits of African leafy vegetables relate to positive perceptions regarding these vegetables such as, boosting the immune system, giving energy and strength, strengthening bones, preventing illnesses, providing vitamins and promoting longevity (Matenge et al., 2012). With regard to the health benefits of consuming indigenous fruits, there is limited literature that relates to the health benefits of indigenous fruits. The available literature is mostly focusing on the benefits of consuming ALVs rather than indigenous fruits.

2.2.2 SENSORY-BASED PERCEPTIONS

Positive perceptions have been observed among consumers of IF&Vs in relation to their general appearance, colour, texture, smell and taste (Matenge et al., 2012). However, a decline of IF&Vs was reported among younger consumers who were found to prefer the taste of fatty foods associated with the Western fast food (Vorster, 2007). Many pre-teen children also do not like the taste of IF&Vs as they alleged them to have an unpleasant taste (Van Rensburg et al., 2007). Obel-Lawson (2006) noted that factors affecting public perceptions
towards IF&Vs were associated with the appearance, flavour and texture of IF&Vs. These sense-based factors were the most important determinants of consumer acceptance and eventual decisions about whether or not to purchase IF&Vs. The physical appearance of IF&Vs, as with exotic fruits and vegetables was also identified as one factor that affects consumers’ perceptions of its freshness (Abugre, 2011). Van der Hoeven et al. (2013) in their study found out that, adults enjoy the taste of certain indigenous vegetables, with children accepting the colour, smell and taste of the ALVs. This implied that the study were more likely to have positive perceptions towards IF&Vs.

2.2.3 SOCIAL PERCEPTIONS

ALVs have been seen as food for the poor (Cloete & Idsardi, 2013; Mwangi & Kimathi, 2006; Matenge et al., 2012), for example, among Kwa-Zulu Natal households (Faber et al., 2010). Given that rural areas generally have the most food-insecure populations, indigenous fruits and vegetables are also considered as “old-fashioned food” (Cloete & Idsardi, 2013). This means that there continues to be a negative perception associated IF&Vs despite the fact that these vegetable can act as substitute for food in most rural households. Generally, the youth in rural areas as compared to youth in urban areas hold more positive perceptions towards IF&Vs (Taleni et al., 2012). This is because the youth in the rural setting engage and consume IF&Vs areas as compared to their counterparts. (Taleni et al., 2012). Meanwhile, the IF&Vs have been perceived as being weeds due to their erratic nature of growth (Faber & Wenhold, 2007). In addition, IF&Vs have also been considered as low-status food because they are considered to be cheaper than exotic vegetables (Taruvinga & Nengovhela, 2015; Vorster et al., 2007). This, may be the reason why there exists a negative perception towards IF&Vs.

2.3 INDIGENOUS FRUITS & VEGETABLES CONSUMPTION PATTERNS

This section focuses on literature related to consumption patterns of IF&Vs for purposes of understanding the existing consumption patterns.

2.3.1 INDIGENOUS FRUITS & VEGETABLES CONSUMPTION PATTERNS

Obel-Lawson (2006) noted low IF&V consumption levels, similar comparable findings were later noted by Taruvinga & Nengovhela (2015). The consumption levels tend to be especially low among youth and urban consumers (Mbhenyane et al., 2005). In South Africa, consumption levels have not only been low recently but, they have also been declining along
with production levels (DAFF, 2013). Even though there is a low national consumption, some South African communities have been found to substantially incorporate IF&Vs into their dietary consumption patterns (Flyman & Afolayan, 2006; Jansen van Rensberg et al., 2007). A study by Macintye et al. (2001) found that, low rural consumption of IF&Vs was attributed to climate change, low rainfall, poor soil, adult male migration to the ‘greener pastures’ of urban environments. Low urban consumption was due to growth and spatial limitations. The current study delved further into consumption patterns among rural residents to only confirm the occurrence of factors limiting consumption as identified by Macintye et al. (2001) as mentioned in the following section but, also to identify any additional determinants of low consumption of IF&Vs.

2.4 DETERMINANTS OF IF&V CONSUMPTION

This section focuses on literature related to determinants of IF&V consumption.

2.4.1 CLIMATE CHANGE

The occurrence of climate change results in the development of unseasonal weather patterns resulting in drought and flood conditions (Beletse, 2014). South Africa, being a water scarce country with much of its land lying in arid and semi-arid regions, is more prone to drought conditions (Backeberg, 2013). Therefore, a number of indigenous fruits and vegetables in the country are naturally drought and heat tolerant including cowpea, nightshade and tsamma melon (Backeberg, 2013). The IF&Vs are suitable for local conditions as compared to flood conditions that lead to soil erosion and may hinder growth of IF&Vs. The changing and variable climate may mean high consumption of IF&Vs since these indigenous food plants tolerate most conditions.

Climate change that leads to drought causes a reduction in rainfall. While drought-tolerant IF&Vs can survive in such circumstances, the majority of IF&Vs wilts (Muthoni et al., 2009). Fewer varieties and lower quantities of naturally growing and cultivated IF&Vs become available in drought-affected areas. This means that, in areas traditionally experiencing low rainfall, farmers should cultivate drought-resistant IF&Vs (Muthoni et al., 2009).

2.4.2 POOR SOIL QUALITY

Indigenous fruit and vegetables growth is influenced by the quality of soil in which the fruits and vegetables grow in terms of the nutrients found therein. Soil fertility can be enhanced
through the use of fertilizer. Chemical components found in fertilizer such as nitrogen, calcium and magnesium foster IF&Vs growth (Beletse, 2014). While many IF&Vs growing in naturally poor soil will require fertilizer, Beletse, (2014) noted that some IF&Vs such as amaranthus grow well even in low-nutrient soils. Furthermore, exotic crops fail to grow in poor soil conditions; this may mean high consumption for IF&Vs since they adapt well in poor soil conditions.

2.4.3 KNOWLEDGE

A significant determinant of IF&Vs consumption is consumers’ awareness. This includes consumer knowledge of the different IF&Vs varieties available together with their nutritional benefits and medicinal uses, among other considerations. Consumers’ knowledge influences consumer perceptions about IF&Vs. For instance, a majority of negative perceptions regarding IF&Vs are not based on knowledge, but on consumers’ subjective perceptions and feelings. As consumers’ learn more about the IF&Vs’ benefits due to the transfer of knowledge through mass media, between generations and other social interactions, perceptions of these indigenous foods improve, which will in turn increase consumption levels (Ekesa et al., 2009).

2.4.4 EDUCATION

Individual consumers’ level of education may lead to their increased or reduced IF&V consumption (Shackleton, 2003). This is attributed to the links among formal education, occupation and social class. Consumers with higher education levels tend to hold higher-paying job positions; as such, higher salaries are associated with higher social class. Individuals in the higher social class tend to adopt the Western lifestyle. This lifestyle includes consuming the exotic vegetables that dominate supermarkets, rather than the indigenous varieties. However, many of the more formally educated consumers are health-conscious, actively seeking knowledge about healthy food. In exploring the value of different vegetables, they are more likely to consider indigenous varieties (Chiekhyoussef & Embashu, 2013).

2.4.5 SOCIO-ECONOMIC CLASS

As mentioned above, education level determines job and salary level, which, in turn, influences socio-economic class. For instance, individuals belonging to higher classes, like to differentiate themselves from the majority in the lower societal levels. Therefore, they tend to
reject IF&Vs choosing Western and other exotic food alternatives which are perceived to be of higher quality. However, a minority of upper-class individuals, for example, those more conscious about their health will consume IF&Vs if they perceive them to be more nutritious.

2.4.6 AREA OF RESIDENCE

Indigenous fruits and vegetables are more available and accessible in rural areas than they are in urban environments. Consumption levels thus, tend to be greater among rural residents compared to urbanites. However, in South Africa, trends of decreased overall IF&Vs consumption and increased exotic fruit and vegetable consumption among rural residents have been observed (DAFF, 2013). This implies the fact that, residential location is becoming a less influential determinant of IF&Vs consumption patterns.

2.4.7 AVAILABILITY OF IF&Vs IN SOUTH AFRICA

A wide array of IF&Vs exists in South Africa. IF&Vs are widely available (DAFF, 2013). Most of these indigenous crops grow naturally and are cultivated in diverse parts of the country, particularly in the Limpopo, Kwa-Zulu Natal and Eastern Cape Provinces; and they are cultivated under different climatic conditions. IF&Vs normally grow predominantly in the rural areas. Their cultivation is largely on a small-scale basis and mainly for smallholder farmers’ subsistence. Instead, most of the arable farm land is reserved for the cultivation of exotic crops such as maize, wheat and sugar cane (Department of Agriculture, Forestry and Fisheries, 2013). Thus, IF&Vs, despite their nutritional and economic benefits, are yet to be commercially produced and sold. Surplus IF&Vs produces are sold in limited informal markets (Mwangi & Kimathi, 2006). However, recently, there has been growing interest by the government, non-governmental organizations (NGOs) and research institutions, in enabling consumers to take full advantage of the benefits of IF&Vs and extending their availability to a wider market. In essence, the IF&Vs show major potential as a market for agricultural growth in the future (Department of Agriculture, Forestry and Fisheries, 2013).

Indigenous fruit and vegetables availability, by comparison with that of exotic crops is greater as indigenous vegetables grow naturally in several rural areas around the country whereas, the exotic variety requires cultivation (Faber et al., 2010). In the commercial fruits and vegetable markets, indigenous vegetables have remained largely unavailable (Mwangi & Kimathi, 2006). This is due to a number of reasons, amongst them are: the greater popularity of exotic fruits and vegetables, lack of consumer knowledge regarding the benefits of IF&Vs,
and the consequential low demand for indigenous varieties. This is an indication that, the availability of IF&Vs production in the formal market must begin with the existence of consumer demand, which can then trigger supply. Aphane et al., (2002) argue that the supply of information can facilitate the creation of demand, since information improves the marketability and thus, the market value of IF&Vs. Abugre (2011) noted that commercial farmers typically cultivate tried-and-tested fruits and vegetables that will easily reach retail markets and can be purchased by consumers. Therefore, poor IF&Vs availability contributes to low consumption levels (Obel-Lawson, 2006). This infers that, those who produce and consume IF&Vs should implement methods that are effective and will extend their availability beyond seasonal periods (Vorster, 2007). Meanwhile, IF&V availability becomes more important when exotic vegetables go out of season, with the former used to temporarily replace the exotic vegetables (Abugre, 2011). Thus far, IF&Vs serve a similar purpose during drought periods (Baipethi & Jacobs, 2009).

2.4.8 AGE

According to Jansen Van Rensburg et al., (2007), in most areas IF&Vs are associated with poverty and socio-economic status and that has resulted in most people, especially the youth, not using these indigenous food plants because they do not want to be described as “old fashioned”. That is, age has a negative effect on the consumption and knowledge towards IF&Vs.

2.4.9 HOUSEHOLD SIZE

There is limited literature concerning household size and its influence towards IF&V consumption. Usually, household size would be expected to determine the labour available for production, collection or gathering of IF&Vs (Ruel et al., 2004). Household size is therefore likely to positively influence consumption of IF&Vs.

2.4.10 GENDER

In smallholder farming, women do most of the weeding and they often distinguish between undesirable weed species, which are hoed or pulled out, and species that belong to the local collective of indigenous vegetable species, which are harvested or left undisturbed for subsequent use (Hart and Vorster, 2006). Simply put, gender has an influence in the use of IF&Vs, for instance, (Van Averbeke and Juma, 2006) indicated that once a particular plant species becomes domesticated and is grown as a crop, men readily become involved,
especially when its production is commercialised or is to be commercialised. Indigenous fruits and vegetables also tend to be regarded as a female food, but gender distinctions in terms of their consumption are much less universal than in terms of their collection (Whitbread, 1986; Hart and Vorster, 2006).

2.4.11 ACCESS TO EXTENSION

Vorster et al. (2007) argue that the labeling of IF&Vs as food for the poor, and backward knowledge by researchers and extension officers, has led to a shift in food use and willingness of the people to learn about the use of these fruit and vegetables. Extension services may therefore, have an effect on the consumption and knowledge regarding IF&Vs. Indigenous fruits and vegetables are still largely treated as weeds by many research and extension personnel who criticize farmers for not keeping this weed population under control. Thus labeling these important food plant species as unworthy of the space it occupies (Mavengahama, 2013). This implies that extension officers have influence over household consumption towards IF&Vs indigenous food (Vorster, 2007).

2.5 CHAPTER SUMMARY

This chapter focused on discussing related literature based on the following concepts; (a) rural consumers’ perceptions of IF&Vs consumption, (b) rural consumers’ consumption patterns of IF&Vs, and (c) determinants of IF&Vs consumption in rural areas. Previous studies indicated that, a wide array of indigenous fruits and vegetables exist in South Africa. Most of these indigenous crops grow naturally and are cultivated in diverse parts of the country and under different climatic conditions, mostly in the rural areas. Their cultivation is largely on a small-scale basis and mainly for smallholder farmers’ subsistence.

Rural consumers of IF&Vs have generally positive perceptions towards indigenous fruits and vegetables. Researchers have noted that factors affecting public perceptions towards IF&Vs were associated with the appearance, flavour and texture of IF&Vs and that these sense-based factors were the most important determinants of consumer acceptance and eventual decisions about whether or not to purchase IF&Vs. Negative perceptions towards IF&Vs have also been noted. Some indigenous fruits and vegetables have been seen as food for the poor and were sometimes considered as “old-fashioned food”. The review of related literature further revealed that, the consumption levels tend to be especially low among youth and urban consumers. Furthermore, emerging from the literature was that low rural consumption of
IF&Vs was attributed to climate change, low rainfall, poor soil, adult male migration to the ‘greener pastures’ of urban environments. Low urban consumption was due to growth and spatial limitations. The current study delved further into consumption patterns among rural residents to not only confirm the occurrence of the current factors limiting consumption but also discover any additional determinants of low consumption.

A significant determinant of IF&Vs consumption is consumers’ perception. This includes consumer knowledge of the different IF&V varieties available, their nutritional benefits and medicinal uses, among other considerations. As consumers’ learn more about the IF&Vs’ benefits with the transfer of knowledge through mass media, between generations and other social interactions perceptions of these indigenous foods improve, which will increase consumption levels. Individual consumers’ level of education may also lead to their increased or reduced IF&V consumption. Education level determines job and salary level, which, in turn, influences socio-economic class. For instance, those of higher classes, to differentiate themselves from the majority in the lower societal levels, tend to reject IF&Vs for Western and other exotic food alternatives perceived to be of higher quality. The current study also sought to investigate the determinants of IF&Vs consumptions among rural residents to discover and to further consolidate any additional determinants of consumption.

Despite their nutritional and economic benefits, IF&Vs are yet to be commercially produced and sold in South Africa. However, with the growing interest of the government, non-governmental organizations and research institutions, among others, are helping in enabling consumers to take full advantage of these benefits of these indigenous vegetables and extending their availability to a wider market. On the other hand, though, IF&Vs show major potential as a market for agricultural growth in the future, however, previous research has shown that in the commercial fruits and vegetable markets, indigenous vegetables have remained largely unavailable. This is due to a number of reasons, among them: the greater popularity of exotic fruits and vegetables, lack of consumer knowledge regarding the benefits of IF&Vs and the consequential low demand for indigenous varieties. The availability of IF&Vs production in the formal market must begin with the existence of consumer demand, which can then trigger supply. The supply of information can facilitate the creation of demand, since information improves the marketability and thus, the market value of IF&Vs.
CHAPTER THREE: METHODOLOGY

3.1 INTRODUCTION

In this chapter, description of the study area, conceptual framework, research method and design are presented. This chapter also reveals the data collection instruments that were used in the study.

3.2 DESCRIPTION OF THE STUDY AREA

Mutale Local Municipality is situated under Vhembe district Municipality. It is composed of four local municipalities, namely Makhado, Mutale, Musina and Thulamela. Mutale Local Municipality is situated in the Limpopo Province of South Africa (Mutale Local Municipality, 2015). Spanning a geographical area of 2 367.19 km², Mutale Local Municipality lies within the geographical co-ordinates of 22° 35’ S 30° 40’ E. The municipality is bordered by Kruger National Park to the east, the greater Limpopo River to the north east, Musina Local municipality, Zimbabwe to the north, Mozambique to the east, Makhado Local Municipality to the west and Thulamela Local Municipality to the south (Mutale Local Municipality, 2015). Figure 3.1 below shows the entirety of Mutale Local Municipality, including the villages in which the study was conducted.

Figure 3.1: Mutale Municipality (Mutale Local Municipality, 2015)
3.2.1 MUTALE LOCAL MUNICIPALITY

Mutale Local Municipality is part of Vhavenda population, home to the Venda people. It is one of the few parts of South Africa where tribal authorities still hold control, and most of the region’s rural inhabitants maintain a traditional lifestyle, which includes consumption of indigenous crops and fruits for various purposes (Mutale Local Municipality Integrated Development Plan, 2013).

3.2.1.1 ESTIMATED POPULATION OF MUTALE

According to Mutale Local Municipality Integrated Development Plan (2013), Mutale Local Municipality is estimated to have a total population of 131215, with 24239 households and an average of 5 people per household.

3.2.1.2 MAIN ECONOMIC ACTIVITIES PURSUED BY LOCAL RESIDENTS

Agriculture, mining and tourism are the main sources of rural economic development in Mutale Local Municipality (Mutale Local Municipality, 2015). Households under Mutale Local municipality tend to sell some of the indigenous fruits and vegetables. However, some of the IF&Vs such as baobab trees, flora and fauna are maintained for tourism purposes (Mutale Local Municipality, 2015).

3.3 AGRO-ECOLOGICAL SUMMARY

This section presents a brief summary of the average rainfall, temperature, vegetation and soils of Mutale Local Municipality.

3.3.1 RAINFALL

Mutale Local Municipality receives annual rainfall of approximately 500mm per annum, of which 87, 1% falls between October and March (Mutale Local Municipality, 2015). The amount of rainfall received in this area indicates that the production of IF&Vs may be increased because they require less water than exotic crops (Cunningham et al., 1992). Therefore, rainfall amounts within this area may support survival of indigenous fruits and vegetables as compared to exotic crops that require high rainfall. Indigenous crops generally require less inputs such as water, while being rich in micronutrients, such as iron and vitamin (Water Research Commission, 2013). Figure 3.2 below shows average rainfall summary of Mutale Municipality.
3.3.2 TEMPERATURES

Mutale Local Municipality experiences lower temperatures in winter and higher temperatures in summer. With these temperatures, IF&Vs may grow well since they are well known to withstand harsh climatic conditions where most exotic crops fail to grow (Mayekiso, 2015). Figure 3.3 below shows average temperatures of Mutale Local Municipality.

3.3.3 SOILS

There is a dearth of information which is documented about the types of soil in Mutale Local Municipality, but according to the research done by Nethononda and Odhiambó in (2011), Mutale Local Municipality seem to have all different kinds of soils, even though all these types of soils tend to have advantages and disadvantages. For instance, it was reported that clay soils are difficult to plough and they tend to have large clods during ploughing as compared to other soils. However, sandy soils was said to be the best soil in terms of
production. Given the soil condition of this area, it was argued that IF&Vs are drought resistant and they can thrive in poor soil conditions (Water Research Commission, 2013).

3.3.4 VEGETATION

Mutale Local municipality has a biological diversity of flora and fauna which can be attributed to its bio-geographical location and diverse topography (Mutale Local Municipality, 2015). It consists of three biomes namely: savannah, grassland and forest, four bioregions and twenty three different vegetation types or biotopes (Department of Environmental Affairs, 2016). Mutale Local Municipality falls under the Vhembe District Municipality. However this district falls under the savanna biome, which is commonly known as the Bushveld (Mutale Local Municipality, 2015). There are varieties of wetlands in this district, among others include the Sambandou Wetlands and Makuleke.

Mutale Local Municipality also consists of the following vegetation; Mountain Fynbos, Sacred Forests as well as centuries old Baobab Trees. Baobab tree is the largest indigenous tree in South Africa, found in the Mutale Local Municipality (DAFF, 2012). Indigenous trees, fruits and vegetables found in Mutale Local Municipality are shown in the below table.

Table 3.1: Mutale’s indigenous trees, fruits and vegetables (including their Tshivenda names).

<table>
<thead>
<tr>
<th>Trees (tree species or names)</th>
<th>Fruits (common names)</th>
<th>Vegetables (scientific and common names)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baobab</td>
<td>Adansonia digitata</td>
<td>Abelmoschus esculentus(L.) Mbuyu Delele</td>
</tr>
<tr>
<td></td>
<td>Mafula</td>
<td></td>
</tr>
<tr>
<td>Marula</td>
<td>Sclerocarya birrea</td>
<td>Amaranthus dubius C.Mart. Mafula ex Thell. Vowa</td>
</tr>
<tr>
<td>Matumi</td>
<td>Sour plum</td>
<td>Vigna unguiculata (L.) Walp Munawa</td>
</tr>
<tr>
<td>Eucalyptus saligna</td>
<td>Wild plum</td>
<td>Solanum retroflexum Dunal Muxe</td>
</tr>
<tr>
<td>Sequoia sempervirens</td>
<td>Bacgenua discolor</td>
<td>Ipomoea batatas (L.) Lam Niye Murambo</td>
</tr>
</tbody>
</table>
3.4 AGRICULTURE, INFRASTRUCTURE AND OTHER ECONOMIC ACTIVITIES

The majority of the area is used for subsistence agriculture and most of the people in this area use their land and its resources for survival (Mutale Local Municipality, 2015). Much of the agricultural activity in these areas is dominated by subsistence farming. In addition to the use of the area for agriculture, the land is also used for conservation and tourism. Therefore, there are other economic activities based in this area such as lodges, parks and camping sites, which include restaurant facilities (Mutale Local Municipality, 2015). Thus, the existing tourists facilities available coupled with the consumption of IF&Vs from this area may attract more tourists by making these food sources available to restaurants and markets.

In terms of infrastructure, roads in Mutale Local Municipality are very poor and this reduces the transportability of IF&Vs from suppliers inside and outside the municipality to marketplaces. The evidently high demand of IF&Vs (their popularity) in the municipality remains unsatisfied.

3.5 CONCEPTUAL FRAMEWORK, RESEARCH METHOD, DESIGN AND INSTRUMENTS

This section presents the conceptual framework, research method, design and instruments used in this study.

3.5.1 CONCEPTUAL FRAMEWORK

Figure 3.4 below is the conceptual framework for this study. The outermost circle represents all the IF&Vs that can be found in a particular community. IF&Vs availability is influenced
by geo-ecological factors that include, *inter alia*, soil, rainfall and temperature. This suggests the inter-regional heterogeneity of IF&Vs availability.

Out of the entirety of IF&Vs available in the community, a household may only be aware of a subset thereof, possibly just a few as indicated by the circle immediately inside the outermost circle. Such awareness comes from exposure to those IF&Vs through media advertising and those which an individual familiar with.

The further inner circle indicates that households will typically consider from the subset of the IF&Vs they are aware of only for possible consumption. The considerations are made with the households’ knowledge and optimistic bias on perceived health benefits associated with the IF&Vs, personal ideology, social interactions, sensory appeal and time constraints, that is, time required to collect and prepare IF&Vs.

Finally, the innermost circle is the evoked set, which means that, the subset of IF&Vs that households actually consume. This suggests that the availability of numerous IF&Vs in a community does not necessarily translate to local households having access to them. For example, in an area with 100 types of IF&Vs; the evoked set available to households may be only five because of the aforementioned factors. The actual consumption is driven by households’ utility maximisation ambitions which are closely conditioned by socio-economic, institutional and technical factors that can be estimated using econometric modelling.
Figure 3.4: Conceptual framework

Source: Authors’ on computation from various sources

The upward direction of the arrow on the right-hand side indicates a gradual shift from the generality of the total set of IF&Vs in community $x$ to the specificity of the evoked set of IF&Vs consumed by consumer $i$. The breaks in the upward arrow divide it into three sections, which are different in magnitude. In this respect, the sections of the upward arrow are ordered from smallest to largest (following the direction of the arrow). The sectional magnitudes represent the proportions of IF&Vs within community $x$ consumed by consumer $i$ in the four sets of IF&Vs. Thus, the smallest section of the arrow indicates that consumer $i$ will consume a small percentage of the total set of IF&Vs available from community $x$. Indeed, it is possible that, this percentage may be too miniscule to be diagrammatically represented on the arrow if there is an especially high number of IF&Vs available in community $x$ and the number of IF&Vs consumed by consumer $i$ is particularly low. If the percentage of the total set of IF&Vs available from community $x$ that is consumed by consumer $i$ is too minute to be shown in the diagram below, then the smallest section of the upward arrow represents the set immediately inside the total set of IF&Vs in community $x$, namely that of IF&Vs which consumer $i$ from community $x$ is aware of. The relative magnitude of the middle section of the upper arrow indicates that consumer $i$ will consume higher percentages of IF&Vs in the
middle two sets than in the outermost set. These two percentages will also be lower than the 100% of IF&Vs consumed by consumer $i$ in the innermost evoked set. However, if the percentage of total-set IF&Vs consumed by that consumer is too small to be reflected in the upper arrow, the middle section of the arrow will represent the second innermost set, namely that of IF&Vs taken into consideration by consumer $i$. The 100% of IF&Vs consumed by consumer $i$ in the innermost evoked set is represented by the elongated top section of the upward arrow.

The downward arrow on the left-hand side of the diagram is similar to the upward arrow in its three sections ordered from smallest to largest. While, the upward arrow sections represent percentages of sets of IF&Vs consumed by consumer $i$, the downward arrow sections represents corresponding proportions of various influences on the consumer’s overall IF&Vs consumption. These influences include perceptions that, consumer $i$ has regarding IFVs (e.g., health-related, sensory-based and social perceptions) and determinants of consumer $i$’s IF&V consumption (e.g., knowledge and education). The top section of the downward arrow, being the smallest, represents the relatively marginal influence of geo-ecological factors on consumer $i$’s consumption of IF&Vs from within the consumer’s community $x$. Though geo-ecological factors ensure the availability of IF&Vs in community $x$, these factors at best, exert modest influence on IF&V consumption. The middle section of the downward arrow represents the middle two sets of influences on consumer $i$’s IF&V consumption. The relative size of this section suggests that, the middle sets of influences affect IF&V consumption markedly more than geo-ecological factors do. The middle section of the downward arrow appears to be approximately double the magnitude of the upper section, illustrating the extent of the difference. Exposure to IF&V-related media and advertising and personal familiarity with particular IF&Vs are thus, expected to significantly influence consumer $i$’s consumption of these indigenous varieties. Thus, to a certain extent, health, personal ideology, social interactions, sensory appeal and time constraints will impact on the IF&V consumption of consumer $i$. However, these middle sets of influences will typically make far less impact on the average consumer’s IF&V consumption than utility maximisation concerns. The bottom section of the downward arrow represents the proportion of the influence of consumer $i$’s utility maximisation motives on the consumer’s overall IF&V consumption. The size of the bottom section, by far the largest of the three downward arrow sections, indicates that, utility maximisation motives exert the greatest influence on consumer $i$’s IF&V consumption.
The study therefore estimated factors that influence rural households’ consumption patterns of IF&Vs based on the evoked set as summarised in the econometric model detailed in the next section.

### 3.6 RESEARCH METHOD

A mixed-methods research approach was adopted for this study. Thus, the study used both the quantitative and qualitative methods of research. This approach was used for a number of reasons; for instance, combining the quantitative and qualitative approaches enabled the researcher to compare the two sets of data. However, quantitative data is more objective than qualitative data. According to Taylor (2005:91), “the major purpose of quantitative research is to make valid and objective descriptions on phenomena.” Qualitative research, on the other hand, involves the researcher collecting verbal data (i.e., data in the form of words) that provides insight into the opinions and feelings about research respondents’ experiences.

### 3.7 RESEARCH DESIGN

Cross sectional survey is the type of research study, where either the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer research questions of interest (Oslen & George, 2004). This study used a cross-sectional field survey design whereby data was gathered from a sample of 200 households.

### 3.8 SAMPLING FRAME

The target population of this study was rural households residing in Mutale Local Municipality where indigenous fruits and vegetables are available.

#### 3.8.1 SAMPLING PROCEDURE

Several villages from Mutale Local Municipality in Limpopo Province were purposively selected based on the availability of IF&Vs. A multi-stage purposive and random sampling approach was used as follows:

First stage: Mutale Local Municipality was purposively selected based on

Second stage, top 10 villages with abundance and consumption of IF&Vs were also purposively selected (Sejabaledi, 2016).

Second stage, top 10 villages with abundance of IF&Vs were randomly selected (Sejabaledi, 2016).
Third stage, 20 households were randomly selected from each of the 10 purposively selected villages with abundance of IF&Vs.

3.8.2 SAMPLE SIZE

A sample size of 200 households was randomly selected for the study. The sample size was calculated using the Rao soft Sample Size Calculator as summarised in equation 1:

The sample size \( n \) and margin of error \( E \) are given by

\[
x = Z^2 \left( \frac{r(100-r)}{4} \right) \]

\[
n = \frac{N \times x}{(N-1)E + x}
\]

\[
E = \sqrt{\frac{(N-n)x}{n(N-1)}}
\]

Where \( r \) is the fraction of the responses and \( Z(c/100) \) is the critical value of the confidence level \( c \). However, input values of the margin of error (7%), confidence level (95%), response distribution (50%) and population size (\( N = 23,751 \)) produced an initial sample size of 195 (\( n = 195 \)), which was then rounded off to 200 (Raosoft, 2011).

3.9 DATA COLLECTION PROCEDURES

3.9.1 RESEARCH INSTRUMENTS

Semi structured interviews comprising of open-ended questions (qualitative) as well as closed-ended (quantitative) questions was used to collect data from rural household in Mutale Local Municipality. The researcher asked respondents who consumed IF&Vs open-ended questions to allow respondents to answer in their own words.

3.10 ENUMERATOR SELECTION AND TRAINING

Five enumerators were selected according to their experience in agriculture, field work and data collection. The team was chosen from Limpopo Province, where the study was taking place. All the enumerators were fluent in Tshivenda, which was the local language spoken. Training was attended for a week, in order to familiarize every enumerator with different sections of the questionnaire.

3.11 DATA ANALYSIS

This section presents data analysis according to each objective and the analytical tools used.
3.11.1 DESCRIPTIVE ANALYSIS

Descriptive analysis was used to analyse the first and second objective. The first objective was to assess rural consumers’ perception of IF&Vs consumption whilst, the second was to assess rural consumers’ consumption patterns of IF&Vs. Descriptive analysis looked at frequencies, percentages and averages of the socio economic and institutional variables. Tables and graphs were also used to describe consumers’ perceptions and consumption patterns of IF&Vs.

3.11.2 ORDINAL OR ORDERED LOGIT MODEL

Ordinal logit model (OLM) was used in analysing the third objective, which was to investigate the determinants of IF&Vs consumption. IF&Vs are consumed differently by respective households during their peak periods of availability in summer. Such consumption occurs at varying frequencies (i.e., daily, weekly and monthly). Using the ordinal logit model, the study estimated the association between consumption pattern and households’ socio-economic, institutional and technical attributes. The OLM is applicable when the outcome variable is grouped in an ordinal scale (Opiyo et al., 2014). Such is the case with the ordered IF&Vs consumption pattern categories (i.e., daily, weekly and monthly). Greene (2003) presented the reduced form of the OLR as summarised in equation 2 below. Two separate equations were used for (a) indigenous fruits (IFs) and (b) indigenous vegetables (IVs) although in equation 2 this was combined:

\[ Y^*_j = X^*_j \beta + U_{ij} \]

Where,

\[ Y = \text{IF&Vs consumption frequency ordered as follows:} \]

\[ Y = 1 \text{ (high consumption level – daily consumers);} \]
\[ Y = 2 \text{ (neutral consumption level – weekly consumers);} \] and
\[ Y = 3 \text{ (low consumption level – monthly consumers);} \]

\[ Y^* = \text{given state of IF&Vs consumption;} \]
\[ X_{ij} = \text{explanatory variables;} \] and
\[ U_{ij} = \text{disturbance term.} \]
Y* is unobserved, but what will be observed is:

\[ Y = 1 \text{ if } Y^* \leq \mu_2; \]
\[ Y = 2 \text{ if } \mu_2 < Y^* \leq \mu_3; \text{ and} \]
\[ Y = 3 \text{ if } \mu_3 < Y^*, \]

Where \( \mu_k \) = unknown parameter to be estimated with \( \beta \).

Based on the cumulative normal function \( \Phi (\beta' x) \), the probabilities can be expressed as follows:

\[ \text{Prob } [y = 1: \text{daily consumers}] = \Phi (- \beta' x); \]
\[ \text{Prob } [y = 2: \text{weekly consumers}] = \Phi (\mu_2 - \beta' x) - \Phi (\mu_3 - \beta' x); \text{ and} \]
\[ \text{Prob } [y = 3: \text{monthly consumers}] = 1 - \Phi (\mu_3 - \beta' x). \]

Where \( \Phi = \) (the phi co-efficient which is) a measure of the degree of association between two binary variables.

**3.12 DESCRIPTION OF VARIABLES SPECIFIED IN THE ORDINAL LOGIT MODEL**

This section focuses on a description of the variables specified in the ordinal logit model. Using conclusions inferred from other studies, the \textit{a priori} influence of various households’ characteristics was estimated.

Table 3.2: Variables specified in the ordinal logit model and their expected signs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable description</th>
<th>Anticipated sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male=0, female=1</td>
<td>+</td>
</tr>
<tr>
<td>Age</td>
<td>Exact number of years</td>
<td>+</td>
</tr>
<tr>
<td>Marital Status</td>
<td>0=single; 1=married; 2=widowed; 3=divorced</td>
<td>-</td>
</tr>
<tr>
<td>Occupation</td>
<td>0=permanent; 1=temporary; 2=pension; 3=social grant; 4=remittances</td>
<td>-</td>
</tr>
<tr>
<td>Level of income</td>
<td>0=&lt;1000; 1=1000-1999; 2=2000-2999; 3=3000-3999; 4=4000-4999; 5=&gt;5000</td>
<td>-</td>
</tr>
<tr>
<td>Level of education</td>
<td>0=primary; 1=secondary; 2=tertiary; 3=never went to school</td>
<td>+</td>
</tr>
<tr>
<td>Household size</td>
<td>Number of family members</td>
<td>+</td>
</tr>
<tr>
<td>IF&amp;Vs are healthier than exotic</td>
<td>No=0, Yes=1</td>
<td>+</td>
</tr>
<tr>
<td>IF&amp;Vs make people live</td>
<td>No=0, Yes=1</td>
<td>+</td>
</tr>
</tbody>
</table>
### 3.12.1 SOCIO-ECONOMIC FACTORS

The following section presents socio-economic factors that affect consumption of IF&Vs.

**(a) Household size**

Household size was measured by the number of family members in the household. Household size was expected to determine the labour force available for collection/gathering of IF&Vs. Thus far, a positive association was expected. Literature argues that availability of labour force is a critical factor towards consumption of IF&Vs (Ruel et al., 2004).

**(b) Gender**

There are gender-based differences with respect to the consumption, knowledge and gathering of IF&Vs. Ndenga et al., (2013:555) noted that “women consumed more indigenous vegetables than men, based on cultural knowledge, taboos and lifestyles”. Keller et al., (2005) noted that in historic times, women collected most of the wild indigenous vegetables. However, gender was defined as follows: 0=males, 1=females. With regard to the literature or background information, therefore, a positive relationship is expected from this variable.

**(c) Age**

Age is a determining factor in the consumption of IF&Vs. It was measured by the exact number of years of the participant. According to Vorster (2007), the youth of today perceive...
IF&Vs negatively, considering them as weeds or food consumed by the poor. Similar observations were also noted by several authors (Faber et al., 2010; Jansen Van Rensberg et al., 2007; Mwangi & Kimathi, 2006). Whereas, Mwangi and Kimathi (2006) found that most young consumers lack information about IF&Vs while, those exposed to them held negative views towards IF&Vs. They felt that they were unfashionable compared to Western fast foods. Hence, a positive correlation was expected.

(d) Level of education

Level of education was measured in terms of whether the participant in IF&Vs consumption is educated or uneducated. The variable was coded as follows: 0= primary school; 1= high school; 2=tertiary school; 3= never went to school. Mayekiso (2015) noted that respondents in ILVs with low levels of education were generally those who consumed IF&Vs whereas respondents with higher levels of education (i.e., who attended secondary school and tertiary institutions) largely consumed little to no IF&Vs. The level of education was measured in terms of whether the participant was educated or uneducated. A positive correlation between level of education and consumption of IF&Vs was expected. The assumed positive relationship is based on the available literature about the level of education.

(e) Level of income

The level of income was measured by the amount of income each participant received per month. Education levels generally determine individual income levels. Individuals, with higher education tend to earn higher incomes which enable them to afford the variety of vegetables sold in the market rather than, to grow their own indigenous. To this end, a negative correlation was expected for this variable.

3.12.2 PERCEPTION RELATED FACTORS

(a) IF&Vs treated as food for the poor

African leafy vegetables have been seen as food for the poor (Cloete & Idsardi, 2013; Mwangi & Kimathi, 2006; Matenge et al., 2012), for example, among Kwa-Zulu Natal households (Faber et al., 2010). Therefore, this result to a negative perception towards IF&V. Indigenous fruits and vegetables are also considered as “old-fashioned food” (Cloete & Idsardi, 2013). This means that a negative perception was developed from the above background. Rural young people, contrary to youth in general, hold more positive perceptions towards IF&Vs (Taleni et al., 2012). This is because youth is the most age group
that engage and consume IF&Vs in rural areas (Taleni et al., 2012). The IF&Vs have been perceived as being weeds due to their erratic nature of growth (Faber & Wenhold, 2007). To this end, a negative perception was expected.

(b) Perceptions related to health benefits

African leafy vegetables are said to have beneficial properties such as; boosting the immune system, giving energy and strength, strengthening bones, preventing illnesses, providing vitamins and also promoting longevity (Matenge et al., 2012). Mayekiso (2015) stated that ILVs are associated with the management of numerous diseases including HIV/AIDS, diabetes and high blood pressure. The perceived high nutritional benefits of ALVs (Faber et al., 2010; Matenge et al., 2012; Taruvinga & Nengovhela, 2015), contribute to consumers’ generally positive perceptions (Faber et al., 2010; Matenge et al., 2012) with all this supporting literature, a positive relationship was expected.

(c) Perceptions related to the nutritional benefits of IF&Vs

IF&Vs are perceived by multitudes of consumers to be more nutritious than exotic varieties sold in formal markets, as well as being easier to prepare (Obel-Lawson, 2006), tastier (Vorster, 2007), more filling (Faber et al., 2010), immune-boosting, digestively cleansing (Obel-Lawson, 2006) and cheaper (Abugre, 2011; Taruvinga & Nengovhela, 2015) than exotic fruits and vegetables. Obel-Lawson’s (2006) study also provided a myriad of positive views about ALVs. Irungu et al. (2011) mentioned that indigenous vegetables play a role in livelihoods by providing an improved diet in terms of nutritional value and diversity for poorer household. Moreover, ALVs contain significant levels of micronutrients that are essential for human health (Nangula et al., 2010). This makes ALVs an important source of vitamins A and C and iron among other micronutrients (Odhav et al., 2007). A study conducted on the nutrient content of eight ALVs, by Jansen van Rensburg et al., (2007), concluded that ALVs are nutritionally diverse. They are better nutritional sources than modern or exotic vegetables (Odhav et al., 2007). ALVs therefore, play a major role towards alleviating malnutrition as they contribute significantly to the amount of calories and other essential nutrients in a balanced diet (Odhav et al., 2007). With this information, a positive influence on consumption of IFVs was expected from this variable.
Table 3.3: Summary of research objectives and analytical tools

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>HYPOTHESIS</th>
<th>DATA REQUIRED</th>
<th>ANALYSIS METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>To assess rural consumers' perceptions of indigenous fruit and vegetable consumption.</td>
<td>Rural consumers have positive perceptions towards indigenous fruit and vegetable consumption.</td>
<td>General perceptions shared by households.</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>To assess rural consumers’ consumption patterns of indigenous fruits and vegetables.</td>
<td>Rural consumers frequently consume indigenous fruits and vegetables.</td>
<td>Households’ consumption frequency of IF&amp;Vs.</td>
<td>Descriptive statistics</td>
</tr>
<tr>
<td>To investigate determinants of indigenous fruit and vegetable consumption in rural areas.</td>
<td>Gender, education, extension are some of the factors that influence consumption of IFVs in rural areas.</td>
<td>Socio-economic and institutional data of households.</td>
<td>Ordered/ordinal logit (OLR) model</td>
</tr>
</tbody>
</table>

3.13 CONCLUSION

With the agro ecological summary of the area discussed above, Limpopo Province has extremely high temperatures and humidity in summer. Hence, summer conditions are conducive to the optimal growth of indigenous fruits and vegetables. Whilst in winter it experiences cold temperatures with low rainfall due to climate change which lead to drought. Literature supported that IF&Vs are drought tolerant, they can survive in such circumstances. Descriptive statistics was used to analyse both the first and the second objective while Ordinal Logit Model was used to analyse the third objective.
CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 INTRODUCTION

This chapter presents the main findings of the study. The chapter also presents the socio-economic and institutional variables of the respondents. Descriptive statistics were used to address the first two study objectives and ordered/ordinal logit model was used to address the third objective.

Table 4.1 Basic statistics of all the respondents

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>FREQUENCIES</th>
<th>PERCENTAGES %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>123</td>
</tr>
<tr>
<td>Marital status</td>
<td>Single</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Widowed</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>12</td>
</tr>
<tr>
<td>Occupation</td>
<td>Permanent job</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Temporary job</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Pension</td>
<td>70</td>
</tr>
<tr>
<td>Level of income</td>
<td>Less than R1000</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>R1000-R1999</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>R2000-R2999</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>R3000-R3999</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>R4000-R4999</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Over R5000</td>
<td>57</td>
</tr>
<tr>
<td>Educational qualification</td>
<td>Never went to school</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Primary school</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>High school</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Tertiary school</td>
<td>82</td>
</tr>
<tr>
<td>Access to extension services</td>
<td>No</td>
<td>200</td>
</tr>
<tr>
<td>Markets for IF&amp;Vs</td>
<td>No</td>
<td>200</td>
</tr>
<tr>
<td>Access to media or adverts related to IF&amp;Vs</td>
<td>No</td>
<td>200</td>
</tr>
<tr>
<td>Awareness of IF&amp;Vs</td>
<td>Yes</td>
<td>200</td>
</tr>
<tr>
<td>MINIMUM</td>
<td>MAXIMUM</td>
<td>AVERAGE</td>
</tr>
<tr>
<td>Age</td>
<td>26</td>
<td>76</td>
</tr>
<tr>
<td>Household size</td>
<td>1</td>
<td>19</td>
</tr>
</tbody>
</table>
Table 4.1 above consists of the socio-economic and institutional variables of the study sample. A total of 200 respondents were considered. Female respondents (61.5%) were more as compared to their male counterparts (38.5%). Most of the respondents were married (47%). He results of the study also show that some respondents depended more on social grants (25.5%) and those with temporary jobs were (25.5%). The largest income group were of respondents whose income ranged from R1000 to R1999 per month. Table 4.1 revealed that, a significantly large number of respondents (41%) possessed tertiary education. However, none of the respondents had access to extension services, markets, media and adverts related to IF&Vs. All of the respondents were aware of IF&Vs in their areas.

Household sizes ranged between a minimum of one and a maximum of 19 family members, with an average household size of six members. The youngest and oldest respondents were 26 and 76 years old respectively, with the sample’s average age being 51 years.

The next section presents consumers’ perceptions of IF&Vs from the study area.

### 4.3 CONSUMERS’ PERCEPTIONS OF INDIGENOUS FRUITS AND VEGETABLES

This section presents results on consumers’ perception of IF&Vs. Table 4.2 presents results of the observed consumers’ perceptions towards indigenous fruits.

### 4.3.1 CONSUMERS’ PERCEPTIONS OF INDIGENOUS FRUITS

Table 4.2 presents a summary of rural consumers’ perceptions of indigenous fruits.

#### Table 4.2: Consumers’ perceptions of indigenous fruits.

<table>
<thead>
<tr>
<th>Perceptions of indigenous fruits</th>
<th>Yes %</th>
<th>No %</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IFs are healthier than exotic fruits</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs make people live longer</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs give people energy and strength</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs have health benefits and they prevent diseases</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs tastes good (delicious)</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs are cheaper than exotic fruits</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs are food for poor people</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Appearance influences consumption of Ifs</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs have a pleasant smell</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IFs are easy to collect</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Texture influence consumption</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
The results revealed that, respondents believed the majority of the perceptions held about indigenous fruits. However, they did not believe the perception that indigenous fruits were food meant for the poor. These results therefore, suggest that majority of the respondents had largely positive perceptions towards indigenous fruits. This may be explained by the fact that indigenous fruits are more widely available and accessible in rural areas than they are in urban environments, thereby enabling rural consumers to consume indigenous fruits more frequently. Several previous studies support these findings which highlight that consumers generally perceive indigenous fruits to be healthier than exotic fruits (Obel-Lawson, 2006), promote long life (Faber et al., 2010) and are a good source of energy and strength (Obel Lawson, 2006; Faber et al., 2010). The findings of the study align with past studies, which highlight that the physical appearance of indigenous fruits is a key determinant of their consumption (Obel-Lawson, 2006; Abugre, 2011; Matenge et al., 2012), their enjoyable taste (Vorster, 2007; Matenge et al., 2012) and their lower cost compared to exotic fruits and vegetables (Abugre, 2011).

4.4 CONSUMERS’ PERCEPTIONS OF INDIGENOUS VEGETABLES

Emerging from the results was that the majority of the respondents believed the perceptions leveled against indigenous vegetables. However, they did not believe the perception that indigenous vegetables were food meant for the poor. The results therefore suggest that, a majority of respondents had largely positive perceptions towards indigenous vegetables. This may be explained by indigenous vegetables’ wider availability and accessibility in rural areas compare to urban areas, thereby enabling rural consumers to more frequently consume indigenous vegetables. The greater experience of indigenous vegetables results in respondents enjoying positive direct sensory and health-beneficial experiences. Several previous findings support the current study’s findings highlighting that consumers perceive indigenous vegetables as healthier than exotic vegetables (Obel-Lawson, 2006), promoting longevity (Faber et al., 2010; Matenge et al., 2012) and being good sources of energy and strength (Matenge et al., 2012). Further, previous studies support the findings of the study which highlight that consumer perception of indigenous vegetables’ physical appearance affects perceptions of their freshness and therefore consumption (Abugre, 2011; van der Hoeven, 2013).
Table 4.3: Consumers’ perceptions of indigenous vegetables.

<table>
<thead>
<tr>
<th>Perceptions of indigenous vegetables</th>
<th>yes %</th>
<th>No %</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVs are healthier than exotic vegetables</td>
<td>100</td>
<td>23.5</td>
<td>100</td>
</tr>
<tr>
<td>IVs make people live longer</td>
<td>100</td>
<td>20.5</td>
<td>100</td>
</tr>
<tr>
<td>IVs gives people energy and strength</td>
<td>100</td>
<td>21.0</td>
<td>100</td>
</tr>
<tr>
<td>IVs have health benefits and prevent diseases</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IVs taste good (delicious)</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IVs are cheaper than exotic vegetables</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Appearance influences consumption of IVs</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IVs are food for poor people</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>IVs are easy to prepare</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>IVs are easy to collect</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Do IVs cook faster?</td>
<td>100</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

The current study’s findings are, however, in contradiction with a previous study by Vorster (2007), which revealed that pre-teenage consumers negatively perceived the taste of indigenous vegetables. The observed variation may be explained by the apparent preference of young consumers, particularly in urban areas, for exotic vegetables and processed foods (Mbhenyane et al., 2005). However, the present study also contradicts previous studies that observed consumer perceptions of indigenous vegetables as low-status food for the poor (Cloete & Idsardi, 2013; Mwangi & Kimathi, 2006; Matenge et al., 2012).

The next section presents consumers’ consumption patterns of indigenous fruits

4.4 CONSUMERS’ INDIGENOUS FRUIT CONSUMPTION PATTERNS.

Table 4.4 presents respondents’ consumption patterns of indigenous fruits based on the 10 most popular fruits from the study area.

Table 4.4: Consumers’ consumption patterns of indigenous fruits

<table>
<thead>
<tr>
<th>Indigenous fruits</th>
<th>Consumption status (%)</th>
<th>Time of consumption (%)</th>
<th>Consumption frequency during their peak availability periods (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Summer</td>
</tr>
<tr>
<td>Mbuyu</td>
<td>84.5</td>
<td>15.5</td>
<td>49.70</td>
</tr>
<tr>
<td>Mafula</td>
<td>82</td>
<td>18</td>
<td>100</td>
</tr>
<tr>
<td>Sour plum</td>
<td>71</td>
<td>29</td>
<td>100</td>
</tr>
<tr>
<td>Wild Plum</td>
<td>77</td>
<td>23</td>
<td>99.35</td>
</tr>
<tr>
<td>Niye</td>
<td>88</td>
<td>12</td>
<td>38.54</td>
</tr>
<tr>
<td>Nombelo</td>
<td>87.5</td>
<td>12.5</td>
<td>100</td>
</tr>
</tbody>
</table>
Table 4.4 indicates that a majority of the respondents (77.6%) consumed indigenous fruits. These findings therefore suggest that, indigenous fruits are very popular in rural areas. The extant literature supports these findings suggesting that, indigenous fruits consumption is particularly high in rural areas (Woodend et al., 2008), consumption of indigenous fruits is less common among rural consumers compared to urban consumers (Mbhenyane et al., 2005) and rural communities highly prize indigenous fruits and depend on them for food and nutrition security (Du Preez et al., 2012). However, the large majority of the consumption of the most popular indigenous fruits among respondents was confined to summer (78.75%), with little consumption occurring during winter (17.07%). Results also indicate that just a few indigenous fruits (e.g., mbuyu, niye) can be consumed throughout the year (4.16%). These findings indicate that the food security contribution of indigenous fruits may be seasonal and more pronounced during summer. The results further concur with other studies that observed low overall annual consumption of indigenous fruits (Macintye et al., 2001; Obel-Lawson, 2006; DAFF, 2013; Taruvinga & Nengovhela, 2015). Previous studies also found that indigenous fruits are more commonly consumed in summer (Bille, Shikongo-Nambabi & Cheikhyoussiff, 2013; Cheikhyoussiff & Embashu, 2013). Meanwhile, the consumption frequency of indigenous fruits during their peak availability periods results also reveal that on average indigenous fruits are mostly consumed on weekly and monthly basis (46.58%; 28.3% respectively) and less likely on daily basis (24.88%) with the exception of mafula and nombelo which were consumed more on a daily basis. The respondents from the study area argued that search for indigenous fruits was not a daily activity but, was accessed on a random basis by households heading cattle and looking for firewood in rangelands. Also contrary to conventional thinking, respondents highlighted that the most palatable indigenous fruits are not abundantly available to support the general rural population. This meant that, availability is normally claimed on “first come first serve” basis normally by early cattle headers.

Table 4.5 presents consumers’ consumption patterns of indigenous vegetables based on the 10 most popular vegetables from the study area.
Table 4.5: Consumers’ consumption patterns of indigenous vegetables

<table>
<thead>
<tr>
<th>Indigenous vegetables</th>
<th>Consumption status (%)</th>
<th>Time of consumption (%)</th>
<th>Consumption frequency during their peak availability periods (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Summer</td>
</tr>
<tr>
<td>Delele</td>
<td>74.5</td>
<td>25.5</td>
<td>42.28</td>
</tr>
<tr>
<td>Vowa</td>
<td>76.5</td>
<td>23.5</td>
<td>100</td>
</tr>
<tr>
<td>Munawa</td>
<td>76</td>
<td>24</td>
<td>14.47</td>
</tr>
<tr>
<td>Muxe</td>
<td>79</td>
<td>21</td>
<td>100</td>
</tr>
<tr>
<td>Murudi</td>
<td>81.5</td>
<td>18.5</td>
<td>100</td>
</tr>
<tr>
<td>Mushidzhi</td>
<td>77.5</td>
<td>22.5</td>
<td>100</td>
</tr>
<tr>
<td>Ngu</td>
<td>75</td>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>Tshibavhi</td>
<td>73</td>
<td>27</td>
<td>100</td>
</tr>
<tr>
<td>Muduwi</td>
<td>69</td>
<td>31</td>
<td>100</td>
</tr>
<tr>
<td>Mutshatsha</td>
<td>65.5</td>
<td>34.5</td>
<td>26.72</td>
</tr>
<tr>
<td>Average</td>
<td>74.55</td>
<td>25.25</td>
<td>78.34</td>
</tr>
</tbody>
</table>

Tables 4.5 indicate that the majority of the respondents (74.55%) consumed indigenous vegetables from the study area, though at a slightly lower rate than the consumption rate for indigenous fruits. These findings suggest that indigenous vegetables are popular in rural areas. For instance, there is evidence of studies that support these findings suggesting that indigenous vegetables are mostly grown in rural areas, supporting a significant proportion of households (Ngugi et al., 2007). However, rural inhabitants heavily depend on indigenous vegetables given the lack of market supplies (Misra et al., 2008) and are favoured by several rural populations throughout Africa (Cernansky 2015). On average, the results further reveal that most of these indigenous vegetables are consumed during summer (78.34%) while, a few are consumed during winter (11.63%). The emerging results also indicate that just a few indigenous vegetables (Mutshatsha, Munawa and Delele) can be consumed throughout the year (10.01%). Similarly, to indigenous fruits, the food security contribution of indigenous vegetables may be seasonal and more pronounced during summer. However, there are studies which contradict with these findings and demonstrate that there is low overall consumption of indigenous vegetables due to low production attributed to low rainfall, climate change and poor soils (Macintye et al., 2001; Obel-Lawson., 2006; Taruvinga & Nengovhela., 2015; DAFF, 2013).

Furthermore, the findings of the study with reference to consumption frequency of indigenous vegetables during their peak availability periods, reveal that on average they are
more consumed on weekly and monthly bases (53.37%; 32.20% respectively) and less likely on a daily basis (15.35%). Similar observations were noted by several previous studies highlighting that daily and weekly rural consumers are significantly outnumbered by less frequent consumers (Santosa et al., 2015) and rural consumers do not consume certain indigenous vegetables frequently due to their unavailability (Ndenga et al., 2011).

These findings suggest that, indigenous fruits and vegetables are very popular in rural areas, normally available during summer periods and commonly consumed on weekly and monthly basis. Therefore, caution should be exercised when indigenous fruits and vegetables are recommended as food security supplements for rural households bearing in mind the periods in which they are available during the year and their consumption patterns. The next section presents the determinants of indigenous fruits consumption frequency.

4.5 DETERMINANTS OF INDIGENOUS FRUITS CONSUMPTION FREQUENCY

This section presents the econometric results of the determinants of indigenous fruit consumption as summarized in Table 4.6. The parallel lines test for assessing whether the assumption that the parameters are the same for all categories is reasonable was plausible with a large $p$-value (0.242), which is greater than the 5% significance level (failed to reject the null hypothesis). The proportional odds assumption appears to have held for the general model. With regard to the coefficient of determination, Pseudo R squared was computed, which summarizes the proportion of variance in the dependent variable associated with the predictor (independent) variables. In this model, Nagelkerke $R^2$ of 51.7% was obtained, suggesting that more of the variation was explained by the model. The Goodness of fit which tests whether the observed data are inconsistent with the fitted model revealed that the data and the model predictions are similar as supported by large significant values (Pearson's chi-square statistic = Sig. 1.000; chi-square statistic based on the deviance = Sig. 1.000).

The model used to analyse this last objective was discussed in detail in chapter three under the data analysis section. Consumption was measured on daily (1), weekly (2) and monthly (3) basis. These (consumption frequency: daily 1; weekly 2; monthly 3) were used as the dependent variables in the Ordinal Logit Model. Following an approach by Opiyo et al. (2014), the implication is that higher net value (3) indicates low consumption and vice versa. Thus far, a positive estimate value [ordered log-odds (logit) regression coefficient] indicates that an increase in that variable increases low consumption (thus discourages consumption – monthly consumption), while a negative estimate value [ordered log-odds (logit) regression
coefficient] indicates that an increase in that variable decreases low consumption – thus promoting high consumption (daily consumption).

Table 4.6: Determinants of indigenous fruits consumption

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimate</th>
<th>Std. error</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Gender</td>
<td>-.306</td>
<td>.358</td>
<td>.393</td>
</tr>
<tr>
<td>(2) Age</td>
<td>-.029</td>
<td>.010</td>
<td>.004***</td>
</tr>
<tr>
<td>(3) Marital status</td>
<td>-.465</td>
<td>.213</td>
<td>.029**</td>
</tr>
<tr>
<td>(4) Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent job</td>
<td>1.373</td>
<td>.484</td>
<td>.005***</td>
</tr>
<tr>
<td>Temporary job</td>
<td>1.191</td>
<td>.473</td>
<td>.012**</td>
</tr>
<tr>
<td>Pension fund</td>
<td>.050</td>
<td>.656</td>
<td>.939</td>
</tr>
<tr>
<td>(5) Level of income</td>
<td>.156</td>
<td>.096</td>
<td>.106</td>
</tr>
<tr>
<td>(6) Level of education</td>
<td>.426</td>
<td>.167</td>
<td>.011**</td>
</tr>
<tr>
<td>(7) Household size</td>
<td>-.105</td>
<td>.058</td>
<td>.072*</td>
</tr>
<tr>
<td>(8) IFs(indigenous fruits) are healthier</td>
<td>-.492</td>
<td>.392</td>
<td>.209</td>
</tr>
<tr>
<td>(9) IFs make people live longer</td>
<td>-.858</td>
<td>.425</td>
<td>.044**</td>
</tr>
<tr>
<td>(10) IFs give people and energy strength</td>
<td>-.563</td>
<td>.406</td>
<td>.166</td>
</tr>
<tr>
<td>(11) IFs have health benefits &amp; prevent diseases</td>
<td>-.835</td>
<td>.422</td>
<td>.048**</td>
</tr>
<tr>
<td>(12) IFs taste good</td>
<td>-.234</td>
<td>.444</td>
<td>.599</td>
</tr>
<tr>
<td>(13) IFs are cheaper</td>
<td>-.160</td>
<td>.418</td>
<td>.701</td>
</tr>
<tr>
<td>(14) IFs are food for poor</td>
<td>.012</td>
<td>.349</td>
<td>.972</td>
</tr>
<tr>
<td>(15) Appearance influence consumption</td>
<td>-.454</td>
<td>.418</td>
<td>.278</td>
</tr>
<tr>
<td>(16) IFs have a pleasant smell</td>
<td>-.425</td>
<td>.407</td>
<td>.296</td>
</tr>
<tr>
<td>(17) Texture influences consumption</td>
<td>-.425</td>
<td>.412</td>
<td>.303</td>
</tr>
<tr>
<td>(18) IFs are easy to collect</td>
<td>-.272</td>
<td>.405</td>
<td>.501</td>
</tr>
</tbody>
</table>

Model fitting information

<table>
<thead>
<tr>
<th>Goodness of fit</th>
<th>Pseudo R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>-2 Log Likelihood</td>
</tr>
<tr>
<td>Intercept only</td>
<td>257.749</td>
</tr>
<tr>
<td>final</td>
<td>100.964</td>
</tr>
</tbody>
</table>

Test of parallel lines
From the eighteen predictor variables fitted in the ordinal or ordered logit model, seven variables had a significant impact on influencing consumption of IFs, while eleven variables were not significant. The variables that were found to be significant are discussed below.

(a) Age

The results of the Model confirm a negative association between household head age and indigenous fruits consumption frequency. The results reveal that, for every unit increase in household head age there is a 0.029 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings infer that, as household head age increases, the consumption of indigenous fruits also increases. A number of previous studies argued that the youth of today perceive IF&Vs negatively (Taruvinga and Nengovhela, 2015), considering them as weeds, food consumed by the poor and unfashionable compared to western fast foods (Faber et al., 2010; Voster, 2007; Mwangi & Kimathi, 2006). Therefore, the results of the current study may be explained by the fact that rural household head in Mutale Local Municipality were the ones that were interviewed not the youth.

(b) Marital status

In Table 4.6, results reveal a negative association between marital status and consumption frequency of IFs. For every unit increase in marital status (thus moving from single to married category) there is a 0.465 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. The findings imply that married households increase the probability of high consumption of indigenous fruits. Reason being, there is availability of labour (more hands and more mouths to feed) for indigenous fruits gathering which is labour intensive.
(c) Occupation

The results from the Model further confirm a positive association between occupation and consumption frequency of IFs. These results disclose that, for every unit increase in occupation (either temporal or permanent job) there is a 1.191 (temporal job) and 1.373 (permanent) increase in the log of low consumption frequency of indigenous fruits, holding all the other independent variables constant. These findings indicate that, households with access to more income from permanent or temporary jobs have a higher probability of consuming less indigenous fruits. This may be explained by the fact that access to income from employment opportunities may place households in higher social classes dominated by western food types. Secondly, employed rural households may fail to have time to harvest IFs, given that harvesting of IFs is labour intensive and requires proper timing.

(d) Level of education

The Model also confirms a positive association between level of education and IFs consumption frequency. The results reveal that, for every unit increase in household head education there is a 0.426 increase in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings suggest that as household head level of education increases consumption of indigenous fruits decreases. These findings support popular beliefs that higher education places individuals in higher social classes more often associated with Western lifestyles and food choices at the expense of indigenous foods (Mayekiso, 2015; Taruvinga and Nengovhela, 2015), contrary to suggestions by Chiekhyoussef and Embashu (2013) who noted that education may promote consumption of indigenous foods, rather than Western food, for consumers will be more health-conscious.

(e) Household size

The Model results confirm a negative association between household size and consumption frequency of IFs. The results show that, for every unit increase in household size there is a 0.105 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. These findings indicate that, household size increases the probability of high consumption of indigenous fruits. These findings support previous studies which highlights that availability of labour force is a critical factor towards consumption of IF&Vs (Ruel et al., 2004), given the intensive nature of
indigenous fruits gathering. However, marital status together with household size, both increases the probability of high consumption of indigenous fruits and vegetables.

(f) IFs make people live longer

Regression results reveal a negative significant association between the perceptions that “indigenous fruits make people live longer” and consumption frequency of indigenous fruits. The results indicate that, for every unit increase in the perceptions that indigenous fruits make people live longer there is a 0.858 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. Therefore, the findings of the study reveal that as households believe more in this perception; this may increase the probability of indigenous fruits consumption. These findings support previous studies which highlights that, indigenous fruits and vegetables are said to have beneficial properties such as; boosting the immune system, giving energy and strength, strengthening bones, preventing illnesses, providing vitamins and also promoting longevity (Matenge et al., 2012).

(g) IFs have health benefits and prevent diseases

The results also indicate that a negative significant association between the perceptions that “indigenous fruits have health benefits and prevent diseases” and consumption frequency of indigenous fruits. The results further revealed that, for every unit increase in the perceptions that indigenous fruits make people live longer there is a 0.835 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. The findings of the study suggest that as long households perceive that there are health benefits and disease prevention associated with IFs, they may be encouraged to consume them. Several previous studies endorse the health benefits of indigenous foods (Obel-Lawson, 2006; Abugre, 2011; Taruvinga & Nengovhela, 2015).

The next section focuses on econometric results of the determinants of indigenous vegetable consumption.

4.5.2 FACTORS THAT INFLUENCE CONSUMPTION OF INDIGENOUS VEGETABLES

Table 4.7 summarizes econometric results for factors that influence consumption of indigenous vegetables (IVs). The parallel lines test for assessing whether the assumption that
the parameters are the same for all categories is reasonable was large enough (p-value: 0.122) and greater than the 5% significance level. The proportional odds assumption appears to have held for the general model. With regard to the coefficient of determination, Pseudo R squared was computed, which summarizes the proportion of variance in the dependent variable associated with the predictor (independent) variables. In model study, Nagelkerke R^2 of 58, 8% was obtained, suggesting that more of the variation was explained by the model. The Goodness of fit which tests whether the observed data are inconsistent with the fitted model revealed that the data and the model predictions are similar as supported by large significant values (Pearson's chi-square statistic = Sig. 0.994; chi-square statistic based on the deviance = Sig. 1.000).

Ordinal logit model was used to analyse factors that influence consumption of indigenous vegetables and detailed information about the model was discussed in the methodology chapter. Consumption of indigenous vegetables was measured on daily (1), weekly (2) and monthly (3) basis. These (consumption frequency: daily 1; weekly 2; monthly 3) were considered as the dependent variables in the Ordinal Logit Model. Following an approach by Opiyo et al. (2014), the implication is that higher net value (3) indicates low consumption and vice versa. Thus far, a positive estimate value [ordered log-odds (logit) regression coefficient] indicates that an increase in that variable increases low consumption (thus discourages consumption – monthly consumption), while a negative estimate value [ordered log-odds (logit) regression coefficient] indicates that an increase in that variable decreases low consumption – thus promoting high consumption (daily consumption).

**Table 4.7: Determinants of indigenous vegetable consumption**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimate</th>
<th>Std. error</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Gender</td>
<td>.281</td>
<td>.391</td>
<td>.473</td>
</tr>
<tr>
<td>(2) Age</td>
<td>.004</td>
<td>.010</td>
<td>.663</td>
</tr>
<tr>
<td>(3) Marital status</td>
<td>.298</td>
<td>.214</td>
<td>.164</td>
</tr>
<tr>
<td>(4) Occupation</td>
<td>.142</td>
<td>.130</td>
<td>.274</td>
</tr>
<tr>
<td>(5) Level of income</td>
<td>-.055</td>
<td>.102</td>
<td>.590</td>
</tr>
<tr>
<td>(6) Level of education</td>
<td>-.273</td>
<td>.165</td>
<td>.098*</td>
</tr>
<tr>
<td>(7) Household size</td>
<td>.047</td>
<td>.060</td>
<td>.427</td>
</tr>
<tr>
<td>(8) IVs (indigenous vegetables) are healthier than exotic</td>
<td>-.787</td>
<td>.388</td>
<td>.042**</td>
</tr>
<tr>
<td>(9) IVs make people live longer</td>
<td>-.881</td>
<td>.386</td>
<td>.023**</td>
</tr>
<tr>
<td>(10) IVs give people energy and strength</td>
<td>.037</td>
<td>.459</td>
<td>.935</td>
</tr>
</tbody>
</table>
(11) IVs taste good  .281  .515  .585
(12) IVs are cheaper .425  .502  .397
(13) IVs are food for poor - .389  .396  .325
(14) Appearance influence consumption .218  .322  .498
(15) IVs have a pleasant smell -.413  .379  .276
(16) IVs are easy to prepare .812  .405 .045**
(17) IVs are easy to collect -.288  .432  .505
(18) IVs cook faster -.015  .434  .972

<table>
<thead>
<tr>
<th>Model Fitting Information</th>
<th>Goodness Of Fit</th>
<th>Pseudo R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>-2 Log Likelihood</td>
<td>Chi-Square</td>
</tr>
<tr>
<td>Intercept only</td>
<td>205.966</td>
<td>Pearson</td>
</tr>
<tr>
<td>Final</td>
<td>76.279</td>
<td>Deviance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test of parallel lines</th>
<th>-2 Log Likelihood</th>
<th>Chi-Square</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null Hypothesis</td>
<td>123.943</td>
<td></td>
<td>.122</td>
</tr>
<tr>
<td>General</td>
<td>111.220</td>
<td>12.723</td>
<td></td>
</tr>
</tbody>
</table>

**Note**: ***: significant at 1% level; **significant at 5% level; *significant at 10% level

This section presents the results. However, discussed below are the variables found to influence consumption of indigenous vegetables.

(a) Level of education

The model results confirm a negative association between level of education and IVs consumption frequency. The results reveal that, for every unit increase in household head level of education, there is a 0.273 decrease in the log odds of low consumption frequency of indigenous vegetables by households, holding all other independent variables constant. These findings therefore suggest that as household head level of education increases, consumption of indigenous vegetables also increases. Contrary to indigenous fruits, the more educated household heads are, the more they are likely to consume indigenous vegetables.
possibly to take advantage of the health and nutritional benefits associated with indigenous vegetables. The findings may therefore suggest that the rural households in Mutale Local Municipality have an understanding of the benefits of IVs towards livelihoods when comparing their understanding towards the benefits of IFs. This could also be based on the fact that indigenous vegetables are more available and easy to get in rural areas as compared to exotic fruits.

(b) IVs have healthier benefits and prevent diseases than exotic vegetables

The findings further confirm a negative significant association between the perceptions that; “indigenous vegetables are healthier than exotic vegetables” and consumption frequency of indigenous vegetables. The results reveal that, for every unit increase in the perceptions that indigenous vegetables are healthier than exotic vegetables there is a 0.787 decrease in the log odds of low consumption frequency of indigenous vegetables by households, holding all other independent variables constant. These findings suggests that, as long as people perceive that there are health benefits associated with IVs, they may be encouraged to consume them. These findings support previous studies which highlights that IVs are associated positively with health benefits (Faber *et al*., 2010; Husselman & Sizane, 2006) and has helped communities to maintain balanced diets (Faber *et al*., 2010; Irungu *et al*., 2011).

(c) IVs make people live longer

The results of the Model further reveal a negative significant association between the perceptions that; “indigenous vegetables make people live longer” and consumption frequency of indigenous vegetables. Results indicate that, for every unit increase in the perceptions that: “indigenous vegetables make people live longer” there is a 0.881 decrease in the log odds of low consumption frequency of indigenous fruits by households, holding all other independent variables constant. The findings of the study show that, as households believe more in this perception, this may increase the probability of indigenous vegetable consumption. The findings of the study are in line with previous studies which highlight that indigenous vegetables are said to have beneficial properties such as; boosting the immune system, giving energy and strength, strengthening bones, preventing illnesses, providing vitamins and also promoting longevity (Matenge *et al*., 2012).
(d) IVs are easy to prepare

Lastly from Table 4.7, results confirm a positive significant association between the perceptions that indigenous vegetables are easy to prepare and consumption frequency of indigenous vegetables. These findings disclose that, for every unit increase in the perception that: “indigenous vegetables are easy to prepare” there is a 0.812 increase in the log odds of low consumption frequency of indigenous vegetables by households, holding all the other independent variables constant. These indicate that, as long people believe that IVs are easy to prepare, they may be discouraged in using them as part of their diets. Therefore, this implies that, the observed association between easy to prepare indigenous vegetables and low consumption may be a cultural effect specific to the study area.

4.7 CONCLUSION

Chapter 4 presented the results on perceptions, determinants and consumption patterns of IF&Vs in Mutale Local Municipality. Majority of the residents in the study area largely had positive perceptions towards IF&Vs probably due to their high accessibility allowing greater and more frequent experience with them. The findings of the study seem to suggest that, indigenous fruits and vegetables are very popular in rural areas, indicating their significant contribution to food and nutrition security in rural areas. The consumption of indigenous fruits and vegetables were more confined to summer periods and commonly consumed on weekly and monthly basis. However, caution should be exercised when indigenous fruits and vegetables are recommended as food and nutrition security supplements for rural households bearing in mind the periods of the year they are available and their consumption patterns.
CHAPTER FIVE: RESEARCH SUMMARY, CONCLUSIONS AND POLICY

RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapter presented and discussed the results of the research under study. This chapter, gives a summary and conclusions that are drawn from the findings of the study. Finally, based on the findings and conclusions, recommendations are given to researchers, policy-makers, indigenous fruit and vegetable sellers, NGOs and consumers.

5.2 RESEARCH SUMMARY

The research problem of generally low and declining indigenous fruit and vegetables consumption among highly food-insecure rural consumers motivated this study. Three study objectives were thus identified as follows:

The first specific objective was to assess rural consumers’ perceptions of IF&Vs. Major findings drawn from the analytical chapters were that rural consumers positively perceive indigenous fruits and vegetables.

Secondly, the study focused on rural consumers’ consumption patterns of IF&Vs. Main findings with respect to both indigenous fruits and vegetables were that, most of these fruits and vegetables were eaten only in summer and on a weekly basis rather than daily or monthly basis.

Lastly, the third specific objective was to investigate the determinants of IF&Vs consumption. The major findings were that, consumption of IF&Vs are influenced by perceptions (IF&Vs make people live longer, IF&Vs have health benefits and prevents diseases and that IVs are easy to prepare) and socio-economic (age, marital status, occupation, level of education and household) factors.

5.3 CONCLUSIONS

This research study concluded that consumers in Mutale Local Municipality generally had positive perceptions of indigenous fruits and vegetables. Their wider availability and
accessibility enabled the consumers in the study area to consume the IF&Vs more frequently and experience the multi-faceted benefits hence, their positive perceptions towards the indigenous fruits and vegetables.

The IF&Vs are consumed more in summer when they are readily available than any other season of the year. Despite their availability in summer, the IF&Vs were mostly consumed on a weekly basis rather than on daily basis. From these research findings, it is clear that, extreme caution is required when indigenous fruits and vegetables are recommended as food security supplements for rural households bearing in mind the periods of the year they are available and their consumption patterns.

Furthermore, the demographics and perceptions of IF&Vs discussed in Chapter 4 are some of the factors that influenced consumption of indigenous fruits and vegetables in the study area. Ordinal or ordered logit model (OLM) was used to investigate the determinants of IF&Vs consumption. A total of eighteen predictor variables were fitted in the ordinal or ordered logit model and, seven variables had a significant impact on influencing consumption of IFs, while four variables were significant on IVs consumption. The level of education was the only variable that had significant impact on the consumption of both indigenous fruits and vegetables.

Based on the research findings, several policy recommendations were also made on how to promote consumptions of indigenous fruits and vegetables as summarized in the next section based on the above conclusions.

**5.4 RECOMMENDATIONS**

The study makes the following recommendations to enhance consumption of indigenous fruits and vegetables. These recommendations are targeted to rural development agencies (NGOs, government and private sector), rural fruits and vegetables sellers and rural consumers in general:

1. IF&Vs should be afforded greater prominence in national food and nutrition security policy. Current policy appears to emphasize the production and consumption of exotic foodstuffs. While, the benefits of IF&Vs are well documented, government efforts do not consistently encourage and support IF&V production and post-harvest activities (e.g., processing or value addition and preservation). IF&V consumption
has not only remained low, but it has also been declining. Therefore, future policy should feature IF&Vs as fundamental to ensuring national food nutrition security.

2. There is a need for policy to address an evident lack of agricultural extension services among rural households. The deployment of additional extension officers to rural areas need to improve access. Also, improving strategic location of offices should be considered. This would facilitate better area coverage. Once spatial concerns are addressed, communications could be improved through the provision of the contact details of extension officers who themselves may obtain farmers’ particulars, thereby enabling effective two-way communication.

3. The incorporation of indigenous fruits-related knowledge into schools and colleges curricula, with emphasis on their nutritional and health benefits, to empower youths and the educated to make healthier food choices along other exotic products. Further opportunities to learn more about these varieties would likely occur through mass media and from friends, neighbours and relatives and this may encourage IF&V consumption.

4. Visual presentations of IF&Vs, whether in advertisements or at marketplaces, have been shown to be key determinants of their consumption. Therefore, extra attention should be afforded to the appearance of IF&Vs. This begins from the cultivation of the produce and continues with its handling, cleaning, packaging and layout.

5. Marketers and retailers stand to benefit from identifying to consumers indigenous vegetables that are easiest to prepare. Ease of preparation is evidently a significant determinant of indigenous vegetable consumption. Such varieties can be especially appealing to urban consumers who, being busy for several hours on working days, find little time to prepare meals and therefore need foods that are quick and easy to prepare, yet nutritious.

6. Awareness campaigns dispelling negative label tags (weeds, food consumed by the poor and unfashionable compared to exotic fast foods) associated with IFs, especially among the youth, employed and the educated. More effective communication through public (and private) mass media about the availability of IF&Vs and how nutritious they are is important as it can help in terms of food insecurity.

7. Promotion of local markets selling indigenous fruits alongside exotic fruits and vegetables
LIST OF REFERENCES


Department of Agriculture, Forestry and Fisheries/Department of Social Development. (2013). National Policy on food and nutrition security.


Mayekiso, A. (2015). Production of Indigenous Leafy Vegetables (ILVs) and their contribution to household food security: Evidence from Coffee Bay, Eastern Cape Province, South Africa. Unpublished MSc Dissertation, Alice, University of Fort Hare. Available online:


APPENDIX A: QUESTIONNAIRE

QUESTIONNAIRE

SECTION A: COVERING LETTER

DEAR RESPONDENT,

I am a Masters student in the Department of Agricultural Economics at the University of Fort Hare. Currently, I am conducting research on the perceptions, determinants and consumption patterns of indigenous fruits and vegetables in rural areas. It would be greatly appreciated if you would kindly complete the following questionnaire. The information that you provide will be used to make recommendations to fruit and vegetable marketers and policy makers. I promise that the information will be treated with the strictest confidence. To protect your identity, your name will not be required. Thank you in advance.

Yours Faithfully,

Rudzani Nengovhela.

Contact details:

E-mail: nengovhelarudani90@gmail.com

Cellphone: +27 791 374 866

SECTION B: DEMOGRAPHIC AND SOCIO-ECONOMIC INFORMATION

Please fill in the following information by marking with an X in the appropriate box.

<table>
<thead>
<tr>
<th>1. Gender:</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
</table>

2. Age ................................................................. (Years)

3. Marital status:

<table>
<thead>
<tr>
<th>Single</th>
<th>Married</th>
<th>Widowed</th>
<th>Divorced</th>
</tr>
</thead>
</table>

4. What is your main occupation?

<table>
<thead>
<tr>
<th>Permanent job salary</th>
<th>Temporary job salary</th>
<th>Pension fund</th>
</tr>
</thead>
</table>
5. How much income do you receive per month?

<table>
<thead>
<tr>
<th>Less than R1000</th>
<th>R1000-R1999</th>
<th>R2000-R2999</th>
<th>R3000-R3999</th>
<th>R4000-R4999</th>
<th>Over R5000</th>
</tr>
</thead>
</table>

6. What is your highest educational qualification?

<table>
<thead>
<tr>
<th>Primary school</th>
<th>High school</th>
<th>Tertiary school</th>
<th>Never went to school</th>
</tr>
</thead>
</table>

7. Household size……………………………………………………………………………………………

8. Do you have access to extension services related to IF&Vs?

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

9. Do you have markets for IF&Vs?

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

10. Do you have access to media and adverts related to IF&Vs?

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

11. Are you aware of IF&Vs in your areas?

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

SECTION C: INDIGENOUS FRUITS CONSUMED FROM THE AREA

1. Name indigenous fruits you consume and your consumption frequency

<table>
<thead>
<tr>
<th>Indigenous fruits</th>
<th>Consumption status</th>
<th>Time of consumption</th>
<th>Consumption frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>summer</td>
</tr>
<tr>
<td>Mbuyu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sour plum</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECTION D: INDIGENOUS VEGETABLES CONSUMED FROM THE AREA

1. Name indigenous vegetables you consume and the consumption frequency.

<table>
<thead>
<tr>
<th>Indigenous vegetables</th>
<th>Consumption status</th>
<th>Time of consumption</th>
<th>Consumption frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Summer</td>
</tr>
<tr>
<td>Abelmoschus esculentus(L.) Delele</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranthus dubius  C.Mart. ex Thell. Vowa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vigna unguiculata (L.) Walp Munawa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solanum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lepidoglossum retroflexum</td>
<td>Dunal</td>
<td>Muxe</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Ipomoea batatas (L.) Lam</td>
<td>Murambo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleome gynandra L. Murudi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bidens pilosa L. Mushidzhi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Momordica foetida Schumach Nngu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Momordica balsamina L. Tshibavhe</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SECTION E: RURAL CONSUMER PERCEPTIONS OF IFs**

Please indicate the extent to which you agree or disagree with the following statements by marking with an X in the appropriate box.

1. Indigenous fruits are healthier (more nutritious) than exotic fruits

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

2. Indigenous fruits make people live longer

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

3. Indigenous fruits give people energy and strength

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

4. Indigenous fruits have health benefits and they prevent diseases

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

5. Indigenous fruits taste good (delicious)

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

6. Indigenous fruits are cheaper than exotic fruits

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

7. Indigenous fruits are food for poor people

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

8. Appearance influences consumption of indigenous fruits

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

9. Indigenous fruits have a pleasant smell

<table>
<thead>
<tr>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

10. Texture influences consumption of indigenous fruits
No | Yes
11. Indigenous fruits are easy to collect
No | Yes

SECTION F: RURAL CONSUMER PERCEPTIONS OF IVs
Please indicate the extent to which you agree or disagree with the following statements by marking with an X in the appropriate box.

1. Indigenous vegetables are healthier (more nutritious) than exotic vegetables
No | Yes

2. Indigenous vegetables make people live longer
No | Yes

3. Indigenous vegetables give people energy and strength
No | Yes

4. Indigenous vegetables have health benefits and they prevent diseases
No | Yes

5. Indigenous vegetables taste good (delicious)
No | Yes

6. Indigenous vegetables are cheaper than exotic vegetables
No | Yes

7. Indigenous vegetables are food for poor people
No | Yes

8. Appearance influences consumption of indigenous vegetables
No | Yes
9. Indigenous vegetables have a pleasant smell

| No | Yes |

10. Indigenous vegetables are easy to prepare

| No | Yes |

11. Indigenous vegetables are easy to collect

| No | Yes |

12. Do indigenous vegetables cook faster?

| No | Yes |

SECTION G: RURAL CONSUMERS’ CONSUMPTION PATTERNS OF IF&V

1. In your household, do males or females consume the most indigenous fruits and vegetables?

| Males consume the most | Female members consume the most | Neither – there is equal consumption |

2. In your household, do younger members or older members consume the most indigenous fruits and vegetables?

| Younger members consume the most | Older members consume the most | Neither – there is equal consumption |

3. Does your household consume larger or smaller amounts of indigenous fruits and vegetables during periods of drought?

| The household consumes larger amounts | The household consumes fewer amounts | Neither – consumption levels remain the same |