ANALYSIS OF USES, MARKETING AND CONTRIBUTION OF UAPACA KIRKIANA TO HOUSEHOLD INCOME IN GOROMONZI DISTRICT, ZIMBABWE

BY

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DECLARATION

I, Chadzimura James a student at Bindura University of Science Education do hereby declare that research report entitled: Analysis of uses, marketing and the contribution of Uapaca kirkiana fruits to household income in Goromonzi District, Zimbabwe is entirely my original work, except where acknowledged, and that it has never been submitted before to any other University or institution of higher learning for the award of a Degree.

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SIGNATURE DATE

We confirm that the candidate under our supervision carried the work reported in this thesis

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Abstract

The management of indigenous fruits in Southern Africa, including Zimbabwe, can bring increased revenues for rural households. However, there are many logjams which must be addressed in order to realise wider benefits from these resources. This study evaluates the contribution of Uapaca kirkiana to rural households’ income and determining its uses and marketing channels in Domboshawa Ward 4, Goromonzi District, Zimbabwe. The study gathered primary data from 300 households in the study area using a multi-stage sampling, as well as from key stakeholders through purposive sampling techniques. Secondary data from literature was also used and observations complimented information collected. Data was analysed using descriptive and inferential statistics and presented in frequency tables and graphs. Findings show that Uapaca kirkiana is recognised to have an important poverty mitigation function providing healthy nutritious food as well as the much needed income. The findings from the study revealed that Uapaca kirkiana fruits are mainly used for cash sales across all zones with Sarakunze VIDCO 95.5%, Gangarahwe 98.7% and Chivavarirwa 90.9%. The fruits are also used for consumption, donation, barter trade and making bread, cakes, burns, porridge and brewing sweet beer. The marketing system is characterised largely by informal channels that include roadside selling, middlemen, farm gate, door to door and wholesale trading. The middlemen and agriculture markets channels were the major channels used across the three zones. Middlemen in Chivavarirwa VIDCO recorded 50%, Gangarahwe 42% and Sarakunze 15% and agricultural market at Chivavarirwa recorded 24%, Gangarahwe 35% and Sarakunze 48%. The results also indicated that contribution from Uapaca kirkiana fruits to household income vary significantly across market channels (P<0.05). The results show that contribution of household income from Uapaca kirkiana fruit gives an average of US$66.91 which ranges from US$10 to US$260 per harvesting season. Income contribution from Uapaca kirkiana fruits is affected by age of respondent (P=0.003), the number of 20 litre buckets sold last year (2014/15 season) P=0.000 and the quantity used for barter trade (P=0.000). The study recommends that to improve productivity, farmers must adopt sustainable harvesting methods and sorting of fruits to ensure supply of high quality fruits. Furthermore, the government must review policies and encourage development partners to participate with a view to promote value addition of the fruits and promote sustainable harvesting of Uapaca kirkiana fruits.

Key words: Barter trade, domestication, income, indigenous fruit trees, Uapaca kirkiana, and value addition.
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Dedication

This thesis is dedicated to my family (Upenyu, Anesu, Tinovimba, Justice and Taonashe Chadzimura) and to my lovely mother, Concilia Garakai Chadzimura and late father Ginos Chadzimura.
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<th>Full Form</th>
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<tr>
<td>FAO:</td>
<td>Food and Agriculture Organisation</td>
</tr>
<tr>
<td>WFP:</td>
<td>World Food Programme</td>
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<td>ZimVAC:</td>
<td>Zimbabwe Vulnerability Assessment Committee.</td>
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<td>VIDCO:</td>
<td>Village Development Committee</td>
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<tr>
<td>NTFPs:</td>
<td>Non-Timber Forest Products.</td>
</tr>
<tr>
<td>NGO:</td>
<td>Non Government Organisation.</td>
</tr>
<tr>
<td>ZIMASSET:</td>
<td>Zimbabwe Agenda for Sustainable Socio-Economic Transformation</td>
</tr>
<tr>
<td>HIV:</td>
<td>Human Immune Virus</td>
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<tr>
<td>IFTs:</td>
<td>Indigenous Fruit Trees.</td>
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<tr>
<td>ICRAF:</td>
<td>International Center for Research in Agroforestry</td>
</tr>
<tr>
<td>FTLRP:</td>
<td>Fast Track Land Resettlement Programme.</td>
</tr>
<tr>
<td>EMA:</td>
<td>Environmental Management Agency.</td>
</tr>
<tr>
<td>CIFOR:</td>
<td>Centre for International Forestry Research.</td>
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<tr>
<td>FGDs:</td>
<td>Focus Group Discussions</td>
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<tr>
<td>ANOVA:</td>
<td>Analysis of Variance.</td>
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<td>IPCC:</td>
<td>Intergovernmental Panel on Climate Change</td>
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CHAPTER I
INTRODUCTION

1.1 Background

In Zimbabwe, agriculture is the backbone of the economy which provides employment and income to 60 - 70 percent of the population. Hence, agriculture is top priority of the government aimed at enhancing food security and income generation. However, agriculture in Zimbabwe is being affected by poorly distributed rains, drought and also high inputs cost like pesticides, seed, fertilizers, labour and power. According to Food Agriculture Organisation (FAO), (2012) in Zimbabwe maize yield has dropped significantly over the past decades for instance average yield in early 1980s was at 800kg per hectare and the average yield went down to 400kg per hectare between 2000 and 2011 (FAO, 2012). Therefore, this decline in maize yield is an indication of food crisis in Zimbabwe as maize is the staple food. According to World Food Programme (WFP) (2015), Zimbabwe’s 2014/15 agricultural season recorded a 51 percent decline in maize production compared to 2013/14 season due to drought and climate change. Furthermore, the report published in July 2015 by Zimbabwe Vulnerability Assessment Committee (ZimVAC) indicated that some 1.5 million people in Zimbabwe are in need of food to meet their minimum food requirement during 2015/16 lean season (WFP, 2015). Due to shortage of maize, Zimbabwe is going to import a deficit of 1.7 million tonnes of maize during 2015/16 season for both human and animal consumption (Mutenga 2016).

In most parts of the country people have turned into use of Non-Timber Forest Products (NTFPs) as an alternative source of income and food. According to the World Bank (2001), it is estimated that one out of four of the world’s poor people depend directly or indirectly on forest products for their survival. Over two thirds of Africa’s 600 million people depends more on forest products, either in the form of subsistence uses or as cash income derived from NTFPs (Arnold 2001; CIFOR 2005; Kaimowitz 2003; Sunderlin et al., 2005). In Southern Africa, rural people depends on indigenous fruits from Miombo woodlands like *Uapaca kirkiana* as an important source of nutrients and food security during drought periods, and cash income during periods of fruit surplus (Ramadhani 2002; Mithöfer and Waibel 2003; Akinnifesi et al., 2004). More so, the majority of people in Africa are food insecure and chronically malnourished (Tiisekwa et al., 2004), hence people in the rural areas need forest products especially fruits such as *Uapaca kirkiana* to sustain their livelihood. Indigenous fruits like *Uapaca kirkiana*, *Ziziphus mauritiana*, *Parinari curatellifolia* play a
very vital role in times of drought (Akinnifesi et al., 2008) providing source of nutrition (Munok et al., 2001) and as a source of cash income to rural households (Akinnifesi et al., 2006).

Many villagers in the Miombo ecological regions are fully into gathering and selling of NTFPs including *Uapaca kirkiana* fruits (Chisimba, 1996; Taylor et al., 1996). In communities with abundant *Uapaca kirkiana* most households are now into gathering and marketing of NTFPs as a way to get food, medicine, fibre and income. However, agriculture and development policies in most countries overlook the contribution of NFTPs to household income and food security (FAO, 1989; Okafor et al., 1994; Saka and Msothi, 1994; Ramadhani, 2002 and Saka et al., 2004). The increasing demand for forest products in developing countries has enhanced rural livelihoods and promoted the expansion of domestic markets, particularly in urban areas where wood fuels and other forest resources are scarce (Arnold et al., 2006). Therefore, NTFPs may provide sources of employment opportunities and income generation for poverty reduction in both rural and urban areas. The domestication of *Uapaca kirkiana*, which is currently taking place in the Eastern and Southern Africa (Magembe et al., 1998; Akinnifesi et al., 2004), is promising to enhance household incomes and food security. However, data on the contribution of *Uapaca kirkiana* to household income and food security is still limited.

### 1.2 Problem Statement

The majority of households in Domboshawa ward 4 communal areas depend on horticulture and field crop farming as the main sources of livelihoods. However, climate change has negatively affected crop yields and this has led to food crisis. In addition, horticultural products sometimes flood the market resulting in buyers offering very low prices for their produce (Chigusiwa et al., 2013). According to FAO (2012) maize average yield in early 1980s was at 800kg per hectare and the average yield went down in 2000 to 2011 to 400kg per hectare and this has resulted in many households becoming food insecure in Domboshawa communal area. According to WFP (2015) Zimbabwe’s 2014/15 agricultural season recorded a 51 percent decline in maize production compared to 2013/14 season due to drought and climate change and Matarira et al. (1995) reported that maize yield is adversely affected by drought and climate change. Furthermore, the report published in July 2015 by (ZimVAC) indicated that some 1.5 million people in Zimbabwe are in need of food to meet their minimum food requirement during 2015/16 lean season (WFP, 2015). The report on
Poverty and Poverty Datum Line Analysis in Zimbabwe in June 2011 to May 2012 revealed that about 76% of the rural people are poor compared to 38.6% in urban areas (ZIMSTAT, 2012). The report further indicated that 30.4% of the rural people in Zimbabwe are extremely poor compared to 5.6% in urban areas (ZIMSTAT, 2012). The province of Mashonaland East where Domboshawa is located has a poverty level of 67% in 2012 (ZIMSTAT, 2012). A high poverty level indicates that rural people in Domboshawa are poor yet they harvest and market *Uapaca kirkiana*. Hence there is need to carry out a research to find out how much income is being contributed to the households from sale of *Uapaca kirkiana* fruit.

In addition, in most African countries the timber industry is mainly considered given its contribution to national and local economies, but very limited research has been done on the contribution of non-timber forest products to national and local economies by the development planners and scientists (Jimoh, 2006).

The potential contribution of *Uapaca kirkiana* fruits to the economy are not considered by the government because there is limited information on the level of contribution of *Uapaca kirkiana* to rural households’ total income. The information on marketing of indigenous fruits is still scanty (Chilimapunga, 2001; Muumba *et. al.*, 1996) but identity, distribution and utilisation of edible indigenous fruits in Africa have been strongly documented (Saka and Msonthi, 1994). Furthermore, there is limited knowledge on the barriers on production and processing of indigenous fruits into finished products (Brigham *et al.*, 1996; Arnold, 1996). The unsustainable harvesting practices of dislodging fruits with objects often led to the destruction of indigenous fruit trees show lack of valuing their potential contribution to household income. Therefore, the study seeks to look at the uses, harvesting, marketing and the contribution of *Uapaca kirkiana* fruits to household income in Domboshawa area.

### 1.3 Research questions

1. What are the uses of *Uapaca kirkiana* in Domboshawa?
2. Which *Uapaca kirkiana* marketing channels are being used by households in Domboshawa ward 4?
3. Does income from *Uapaca kirkiana* vary significantly across marketing channels?
4. What are the socio-economic factors that affect the contribution of *Uapaca kirkiana* to household income in Domboshawa?
1.4 Objectives

Main objective

The main objective of the study is to evaluate the contribution of *Uapaca kirkiana* to the household income in Domboshawa area.

1.4.1 The Specific objectives are to:

1. determine the uses of *Uapaca kirkiana* in Domboshawa area.
2. identify different *Uapaca kirkiana* marketing channels used by households in Domboshawa.
3. determine whether income from *Uapaca kirkiana* varies significantly across marketing channels.
4. identify factors affecting the contribution of *Uapaca kirkiana* to household income in Domboshawa.

1.5 Hypothesis

1. The contribution of *Uapaca kirkiana* fruits to household income vary across the markets.
2. Age and gender of household head, family size of household, distance to the market, number of uses of the fruit, quantity of *Uapaca kirkiana* harvested and experience in harvesting of *Uapaca kirkiana* affect the contribution of *Uapaca kirkiana* fruits to household income in Domboshawa.

1.6 Justification

This study contributes towards the on-going debates on whether wild indigenous fruit species in particular *Uapaca kirkiana* are important engines for economic growth and poverty reduction through income attainable from the sale of the fruit in rural communities. It shall therefore provide guide to rural communities on sustainable ways of harvesting that do not result in deforestation, and also on the processing or value addition of *Uapaca kirkiana* fruits, into commercially viable products such as wines, jam, juice and oils which have more value than selling fresh or raw fruit.

More so, the study is important in that it gives insights on the contribution of *Uapaca kirkiana* to the livelihood strategies in the district. In addition, the evidence would assist all key stakeholders in these communities in their endeavours to enhance the food security status of the district. Results of this study can benefit various stakeholders in formulating relevant
policies in agriculture and social welfare and programmes that are suitable for the area and areas with similar characteristics.

The Government of Zimbabwe and in particular the Ministry of Agriculture, Mechanization and Irrigation Development and Ministry of Public Service and Social Welfare, has the mandate and social responsibility to formulate related policies hence the results of the study can be used to foster achievements spelt out in the government blueprint ZIMASSET especially the clusters of value addition of local resources and food security. The responsible administrative structures can thus make and take informed decisions. In addition, findings from the study will aid the Local Forest Committees in coming up with effective by-laws that will promote effective and sustainable management of the *Uapaca kirkiana* in Zimbabwe through which sustainable management of forest resources in Domboshawa will support government to promote the commercialisation of *Uapaca kirkiana* thereby creating jobs for the local people. As a result, findings will help the government to come up with effective policies in addressing issues affecting the harvesting, marketing and utilisation of *Uapaca kirkiana* fruits. The information gathered can also be useful in coordinating efforts by the government and Non-Governmental Organizations (NGOs) so that rural households’ livelihoods may be enhanced. In light of this, the study can sensitize and enlighten the government, non-governmental organizations, and other stakeholders to ensure better intervention methods as a means and way to bring about social and economic development to a country.

The research can also open up new avenues for future research thus acts as reference to future researchers, policy makers and NGOs who may have the desire to improve quality of rural livelihoods in Zimbabwe and anywhere else in the world. Among others, research data will benefit vulnerable groups such as orphans, widows and victims of the HIV/AIDS pandemic through improved nutrition by consuming the fruits as well as income generation through selling of *Uapaca kirkiana* fruits.

1.7 Assumptions of the study

- The major assumption of this research is that the participants supply correct information which can be relied on. To ensure that this assumption hold, the researcher authenticated the data by targeting different groups of people in the Domboshawa rural area, then triangulation method was employed to analyse data
obtained from dissimilar data gathering techniques such as questionnaires, interviews and observations.

- The Domboshawa rural residents’ perceive wild indigenous fruit species as one of vital source of income that can uplift their livelihood.
- Proper ways of harvesting, marketing and processing *Uapaca kirkiana* can enhance sustainability of this source which in turn uplift rural livelihood.

### 1.8 Limitations of the study

- Due to financial constrains the researcher was forced to limit his investigation to Domboshawa rural community.
- Other respondents were not willing to participate in the study.

### 1.9 Outline of the study

The research consists of six chapters. The first chapter highlights the general introduction, the research background, problem statement, research questions and broad and specific objectives, hypothesis, justification of the research, significance of the study and limitations. Chapter two is the literature review, which focused on what other authors have recorded on the subject matter. Furthermore, the chapter presents information on the uses, harvesting and marketing of *Uapaca kirkiana* from various authors. Chapter three explains the research methodology. It gives an explanation of the study area, its location and how data was collected in the field. It also contains the research design, sampling procedures and the research instruments instrument used. In chapter four the collected data is presented and analyzed in several ways, possible relationships and results are presented and analyzed. Chapter five focuses on summary of findings and some concluding remarks. Finally, conclusions, recommendations and suggestions on the study will constitute chapter six. In addition, the list of references and appendices are provided thereafter.
2.0 Introduction
The majority of the rural people in Southern and Eastern Africa are facing food shortage and malnutrition with most of them having to make use of various products from their environment in order to sustain their livelihood (Tiisekwa et al., 2004). Indigenous fruits are very important especially during times of famine (Akinnifesi et al., 2008) as they provide an alternative source of nutrition (Muok et al., 2001) and cash income (Akinnifesi et al., 2006). Following decades of limited success in eliminating rural poverty, new ideas about rural development are emerging. In Africa, special potential for cultivation lies in the great biological diversity of indigenous fruits, nuts and other edible products found in the forests of the continent (IPGRI et al., 2005 and Akinnifesi et al., 2008). One of such wild fruit trees that have gained a lot of attention is the Southern Africa is the Uapaca kirkiana. Uapaca kirkiana tree is a small to medium-sized evergreen or semi-deciduous tree is found in the Miombo woodlands of Southern Africa. The fruits of Uapaca kirkiana are eaten fresh and used for preparing jam and beverages. This chapter review literature on the uses, harvesting techniques, marketing and contribution of Uapaca kirkiana to rural livelihoods. The harvesting of fruits stands as an important coping strategy during times of extreme hunger.

Majority of Africa’s people lives in savannas and in the southern hemisphere, the most common tree species are Miombo woodlands (Campbell 1996). However, apart from the recognition of local significance, there has been very little consideration and recognition given to the importance of Miombo woodland to global interests. In Africa, great potential for cultivation of NTFPs lies in the biological diversity of indigenous fruits, nuts and other edible products found in the forests (IPGRI et al., 2005; and Akinnifesi et al., 2008). There are a lot of indigenous fruit trees (IFTs) species present in the Miombo woodlands of Southern Africa but not known in the global markets.

Campbell (1996) reported that there are many case studies on the use and diversity of Miombo products in Southern Africa, a household perspective of resource use is very limited. However, the most of people in Southern Africa live on customary or communal land depending on resources found on these lands (Misana et al., 1996). Mukwekwere, (1996) reported that in Zimbabwe 42% of the total land area is designated as communal area and is
estimated to support about 70% of the population. At present moment in Zimbabwe, land tenure system discourages people from planting fruit trees because they are, including those fruit trees growing on fields, accessible to anyone. Under the communal tenure system farmers only own the crops in their fields, not the trees; trees and their fruit remain under public domain (Mukamuri, 1995). Previous studies have shown that rural communities prefer planting trees on privately owned land than on the communally owned grazing areas and that fruit trees, especially exotics, are more popular than non-fruit trees (Shumba et al., 1996).

2.1 History of Uapaca kirkiana

*Uapaca kirkiana*, also known as *muzhanje or mushuku* in Zimbabwe is a fast growing fruit tree which is tropical indigenous fruit tree to the Miombo ecological zone of Southern Africa and Madagascar (Maliro and Kwapata, 2004; Ramadhani, 2002). The ecological zone spread over eight countries in central and southern Africa, from Angola and northern Namibia in the West across northern Botswana and northern South Africa, Zimbabwe, Zambia, south of the Democratic Republic of Congo and Malawi, to Tanzania and Mozambique in the East. The name *Uapaca* is derived from the Malagasy name “Voa-paca” used for the Madagascar species *Uapaca thouarsii*, scientifically described by Baillon (1858). The *Uapaca kirkiana* fruit tree is found in eight Southern Africa countries, it has many vernacular names, and these different names simply reflect different ways of spelling the same word in the different dialects (Akinnifesi et al., 2004). The genus *Uapaca* includes 61 species but there has been no recent revision on a continental scale and the number of distinct species is probably less. In the Zaire basin is where the greatest diversity of specie occurs and further South in the Miombo region (Ramadhani, 2002). *Uapaca kirkiana* has five synonyms namely *Uapaca albida*, *Uapaca banguelensis*, *Uapaca goetzei*, *Uapaca homblei*, and *Uapaca greenwayi* and other vital close relatives of *Uapaca kirkiana* are: *Uapaca nitida*, *Uapaca paludosa* and *Uapaca sansibarica* (Orwa et al., 2009).

2.2 Description of *Uapaca kirkiana* tree and fruits

*Uapaca kirkiana* is a small to medium tree with a height of five to twelve meters (Storrs, 1995) and has a girth of five to twenty-five centimetres. *Uapaca kirkiana* leaves are simple, large and alternate, strongly ribbed, dark green and rounded tips and on the under surface of the young leaves are covered with curl hairs. The wood of *Uapaca kirkiana* is light with white sapwood and reddish brown heartwood (Storrs, 1995). *Uapaca kirkiana* tree has male and female flowers which are yellow in colour and globuse in shape (Ramadhani, 2002),
Figure: 1 Uapaca Kirkiana tree with fruits (Source: Akinnifesi F.K. ICRAF 2004)

Flowering occurs at the peak of the rainy season, and trees can remain in flower for five to six months. Flowering of the tree coincides with the start of the rainy season (October/November), and the period extends over the entire 5 to 6 months rainy season. However flowering intensity is also variable throughout the rainy season with a higher proportion of trees flowering between January and March (Ngulube, 1996). Fruit development takes five to eight months and starts in the rainy season and extends through the dry season into the next rainy season.
Fresh fruits of *Uapaca kirkiana* are three to four centimetres in diameter and contain edible pulp which is rich in crude protein, carbohydrates and fat. The fruits ripen towards end of the dry season that is October to November (Ngulube *et al.*, 1995). The pulp is yellowish and sweet-tasting (Storrs, 1995). *Uapaca kirkiana* fruit contains three to five recalcitrant seeds which germinate within three months during rainy season (Mwamba, 1995). The fruit proportion of *Uapaca kirkiana* tree are as follows: about 45% pulp, 38% skin and 17% seed (Hans, 1981; Maliro and Kwapata, 2004), and its weight ranges from 16.5g to 18g per fruit ((Ngulube *et al.*, 1995 and Mkonda *et al.*, 2003). However, the *Uapaca kirkiana* tree is very prone to frost which results in reduced and poor fruit yields (Parker, 1978). The fruit is sweet with the pulp having a pear-like taste (Ramadhani, 2002).

To realise early yields, the participatory domestication approach has applied vegetative techniques for propagation that result in accelerated fruit production compared to tree establishment from seed (Leakey *et al.*, 2004). Propagation of *Uapaca kirkiana* reduces the time between planting and first fruiting from more than 12 years to around 4 years (Sidibe and Williams, 2002; Sanou *et al.*, 2004; Leakey and Akinnifesi, 2008). Significant gaps in knowledge on the productivity, market value, net returns and other features of smallholder fruit production and markets in sub-Saharan Africa need to be filled to properly guide future investments by private enterprise, governments and development donors (Leakey *et al.*, 2005; Schreckenberg *et al.*, 2006 and Akinnifesi *et al.*, 2008). However, at the present moment in
countries such as Zimbabwe, under the communal tenure system farmers only own the crops in their fields, not the trees; trees and their fruit remain under public domain (Mukamuri, 1995).

2.3 Distribution of *Uapaca kirkiana*

*Uapaca kirkiana* is a tropical indigenous fruit tree native to the Miombo ecological zone. The ecological zone stretches over eight countries in central and southern Africa, from Angola and northern Namibia in the West across northern Botswana and northern South Africa, Zimbabwe, Zambia, south of the Democratic Republic of Congo and Malawi, to Tanzania and Mozambique in the East. The zone is mostly deciduous, non-spine scent woodland with a shrub layer of variable density and composition. The total flora consists of about 650 species, including more than 50 indigenous fruit tree species (Orwa *et al.*, 2009).

The *Uapaca kirkiana* is the most widespread species of the Uapaca genus and some of the species namely *Uapaca albida*, *Uapaca banguelensis*, *Uapaca goetzei*, *Uapaca greenwayi*, *Uapaca nitida* and *Uapaca poludosa* (Orwa *et al.*, 2009). The *Uapaca kirkiana* is mostly found in Lowland forest in secondary Miombo woodlands such as clearing and gaps open woodlands and amongst rocks at medium altitudes with good rainfall. The tree grows very well in poor, shallow soils, gravel and sand loam soils (FAO, 1986; Maliro and Kwapata, 2004; Mwamba, 1989; Storrs, 1995).

2.4 Economic importance of *Uapaca kirkiana* fruits

The collection of IFTs from the wild forests has a long history, which started before settled agriculture and shows an important food supplement and cash income for rural people. According to Akinnifesi *et al.*, (2007) there is alot of evidence that IFTs can contribute to household income and presents a major economic opportunity for asset building for rural households. According to Chifamba and Mashavira (2011), the demand for indigenous fruits is increasing mainly because indigenous fruits and leafy green vegetables are tasty and nutritious. However, often these indigenous foods are not readily available. Despite the importance of IFTs, previous studies conducted by Akinnifesi *et al.*, (2007) have not witnessed a deliberate attempt to enhance the role of IFTs through capacititating the rural poor with improved varieties and production, harvesting and storage techniques. Unless concerted effort to explore opportunities to meet food requirements of the rural poor through IFTs, increase emphasis on tree domestication strategies, product development, and
commercialisation and marketing, farmers will remain vulnerable to food insecurity, thereby derailing the prospects of IFTs in alleviating household food insecurity. Some of the major uses of IFTs include consumption and provision of income among others (Akinnifesi 2004).

2.4.1 Sources of income
The cultivation of indigenous and exotic fruits for sub-Saharan Africa’s domestic markets can bring increased revenues for smallholders and improve the diets of local consumers (Jamnadass et al., 2011). Households switch to non-farm income to survive, but responses vary greatly among households, sometimes leading to loss of assets and increased poverty (Fafchamps, 1998; Hoddinott, 2006). The poor people in the community are vulnerable and run the risk of ending up in a poverty trap when exposed to the consequences of climatic shocks. Indigenous Fruit Trees (IFTs) can serve as safety nets at times of shortage (Paumgarten 2005; Muller and Almedom, 2008). In addition, Mithofer et al., (2006) assert that edible wild fruits like *Uapaca kirkiana* in the Southern Africa are a very vital source of income for poor rural people. Resultantly, *Uapaca kirkiana* fruits contribute a great deal to the socio-economic development through income generation especially in most rural areas where gathering and marketing of wild fruits is a viable strategic risk coping option (Akinnifesi et al., 2006). Furthermore, the wood of *Uapaca kirkiana* trees provides more income to rural households because the wood has a high market value for making bee hives which are strong and durable (Storrs, 1995). The harvesting and marketing of *Uapaca kirkiana* provide seasonal employment to many people in the rural areas (Taylor et al., 2006; Leakey et al., 1996).

According to Akinnifesi et al., (2007) 26-50% of rural households in Malawi, Mozambique, Zimbabwe depend on indigenous fruits for income and as a way to fight against seasonal food shortages which takes about three to four months per year during the rainy season. The research conducted in Chipata district, Zambia indicated that income generated from the marketing of *Uapaca kirkiana* fruits on monthly basis is above the minimum wage given to workers (Mkonda et al., 2003).

2.4.2 Human consumption
Several studies indicate that wild food sources contribute to increased dietary diversity, which has been associated with good nutritional status (Johns and Sthapit, 2004). According
to Akinnifesi et al., (2006), *Uapaca kirkiana* fruit trees provide food to the rural households and offer considerable scope for enhancing economic growth in the rural areas. Furthermore, *Uapaca kirkiana* act as food reserves in times of seasonal food crisis mostly at the start of the rainy season, November – February (Maghembe and Seyani, 1992; Saka *et al*., 2002; Ngulube *et al*., 1995; Akinnifesi *et al*., 2004, Akinnifesi 2006). According to Chisimba (1996), in Zambia most people living in areas like Mpongwe, Mkushi and Samfya depend much on the *Uapaca kirkiana* fruit as a reliable source of food at the start of the rainy season. According to Mithofer *et al*., (2006), the fruits are perceived to reduce vulnerability during drought periods by about a third.

### 2.4. 3 Medical

In line with Orwa *et al*., (2009), an infusion made from the roots of *Uapaca kirkiana* can be used to treat indigestion and dysentery. More so, Mander and Le Breton (2006) indicated that up to 80% of the world’s population mostly in developing countries depends on traditional medicine for primary health care. Also, a survey conducted in Zambia on the value of Indigenous fruit trees (ITFs) specifically for medicine indicated that 63% of the households use Indigenous Fruit Trees (ITFs) for medicinal purposes (Iranbakhah *et al*., 2009). *A. boehmii* was the mostly used Indigenous Fruit Tree with 67% followed by *Uapaca kirkiana* with 44% and *Parinari curatellifolia* 36%. The tree parts usually used are roots, leave and bark with the extraction of the active drugs done through the processes of infusion and decoction (Iranbakhah *et al*., 2009).

### 2.4.4 Animal feed

*Uapaca kirkiana* fruits can be used as animal feed, the flush of *Uapaca kirkiana* leaves at the end of the dry season is utilised by cattle as fodder in the absence of more palatable alternatives (Orwa *et al*., 2009). Forests are excellent sources of animal feed, the fodder from indigenous trees provide carbohydrates to livestock in the dry season and in times of very limited availability of fodder. Most farmers have a lot of knowledge on the different indigenous tree species that are used for fodder.

### 2.5 Nutritional value

For indigenous fruit trees, it is necessary to set priorities for which species to promote and to engage in participatory domestication for the improvement of yield, quality and germplasm delivery to farmers. The further promotion of indigenous fruits and vegetables is an attractive
option, as it allows consumers to take responsibility over their diets in culturally relevant, and therefore potentially more sustainable, ways (Keatinge et al., 2010). Furthermore, the nutritional profiles of these indigenous species in supplying micronutrients, fat, fibre and protein are often better than staple foods (Leakey, 1999). Many wild fruits which are edible are nutritionally rich and provide sources of nutrients for humans.

Muok et al., (2001) and FAO (1983) reported that edible indigenous fruits are nutritionally rich and are sources of minerals and essential nutrients for people. Previous studies carried out on the nutritional composition and value of indigenous fruits shows that many indigenous fruits are rich in sugars, essential vitamins, minerals, vegetable oils and proteins, and most of the fruits are good for the health of children and pregnant women (Campbell and Brigham, 1993; Wehmeyer, 1996; Saka et al., 1989). In particular, Uapaca kirkiana has been found to have 4.1% glucose, 2.7% fructose, 1.5% sucrose, 0.2% xylose and traces of ribose, raffinose and galactose (Sufi and Kaputo, 1977). In another study done in Malawi, Uapaca kirkiana fruit was found to have a dry matter content of 27.4%, 86.5% total carbohydrates, 8.4% fibre, 1.1% fat and 1.8% crude protein (Leakey, 1999). Results from a study done in Wedza, Zimbabwe reported that more than 80% of the households indicated that collected the wild fruits providing more than 10% of the total available energy in normal years, which increased at times of poor rainfall to up to 22% for average farmers and up to 42% for the poor farmers. The wild fruits Parinari curatellifolia and Uapaca kirkiana together contributed more than 90% of the total energy, both in years of normal and poor rainfall. The Uapaca kirkiana fruit is very important in dietary role as a native food because of its high nutritive value from the pulp (Hans, 1981).

2. 6 Tree domestication process

Domestication is a process involving accelerated and human-induced evolution to bring indigenous species into wider cultivation through farmer-driven and often market led process (ICRAF, 1997). The collection and evaluation of germplasm for tree crop improvement, product quality and market research of Uapaca kirkiana fruit trees have been conducted with the main goal of domestication. However, domestication depends on availability of good quality planting materials that result in precocious fruiting (Akinnifesi et al., 2006). Furthermore, recent domestication initiatives in Eastern and Southern Africa are likely to raise utilization and conservation of Uapaca kirkiana fruits and other indigenous fruits in the future (Magembe et al., 1998 and Akinnifesi et al., 2004). The Uapaca kirkiana tree is one of
the top species identified and preferred for domestication by researchers and farmers in the Miombo eco-zone of Malawi, Tanzania, Zambia and Zimbabwe because it is a source of food, nutrients, income and other services to many rural and some urban families (Akinnifesi et al., 2004).

The contribution of the indigenous to the rural household livelihoods can be improved by domesticating IFTs. According to Maghembe et al., (1998); Leakey et al., (1994) and Akinnifesi et al., (2006), local planting of indigenous trees, product development and market expansion are the first steps in domesticating indigenous fruits in fields, homesteads and communal areas. Domestication process for it to be successful and effective, local people need to be involved in the process of selection of tree species (Franzel et al., 1996).

The domestication of wild fruit trees is being promoted by most Southern African farmers so as to retain and protect indigenous fruit trees from deforestation (Kwesiga et al., 2000). Domestication is also being done on indigenous fruit tree species like *Uapaca kirkiana, Strychnos cocculoides* and *Parinari curatellifolia* in Malawi, Zambia, Zimbabwe, Mozambique and parts of Tanzania (Kwesiga et al., 2000; Akinnifesi et al., 2004) and in *Sclerocarya birrea* in South Africa (Shackleton, 2004) and Namibia (Leakey, 2005). The first steps in domesticating wild fruit trees are local plantings, product development and market expansion in their fields, homesteads and communal lands (Maghembe et al., 1998; Leakey et al., 2004), adapting the wild tree to their environmental conditions by deliberately selecting for certain characteristics.

Domestication is a process which involves human-induced evolution to accept and bring wild tree species into wider cultivation through a farmer-driven and market-led process. In Tanzania alone over 300 indigenous plants species have been described as edible fruit trees (Ruffo et al., 2002), however very few of these species have been accepted for domestication through deliberate tree improvement programmes. Furthermore, to promote domestication, ICRAF is currently working on Tree domestication initiatives by focusing on promoting *Sclerocaryabirrea, Uapaca kirkiana, Strychnos cocculoides, Vangueria infausta, Parinari curatellifolia, Ziziphus mauritiana, Adansonia digitata, Syzigium cordatum and Vitex species* (Maghembe et al., 1998; Mateke 2000 and Akinnifesi et al., 2004).
According to Maghembe et al., (1994) the studies conducted in Malawi show that while local communities embraced the idea of planting the *Uapaca kirkiana* fruit tree in their gardens for easy access, limited knowledge on the biological and propagation of the tree has slowed down the domestication of *Uapaca kirkiana* tree. According to Mwamba (1995), the poor *Uapaca kirkiana* tree seedling establishment has also contributed a lot to low rate of domestication.

**2.7 Commercialisation of Non-timber forest products (Uapaca kirkiana fruit).**

Non-timber forest products (NTFPs) commercialisation refers to increasing the value of a NTFPs in trade thereby resulting in the increase in income and employment opportunities, especially for poor (FAO, 1995). Furthermore, the increase in income and employment opportunities is based on the well-documented importance of many non-timber forest products to rural livelihoods, the emergence of new markets for natural products, the development of new marketing mechanisms like green marketing and, fair trade(de Beer and McDermott, 1989; Falconer, 1990; FAO, 1995). Hence, commercialisation of non-timber forest products can act as an engine for the growth of rural areas through activities and contribute to improved national incomes of rural communities.

On the conservation of forest resources, there is much speculation that NTFPs commercialisation can create more opportunities for effective forest utilisation (Myers, 1988) and commercialisation of non-timber forest products promote and create incentives for conservation of all forest valuable species and the environment in which they grow.

**2.8 Value addition opportunities for Uapaca kirkiana fruits**

Marketing of unprocessed *Uapaca kirkiana* fruit does not contribute much to the communities; hence income contribution can be enhanced by selling processed products. *Uapaca kirkiana* fruits can be processed into refreshing drinks, jams, wine, squashes, sweet beer and porridge (Mwamba et al., 1995; Mithofer and Waibel, 2003). In Malawi and Zambia, *Uapaca kirkiana* wine is known as *mulunguzi* or *masaku* and is being produced commercially and sold in the city supermarkets (Orwa et al., 2009). Furthermore, the fruits are used to make opaque beer called *napolo ukama* and a gin known as *kachasu* in Malawi (Orwa et al., 2009). Most of the rural household process *Uapaca kirkiana* fruit into wine, jam, non-alcoholic beverages and porridges (Akinnifes et al., 2006).
2.9 Harvesting of *Uapaca kirkiana*

Kadzere *et al.*, (2006) reported that before commencing the harvesting of *Uapaca kirkiana* fruits some harvest indictors are considered by fruit collectors. The fruit ripe indicators follows sweet fruit test up to 49%, fruit size, colour change from green/yellow to brownish, loss of hairs from the surface of the fruit up to 21%, the development of a rough skin and fruit skin covered by spots up to 14% of the fruit. The traditional technique to assess the correct timing of fruit harvest was to depend on natural abscission and then pick the fruits from the ground (Ramadhani, 2002). A number of different harvesting techniques are used in the harvesting of indigenous fruit tree like *Uapaca kirkiana* namely picking the fruit from the ground following abscission, climbing trees to pick fruits, throwing objects to dislodge fruits, hitting stems with a heavy object and shaking stems of branches to dislodge fruits (Kadzere *et al.*, 2004).

According to Ham (2003) some harvesting methods like throwing of objects to dislodge the fruit can cause damage to trees and bruising of the fruit thereby reducing the shelf life of the fruit and quality. The harvesting method of shaking the tree to harvest the fruit lead to fall down of immature and unripe fruit thereby resulting in the cracking of the fruit as the fruit hit to the hard ground (Kadzera *et al.*,2004). Furthermore, fruits are damaged during dislodging even when they are unripe and this result in postharvest darkening of the fruit (Kadzere *et al.*, 2006). However, other farmers have developed strategies to minimize harvest damage of fruits through use of nets (Vossen, 1999).
According to Wilson (2000), post-harvest losses are estimated to be 40% to 60%. Kordyles (1990) estimated a post-harvest loss of between 5%-25% in developed countries and 20%-50% in developing countries. The harvesting of indigenous fruit by forcefully dislodging unripe fruits is now the common practice because of increased competition for the fruits within the communities and with wild animals. *Uapaca kirkiana* fruits are sometimes harvested at unripe stage and kept at home until they ripen. This process is called “*kupfimbika*” in Zimbabwe. Harvesting is normally done by youth and women (Kadzere et al., 2006). Women in rural areas often combine wild fruit collection with other daily activities such as collecting firewood.

### 2.9.1 Challenges faced by households in the harvesting of *Uapaca kirkiana* fruits

The harvesting of IFTs (*Uapaca kirkiana* fruit tree) from the forests pre-dated settled agriculture and presents a valuable source of livelihood enhancement, food supplement, and cash income for the rural poor. In Zimbabwe, the marginalisation of IFTs has ended up in the reduction of traditional seed banks, reduced farm biodiversity, poorer diets, decreased food security, and declining cultural tradition. Deforestation and increasing human population is causing IFTs to recede with serious environmental and socio-economic consequences on the availability of wild fruits, medicinal plants and other plant products. This has exposed the most vulnerable segment of the population, especially women, the aged, the poor and children to malnutrition and reduced income, as traditionally their livelihoods partly depended on these forest products (Chifamba, 2011). Chifamba (2011) further highlighted that the contribution of IFTs to many farmers’ livelihood is often not acknowledged in either local or national level poverty reduction strategies.

The absence of rules and regulations regarding the gathering of IFTs is a challenge to sustainable utilisation. According Chifamba (2011) indicated that in Wedza district, Zimbabwe, there are no norms, either community based or traditional, on harvesting of IFTs. As a result, the free access and consequent exploitation of common resources such as IFTs has been termed by Hardin (1968) as the ‘tragedy of the common’. This is due to the fact that unrestricted demand for a finite resources causes exploitation of the resource as each user’s aim is to maximise individual benefits. This might be attributed to the fact that there are no incentives to act in a socially altruistic way (Hardin, 1968). In this view, it is therefore wise to come up with IFTs policies that will empower community groups to manage the IFTs in open areas. In most countries, state property regimes in which government officials exercise
exclusive decision making powers on use of indigenous fruits are being deemphasized in favour of decentralised and participatory management of IFTs. In Zambia, this was achieved through a legislative reform of land tenure and natural resources management policy conducted over a ten-year period from 1985 to 1994 (Cooks and Wiersum, 2003) while in South Africa and Botswana, land-use planning based on the concept of ‘village territories’ has become very popular (Gram, 2001).

In all cases, governments have sought to clarify tenure issues and reinforce the rights of local communities to manage their resources through granting of legal recognition and decision making authority. More importantly, governance arrangements for complex, multiple-use IFTs need to recognise and make use of institutions and organisations available at different levels (Hassan, 1997; Falconer, 1990). Given that some potential local organisations may not form at all even when given formal authority, state institutions will need to provide support for the formation or strengthening of local organisations where they are non-existent or are weak (Shackleton, 2002).

The existing body of literature on community-based natural resource management suggests that local institutions are a mainstay, particularly for the management of plants and animals upon which communities depend for livelihood (Mukwada, 2008). Institutional arrangements are critical in shaping natural resource management at the community level. Institutional arrangements refer to the systems, procedures, organizations and legal frameworks that influence the way natural resources are used and managed in an area (Bradstock, 2005). Most of the projects in community-based natural resource management have merely served as a vehicle for extending state power and control deeper into the rural society, as a result of governments’ reluctance to decentralize the responsibility of conservation to local communities (Igoe and Croucher, 2007).

Sacred controls are norms of control of tree use based on folklore or ecological religion and enforced by community sanction or traditional leaders (Nhira and Fortmann, 1993). These controls have been widely reported throughout Zimbabwe (Ranger, 2003). For instance, Moore (2005) demonstrated how power was exercised on the residents of Kaerezi in the Eastern Highlands of Zimbabwe by institutions such as headmen, chiefs, the rainmaker and agents of the central government, all of whom sought to exercise authority by controlling access to land-based resources. Pragmatic controls refer to both long-standing and recently
adopted norms designed to maintain a sustainable supply of essential forest products. Taboos that prohibit the cutting of fruit trees are an example of pragmatic controls (Nhira and Fortmann, 1993).

Civil contract is a collection of controls that are based on norms of civility. Such norms restrain individuals from cutting trees or collecting fruit or firewood from other people’s homesteads without seeking prior permission from them (Nhira and Fortmann, 1993). In rural Zimbabwe, where forest and woodland resources are legally owned by the central government and have been managed by the Forestry Commission since the enactment of the Forest Act in 1949, the postcolonial formal grassroots structures that emerged include village development committees, ward development committees and elected councillors. Other formal institutions that have been noted include wildlife management committees and natural resource committees (Nhira and Fortmann, 1993).

Similarly, destructive methods of fruit harvesting, involving the pummelling of branches for the use of poles, especially from the *Uapaca kirkiana*, have been reported by the villagers as one of the major causes of loss of fruit trees in the scheme. Contrary to the widely held view that local institutions, community by-laws, rules, taboos and regulations have the capacity to control the way tree resources are used (Forsyth and Leach, 1998), in some parts of rural communities; continual dependence on a declining tree resource base is largely necessitated by lack of alternative resources.

### 2.10 Marketing of *Uapaca kirkiana*.

The informal market in market stalls, farm gates and along roadside drives the marketing of wild fruits while there is no definite and strategy for pricing indigenous fruits (Ramadhani, 2002). In Zimbabwe, *Uapaca kirkiana* fruits are sold along the highways and in urban markets like at Mbare Musika and Domboshawa market. The collectors of *Uapaca kirkiana* fruits in villages are the first link of the marketing chain. They collect the fruits from the communal forest or farmlands and sell to the wholesalers, retailers, vendors, middlemen and consumers. According to Mkonda *et al.*, (2003) marketing strategies used by *Uapaca kirkiana* fruit collectors include maintaining regular customers, allowing customers to sample fruits by eating a few before buying, meeting suppliers to transact before they reach the market places to reduce competition and increase bargaining power, hiring less labour and sometimes relatives for a short period to minimize costs and final product price. Other
strategies also include sale on credit to attract premium or sale at a higher price than when a cash payment is made (Mkonda et al., 2003).

The fruit price is determined by information about prevailing market prices, total market costs, prices in previous season, supply and harvest costs (Mkonda et al., 2003). Fruits that are transported for a long distance to the market place will have a higher selling price than those that are sold locally (Brigham et al., 1996). The taste of fruit is very vital aspect of market preference, sweet non-astringent flavour have high preference by customers in Zimbabwe (Ramadhani, 2002). The market appreciation of different samples of *Uapaca kirkiana* fruits were also found to depend on fruit colour, with colour and flavour attributes changing during the season as the fruits ripen. The brown fruits are preferred to yellow fruits. According to Kadzere et al., (2006), brown fruits have a higher sugar contents. The *Uapaca kirkiana* fruit has a substantial market value as reported by Mithofer and Waiber (2003) given that the sales of fruits provide the communities with some money in Zimbabwe. The presale activities, which include cleaning and removing damaged and rot fruits, increase the fruit price (Ham, 2003; Ramadhani and Schmidt, 2002).

### 2.10.1 Challenges in the marketing of *Uapaca kirkiana* fruits

The perishable nature of many indigenous fruits like *Uapaca kirkiana* fruit, combined with the poor infrastructure and high transport costs in remote tropical rain forest areas affect the successful marketing of *Uapaca kirkiana* fruits. Arnold and Ruiz Pérez (1998) point out the volatility of many NTFPs markets, where prices fluctuate follow a burst-and-boom cycle which ends up being replaced by domesticated species or synthetic alternatives (Homma, 1992). The other challenges in the marketing of *Uapaca kirkiana* fruits include lack of organisation among harvesters, limited access to credit and storage facilities which all impede the collectors’ access to markets (Verheij and Reinders, 1998; Van Dijk, 1999). Fruits harvested too early or too late are more prone to physiological disorders which results in a reduced storage and shelf life than those fruits harvested at the proper maturity time (Pareek et al., 2009). The middlemen is a problem in the marketing of *Uapaca kirkiana* because they buy the fruit at a lower prices and take them to urban areas and growth points where they will sell it at a higher prices.

Furthermore, the *Uapaca kirkiana* fruit gatherers, traders and the consumers of the fruits cited post-harvest problems such as rapid perishability and a lack of sweetness from some *Uapaca kirkiana* fruits as major challenges (Schomburg et al., 2002).
2.10.2 Policies on indigenous fruit use

Historically, the protection of wild fruit species in many countries of Africa has been carried out by local farmers in their community forest reserves, traditional home gardens, protected volunteer stands of such important plant species in farmlands, market and village squares. There is forest legislation for the whole of Southern Africa that restricts the rights of people to benefit from indigenous trees management for anything other than subsistence purposes (Dewees, 1994). In Zimbabwe for instance, the movement of people into farms during the 2000 Fast Track Land Resettlement Programme (FTLRP) has irrevocably altered the patterns of natural resource use in most areas. Traditionally in Zimbabwe, it can be noted that the legal framework governing large scale commercial farms involved private ownership of land. Hence individual farm owners were the ones responsible for managing resources which lay within their farms.

However, the land reform programme produced a communal ownership of grassland and woodland resources (Chimhowu and Woodhouse, 2008). There are four main classes of land tenure, which are communal land, resettlement land, state land and private land. These land classes are important since they also determine the woodland resource use in an area. On the other hand, the Communal Lands Areas Forest Produce Act in Zimbabwe does not rule out any trade of indigenous fruits. Currently the rules regarding the trade of NTFPs are not fully enforced by the Forestry Commission leaving local chiefs and private landowners controlling indigenous fruit trees in the forest to varying degrees (Rukuni et al., 1998). According to Sithole (1996) harvesting “too much” indigenous fruit is not accepted while harvesting during the night or in the early hours is regarded as theft in Zimbabwe.

2.11 Summary

*Uapaca kirkiana* is very important indigenous fruit tree in the livelihood of rural people as it contributes significantly to food security and income. The *Uapaca kirkiana* fruit tree can be used as food, firewood, fodder for animals, income generation, furniture wood, flowers for honey production, medicinal use and provide shade to animals. The fruit can be consumed raw fruit or processed into finished products like porridge, wine, jam, juice and beer. Marketing of *Uapaca kirkiana* is mostly done at local trading centres, urban markets, along the farm gates, within the village and along highway roads.
CHAPTER 3
RESEARCH METHODOLOGY

3.0 Introduction
In the previous chapter, literature reviewed explored the contribution and importance of *Uapaca kirkiana* in improving livelihoods of households. This chapter will discuss the research methods and the instruments used to carry out the research so as to address the main objective of the study which is to evaluate the contribution of *Uapaca kirkiana* to the household income in Domboshawa area. It specifies the research design employed, survey population, area of study, sample size and characteristics, tools and techniques used in data collection, how the research variables were measured, and procedure of the study, data processing and analysis.

3.1 Description of site
The study was conducted in Domboshawa Communal area Goromonzi District, Mashonaland East Province, Zimbabwe. The district is the largest in the province with a population of 224 987 representing 17% of the total population in the province (ZIMSTATS, 2012). Domboshawa area lies on the Latitude 17°36'40" S and the Longitude 31°10'28"E and Altitude range from 1560m to 1650m above sea level. Goromonzi district covers an area of 9100km² with a total of 11 wards (Zim Stats, 2012). Furthermore; it has the highest number of the economically active group with the main activity being agriculture. It was traditionally supported by commercial farmers who grew flowers, field crops and horticultural crops. However, with the fast track land reform program of 2000, these are no longer operational resulting in about 80% being unemployed and vulnerable (Moyo, 2000). Families currently base their livelihoods on subsistence farming and various informal jobs that include exploitation of abundant natural resources such *Uapaca kirkiana* among others.

In Domboshawa area the most predominant natural vegetation include the Miombo woodlands. Domboshawa is a horticultural farming region located in the agro-ecological region 2a which is characterised by annual rainfall of between 750 mm to 1000mm. The area receives its rainfall from November to March and sometimes associated with mid-season dry spells that affect crop growth and maturity. The area is characterized by pity sandy soils with a few patches of red clay soils (Lister, 1987) and the main activity is horticulture production and some field crops especially maize, rapoko, soya beans, ground nuts (ZIMSTATS, 2012).
Figure 4: Goromonzi Map (Source-Goromonzi district Agritex office)
3.2 The Research design

To effectively anticipate the future as stated in the research objectives, there was need to institute a programmatic research process. A case study research design was adopted. The main strength of the approach lies in that it allowed for use of various sources, variety types of data as well as various methods of data collection. Accordingly, a triangulation of research methods was adopted that is qualitative, quantitative and observation of events within the case study setting. Secondary data was also explored. Nevertheless the strength of the approach, the method is weak on the background of generalisation that is sometimes created from its results. Notwithstanding the shortcomings of the approach, this research is supposed to be viewed as only a beginning thus one in a series that will lead in high and long term strategic plans for Non-Timber Fruits Products in Zimbabwe.

3.3 Sampling Procedure

The study applied both probability and non-probability sampling techniques. The study used probability sampling techniques through multi-stage stratified random sampling to address quantitative needs of the study. This decision was mooted considering that a sample must meet aspects of relevancy, completeness, precision while at the same time it must be up to date in meeting with requirements of the study. At first stage, Mashonaland East province was purposively selected since *Uapaca kirkiana* fruits are in abundance in this province and out of 7 districts in Mashonaland East, Goromonzi district was purposefully selected based on having high production of *Uapaca kirkiana* fruits. According to Zim STAT (2012) Goromomzi has 11 wards namely Chinikya, Dzvete, Gutu, Mawanga, Murape, Munyawiri, Mwanza, Pote, Shangure, Rusike and Shumba. Furthermore, in line with the research design presented herein, Ward 4 (Murape) was purposely selected as the case study area due to the fact that *Uapaca kirkiana* is most traded fruit. The ward is made up of five Village Development Committee (VIDCO) incorporating 80 villages (Zim STAT, 2012).

On the third stage, the ward was stratified in to zones based on distance of VIDCO to the Domboshawa Showground market. The study area was categorized in to three strata that is; villages adjacent to the Domboshawa Showground Shopping Centre within 3.5 km represented the first strata, the second strata was of villages 3.5km to 6.5km from the market while the third strata was of a VIDCO which is 6.5km to 10km distance from the Domboshawa Showground Shopping Centre. In view of this, three VIDCOs were randomly selected based on their location to the market with Sarakunze VIDCO being selected to the
first strata, Gangarahwe VIDCO for the second strata and Chivavarirwa VIDCO was selected for third strata.

3.3.1 Selection of villages
Proportionate quota random sampling was used which states that the sample size of each stratum is proportionate to the population size of each stratum when viewed against the entire population. Furthermore, after adding households from selected zones a total of 2360 households was obtained through the assistance from the local Agritex ward 4 Extension officer, headmen and Ward Councilor who provided households data base. Using the Slovin’s formula basing on a 95% confidence internal and a 5% margin of error, a sample size of 342 households was determined which was more than ten percent of the total household in the selected zones.

It is computed as \( n = \frac{N}{1+Ne^2} \).

Where as: 
- \( n \) = no. of samples
- \( N \) = total population
- \( e \) = error margin / margin of error

However, only 300 household heads were finally interviewed due to the unwillingness of other households to participate in the study and unavailability on the period of the survey.

Table 1: Sample sizes.

<table>
<thead>
<tr>
<th>Village name</th>
<th>Number of households</th>
<th>Proportionate sample %</th>
<th>Target household sample</th>
<th>Actual sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gukwe 1</td>
<td>720</td>
<td>30.5</td>
<td>104</td>
<td>80</td>
</tr>
<tr>
<td>Mukonowenzou</td>
<td>120</td>
<td>5.1</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td>Choga</td>
<td>455</td>
<td>19.3</td>
<td>66</td>
<td>50</td>
</tr>
<tr>
<td>Shiriyekudenga</td>
<td>65</td>
<td>2.8</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Muchenje</td>
<td>780</td>
<td>33.0</td>
<td>113</td>
<td>80</td>
</tr>
<tr>
<td>Ndoro</td>
<td>220</td>
<td>9.3</td>
<td>32</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2360</strong></td>
<td><strong>100</strong></td>
<td><strong>342</strong></td>
<td><strong>300</strong></td>
</tr>
</tbody>
</table>

Source: Survey Data (2015)
3.4 Data collection procedure

As earlier on allude to; a triangulation of research methods was employed that is qualitative, quantitative and observation which is considered a system in equilibrium. Qualitative data provided in depth information while quantitative aided in statistical analysis of results. The study used both secondary and primary data sources in the collection of data. The secondary data sources used included journals, non-governmental organisation reports, government reports, World Agroforestry Centre, textbooks and the internet. Information collected included information on the climatic conditions, use of *Uapaca kirkiana* tree, soil type, research gaps in previous studies done on *Uapaca kirkiana*. Secondary data was also used in drafting the questionnaire for the study as well as in formulation of the discussion guides for focus group discussions and key informants interviews. Primary data sources included key informant interviews, focus group discussions, observations and the questionnaires.

3.4.1 Qualitative Research Methods

The researcher developed a semi-structured discussion guide which was used in conducting key stakeholders interviews. The respondents interviewed include Goromonzi Rural district Council officers, Agritex officers, Ward councilor and village heads. The information on the range of months they start and end harvesting was obtained through the key informant interviews. The interviews provided information like the markets of *Uapaca kirkiana* fruits, pricing system for *Uapaca kirkiana* and time of harvesting. In depth interviews were used to gather extensive information given the open-endedness of the questions. The interviews were limited to key informants aiding in understanding the research problem, promoting discussion and as well as help in generating hypotheses for future researches. The findings from interviews were very essential for the drafting and structuring of the questionnaire for the main survey.

Focus groups discussions (FGDs) allowed discussion among respondents. FGDs were used to find out the months when harvesting of *Uapaca kirkiana* fruits starts and ends. FGDs were also used to identify the activities and duties of the household members in harvesting, transporting, marketing and processing of *Uapaca kirkiana* fruits. FGDs made it easy to identify most of the challenges faced by the community in harvesting, marketing, transporting and storage and also in identifying market channels used and different uses of *Uapaca kirkiana*. The information collected from the FGDs was also used in drafting the questionnaire. However, given that FGDs are sometimes affected by some few dominant
people during the discussion thus making the output of the research very biased the researcher grouped the respondents in groups of similar background and socio-economic status. The influential people in the community like the political Figures, business people, local leaders and the civil servants were grouped in their own focus group whilst the poor and the marginalized were in their own focus group. FGDs brought in new ideas which the researcher was not aware of thus adding value in the development of the main research instrument (Questionnaire).

In addition, observations were employed to provide for cross checking of responses given the realities on the ground. The approach was used in drawing up the necessary questions to be asked during interviews. However the main challenge of the approach is lack of consent from study subjects with the researcher keeping their intent a secret in their observation which is unethical. As well chances are high to misinterpret meaning of observed subjects.

3.4.2 Quantitative Research Methods
In view of the requirement of the study, the research employed the use of structured questionnaires for data collection on the basis that a structured questionnaire offers respondents the same possible choices with all questions being presented in the same order. In addition, this was done to allow objective descriptions and comparative measures of study elements through hard statistical data collected. For this study a questionnaire was developed using the research questions as the guideline. It was standardized and structured to gather data on demographics, household economic activities, harvesting and marketing of Uapaca kirkiana and household food security status. In addition, the questionnaire was pre-coded with options of open ended to allow for depth of information. In formulating the questions, the researcher ensured that clarity; simplicity, precision, neutrality and sensitivity issues were addressed. Simple questions were used to reduce confusing the participants.

The questionnaire was peer reviewed by colleagues and most importantly by the supervisor who have experience in project development and analysis. The questionnaire was also pilot tested. It is worth noting that this was critical given that piloting allows for checking efficiency and adequacy of the questionnaire to answer to research objectives among other factors. The process improved the questionnaire for clarity. The questionnaires were administered to selected household. Additionally, participants observation whilst administering the questionnaires and during data collection was done.
3.5 Data Analysis.

The process of analysing information was considered during questionnaire designing to enable easy understanding of data. The general operation required for data handling in quantitative method include checking data, correcting errors and describing data failures among others and to identify errors with respect to objectives, pre-coding and editing of data entry was done. Quantitative data analysis used descriptive statistics to describe the household demographic information which includes gender, age, level of education, marital status, religion, family size. This was undertaken using SPSS version 20.0 to allow the breaking down of data into constituent parts to obtain answers to research questions.

To find out if the contribution of *Uapaca kirkiana* fruits to household income vary according to marketing channel used, one way Analysis of Variance (ANOVA) and T-test analysis was used to compare the three groups that are the villages adjacent to the market and villages not close to the market on certain variables. Linear Regression analysis was used to identify variables in the study that affect the contribution of *Uapaca kirkiana* fruit to household income in Domboshawa. Data presentation used tables, graphs and pie charts.

In view of qualitative data, while it can both be analyzed using the traditional manual way and using various software, lack of access of appropriate software provided that data be analysed using the traditional manual way. In this regard, data collected was decoded into themes in order to draw conclusions, important themes patterns and relationships. Analysis of qualitative data started during data collection as well as after with observed data also aiding in answering to gaps in information gathered.

Linear regression analysis is a statistical tool used for the investigation of relationships between variables, usually to ascertain the casual effect of one variable upon another (Shingleton, 2012). Using the Linear Regression model, Y will be the contribution of *Uapaca kirkiana* to household income and X1 to X10 were the independent variables. The model will be as follows: (Y/X) = α + β1X1 + β2X2 + β3X3 + ……………..β11X10 + e

Where:

- α is the intercept and β1 to β11 are coefficients
- Y is the contribution of *Uapaca kirkiana* fruits to household income
- X1 is the age of the household head
- X2 is the size of family
\(X_3\) is the distance to the forest
\(X_4\) is the distance to the market
\(X_5\) is the number of years harvesting \textit{Uapaca kirkiana} fruits (experience)
\(X_6\) is the maximum distance travelled to harvest the fruits
\(X_7\) is the number of 20 litre buckets of fruits harvested (quantity)
\(X_8\) is the price of the fruit
\(X_9\) the number of uses of the fruit
\(X_{10}\) is the number of years staying in the ward

The age of the respondents was given in years and the respondent stated their ages in the questionnaire and also size of the family. The distance to the forest where the fruit is being harvested were given as an average distance travelled which was measured in kilometers. Distance to the market was also measured in kilometers calculated as distance from respondents’ homestead to the market place. The price of the fruit was measured in US$ as an average price calculated from onset of season price, peak season price and end of season price. The numbers of uses of the \textit{Uapaca kirkiana} fruit were given by respondents by stating the different uses of the fruit. The time the respondents stay in Domboshawa Ward 4 were given in years. The quantity fruits harvested and sold was captured in 20 litre buckets.

The total household income from \textit{Uapaca kirkiana} was calculated by the formula
\[
(\text{Household total income}) = \text{value of } Uapaca kirkiana \text{ sold} + \text{value of } Uapaca kirkiana \text{ consumed} + \text{value of } Uapaca kirkiana \text{ brewed} + \text{value of } Uapaca kirkiana \text{ baked} + \text{value of } Uapaca kirkiana \text{ donated}.
\]

Opportunity cost was used to calculate the value of \textit{Uapaca kirkiana} consumed, brewed, baked and donated.

3.6 Limitations of the Study

Since \textit{Uapaca kirkiana} fruit is harvested and market in Domboshawa and other parts of Zimbabwe, the study was limited to Goromonzi district specifically Murape ward 4. This study had some problems in the availability and accessibility of the required secondary data, which makes the basis of preliminary analysis done to inform important aspects of the study. When collecting data, some of the respondents had some problems in recalling past amount of fruit collected and income data. Furthermore, some of the fruit collectors were also not willing to share some of their farm production data such that they sometimes under or over
reported. These limitations were addressed by clearly explaining to the respondents the purpose of the study and ensuring maximum confidentiality and by respecting the respondent’s right to privacy.

3.7 Summary
The chapter provided clearly the methodology employed in the study detailing the research plan that was used in data collection in line with the objectives of the study. Also, it discussed both the quantitative and qualitative techniques which were adopted. Furthermore, the sample size has also been outlined and the research tools, which were the questionnaires, have been discussed with particular emphasis on their advantages and disadvantages. Consequently, the preceding chapter explores the research findings of the research study in detail.
CHAPTER 4
RESULTS

4.0 Introduction
The results from the study are presented in this Chapter. Tables, Figures and descriptive narrations were used to present the results. The chapter starts with description of the respondents interviewed and their survival strategies. Results on the uses and marketing of *Uapaca kirkiana* fruits in the study area are also presented in this chapter. The Chapter concludes with a presentation of results on the factors affecting contribution of *Uapaca kirkiana* fruits to household income in Domboshawa District.

4.1 Household demographic characteristics.

4.1.1 Gender and level of education of respondents
A total of 300 household heads who were involved in the harvesting and marketing of *Uapaca kirkiana* fruits were interviewed with 36.7% being male and 63.7% female. This shows that harvesting and marketing is mostly practised by females. The majority of the interviewed household heads (57%) had attained secondary education while only 1% did not attend any formal education as shown in Table 2.

<table>
<thead>
<tr>
<th>Education level</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No formal education</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Primary education</td>
<td>106</td>
<td>35.3</td>
</tr>
<tr>
<td>Secondary education</td>
<td>171</td>
<td>57.0</td>
</tr>
<tr>
<td>Tertiary education</td>
<td>18</td>
<td>6.0</td>
</tr>
<tr>
<td>Informal</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>300</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Source:** Survey Data (2015)

4.1.2 Marital status and age of respondents
Majority (58%) of the respondents were married as shown in Figure 5. The oldest respondent was aged 70 years and the youngest was 20 years old. The average age of respondents was
47.48 years and this shows that most the respondents are of the middle age and were still economically active.

![Marital status of respondents](image_url)

**Figure 5: Marital Status of respondents by zones (Source: Survey data 2015)**

### 4.1.3 Employment status of respondents

The unemployment rate in the study site was high (34.7%) and only 8.3% people were formally employed as shown in table 3. The majority (57%) of the respondents were in the informal sector.

<table>
<thead>
<tr>
<th>Employment status</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployed</td>
<td>104</td>
<td>34.7%</td>
</tr>
<tr>
<td>Formal sector</td>
<td>25</td>
<td>8.3%</td>
</tr>
<tr>
<td>Informal sector</td>
<td>117</td>
<td>57.0%</td>
</tr>
<tr>
<td>Total</td>
<td>300</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Table 3: Employment status**

*Source: Survey Data (2016)*

### 4.2 Household economic activities

#### 4.2.1 Agricultural Activities Practiced

Results show that the main agricultural activities practiced across all zones are vegetable production (93.3%) and crop production (93%). Chivavarirwa zone records above total
mention in the two activities. On the other hand, livestock production is also a notable practice recording 49.7% mainly prevalent in Gangarahwe zone (62.5%) shown in Figure 6. Chivavarirwa zone (41.8%) recorded the lowest in the livestock activities.

![Activities by zones](image)

**Figure 6: Activities by zones (Source: Survey Data 2015)**

### 4.2.2 Household sources of income

Findings revealed that income sources range from gardens, livestock, field crops, *Uapaca kirkiana* and other activities such as employment and trading. Annually farmers across these sources realise from as low as US$10-00 from *Uapaca kirkiana* fruits to as high as US$260-00 from other activities as shown in Table 4.

**Table 4: Household sources of income 2015/16 season (Source: Survey data 2016).**

<table>
<thead>
<tr>
<th>Income source</th>
<th>Minimum per year (US$)</th>
<th>Maximum per annum (US$)</th>
<th>Mean per annum (US$)</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden crops</td>
<td>0</td>
<td>600</td>
<td>168.25</td>
<td>123.258</td>
</tr>
<tr>
<td>Livestock</td>
<td>0</td>
<td>4000</td>
<td>165.60</td>
<td>391.870</td>
</tr>
<tr>
<td>Field crops</td>
<td>0</td>
<td>2000</td>
<td>130.29</td>
<td>153.851</td>
</tr>
<tr>
<td><em>Uapaca kirkiana</em> fruits</td>
<td>10</td>
<td>260</td>
<td>66.91</td>
<td>40.380</td>
</tr>
<tr>
<td>Other activities</td>
<td>0</td>
<td>6200</td>
<td>493.66</td>
<td>1015.447</td>
</tr>
</tbody>
</table>
Livestock sales also provide considerable average income of US$165.60 per income for households against US$130.29 from field crops. Results also show that *Uapaca kirkiana* fruit sales can raise a maximum of US$260-00 annually with an average of $66.91 as shown in Table 4.

### 4.3 Household Food Security status

Majority of respondents (59.7%) are food insecure in comparison to previous seasons with a 38% combined mention of fair and better off status while only 2.0% on total mention reported no change in food security status.

![Food access by zones (Source: Survey Data 2015)](image)

Results also show that both Sarakunze (67.3%) and Chivavarirwa VIDCOs (61.8%) are the most food insecure zones recording above total mention across zones. Gangararawe records fairly above total mention in fair (33.8%) and better (16.3%) food access level responses as shown in Figure 7. On no change food access Gangararawe recorded the highest percentage (3.8%) followed by Sarakunze with 2.7% and total mention recorded 2.0% as shown in Figure 7.
4.3.1 Factors influencing food security

Majority (43.3%) of the respondents across zones indicated that drought is the main key factor influencing food security though in Chivavarirwa the factor is lowly recorded (31.8%) Gangarahwe (51.3%) recorded the highest on drought factor as shown in Figure 8.

The second most important factor is lack of inputs (18.7%) mainly reported in Sarakunze (27.3%) and Chivavarirwa (19.1%) with a low mention in Gangarahwe (6.3%). The lack of water sources was cited most in Chivavarirwa (24.5%) against a total mention of 15.3% across zones. On the other hand, in Gangarahwe most respondents (26.3%) could not provide details of the factors influencing food security.

4.4 Household sources of food.

The main strategy being used to avert food insecurity is the engagement in food and livestock activities (49%) across zones with Gangarahwe (73.8%) recording the highest and Sarakunze (47.3%). In addition, gardening is the second most important strategy (28%) mostly practiced in Sarakunze (35.5%), Chivavarirwa (31.8%) while Sarakunze recorded the least 12.5%. Harvesting and Trading of NTFPs is mostly prevalent in Chivavarirwa recording 31.8% against 15.3% total mention across zones. Also, food for work programs is an alternative with the exception of Chivavarirwa 0.9% as shown in Figure 9.
4.5 Harvesting and Marketing of Uapaca kirkiana fruits

4.5.1 Harvesting of Uapaca kirkiana fruits

It was observed that the traditional method to assess the correct timing of *Uapaca kirkiana* fruit harvest was to rely on natural processes such as natural abscission and then gather fruits from the ground. In situations where the trees are short, collection is done directly while for tall trees, collection involves climbing or beating the tree using a stone or others tool to shake off the fruit. However, earlier fruit harvesting by forcefully dislodging unripe fruits is now being commonly practiced.
Uapaca kirkiana fruits collection is mainly done by women (88%) and youth (73%). Moreover, it was revealed that during focus groups harvesting practices differ between men and women with men mostly involved in collection trips where fruits have been harvested further afield. From the Figure 10, results show that harvesting of fruits is a family activity with the exception of men who recorded 79% non-participation.

4.5 Uapaca kirkiana harvesting regulations.

From the study, qualitative data revealed that while legislation on harvesting wild fruits in Southern Africa is restrictive; in Zimbabwe the communal land areas forest produce Act does not rule out any trade in indigenous trees. In this view, people can trade officially upon acquiring a permit from local rural councils with councils also required to get a permit from the Forestry Commission. However, it is clear from findings that mention of these rules was not recorded as both Sarakunze and Chivavarirwa had 0%, a clear sign that these are not being enforced as shown in Fig 11.

![Harvesting regulations](image)

Figure 11: Harvesting regulations by zones (Source: Survey Data 2015).

It was also observed that where trees fall within homestead and fields, owners of these pieces of land will take ownership of the resources. Most importantly, results shown in Figure 11 confirm that harvesting during the day is the acceptable system which recorded highest mention across all the zones; Chivavarirwa recorded 87.3%, Sarakunze 66.4% and
Gangarahwe with 20.0%. It was observed that harvesting during the night or early hours is prohibited and considered as theft or trespassing. In addition, the cutting down of indigenous trees is reported mostly in Gangarahwe area with 13.8% but Chivavarirwa recorded 0% largely attributed to the fact that being far off the market. Chivavarirwa zone can be considered as most rural and traditional leaders are still actively involved in the management natural resources unlike in other zones which are slowly being urbanised. A high no mention of rules was also noted; a clear sign that respondents lack information with regards to the rules and regulations in the harvesting and marketing of indigenous fruit trees. Gangarahwe recorded highest no mention of 58.8%, Chivavarirwa 12.7% and Sarakunze 32.7% and this shows that respondents were not aware of the rules and regulations regarding the harvesting and marketing of *Uapaca kirkiana* fruits as shown in Figure 11.

4.5.1 *Uapaca kirkiana* harvesting challenges.

The research identified various problems being encountered in harvesting. The findings are presented in the Figure 12. The results show that problems are the same across the study area. It must be noted that competition among communities is the main challenge as a result of overexploitation. Competition among communities recorded the highest responses with Gangarahwe 58.8%, Chivavarirwa 36.4% and Sarakunze recording 21.8%. Distance is another major challenge faced by respondents in the harvesting of the fruit across all the zones as indicated in Figure 12; Sarakunze recorded 26.4%, Gangarahwe 20% and Chivavarirwa recorded 16.3%.

Competition among the communities has also led to the fruits being exhausted thus fruit become scarce resulting in communities having to travel long distances to fetch fruits. Other challenges such as labour issues, veld fire, tree ownership and competition with wild animals’ record low mention but compliment the list as shown in Figure 12. Over exploitation is another challenge faced in the harvesting of the fruit across the study area as shown in Figure 12 Sarakunze recorded 26.4%, Gangarahwe 11.3% and Chivavarirwa 21.8%.
4.6 Marketing of Uapaca kirkiana fruits (channels)

The main marketing channels used by respondents are agriculture markets, middlemen, farm gate and roadside markets across all the zones as shown in Table 5. Middlemen had the maximum number of 100 buckets of *Uapaca kirkiana* sold with an average of 11.09 buckets per household while a maximum of 75 buckets at an average of 13.92 buckets per household were sold at an average price of $2 per bucket at agricultural markets. A maximum of 35 buckets and an average of 0.4 buckets of *Uapaca kirkiana* fruits were sold through other market channels like door to door as shown in Table 5.

Table 5: *Uapaca kirkiana* quantities across marketing channels

<table>
<thead>
<tr>
<th>Channel</th>
<th>Minimum buckets</th>
<th>Maximum buckets</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agric-market</td>
<td>0</td>
<td>75</td>
<td>13.92</td>
<td>11.64</td>
</tr>
<tr>
<td>Processors</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Roadside</td>
<td>0</td>
<td>34</td>
<td>2.61</td>
<td>4.93</td>
</tr>
<tr>
<td>Farm gate</td>
<td>0</td>
<td>21</td>
<td>3.47</td>
<td>4.06</td>
</tr>
<tr>
<td>Middlemen/speculators</td>
<td>0</td>
<td>100</td>
<td>11.09</td>
<td>13.72</td>
</tr>
<tr>
<td>Other channels</td>
<td>0</td>
<td>35</td>
<td>0.40</td>
<td>2.57</td>
</tr>
</tbody>
</table>

Source: Survey data (2015).
4. 6.1 Marketing channels used across the zones
The results reveal that the issue of access to markets and speculators are mainly topical in areas closer to the markets Sarakunze VIDCO (20.9%) while the aspect of middlemen affects the far areas which do not have direct links with the markets. Chivavarirwa and Gangarahwe zones by virtue of being far off markets recorded less than 3% fruit sales on the roadside marketing channel. Respondents mainly used middlemen and agriculture markets as their selling channels across all the zones. The middlemen marketing channel recorded the highest channel used with Chivavarirwa recorded 53.6%, Gangarahwe 43.8% and Sarakunze recorded 18.2% as shown in Figure 13.

Agricultural markets were also mainly used by respondents in the marketing of Uapaca kirkiana fruits across all zones; Sarakunze recorded the highest 49.1%, Gangarahwe 37.5% and Chivavarirwa 28.2%. Speculators were also used 20.9% of the respondents in Sarakunze, 11.3% Gangarahwe and 13.6% Chivavarirwa as shown in Figure 13. Farm gate and roadside marketing channels are used by less than 5% of the respondents in all the study sites.

4. 6.2 Marketing challenges in the marketing of Uapaca kirkiana fruits
A wide range of factors were identified as challenges faced by household in the marketing of Uapaca kirkiana fruits as shown in Figure 14. The aspect of low market prices largely attributed to the involvement of middlemen as well as product over supply is a major threat to
the enterprise. The issue of low market prices is the main challenge faced by respondents across all the zones as shown in Fig 14; Gangarahwe recorded 81.3%, Sarakunze 56.4% and Chivavarirwa with 55.5%. In addition, findings show that high perishability and increased incidences of damage of fruits during transportation as key attributes which have a bearing on the quality of product thus influencing prices. The other marketing challenges like shortage of markets, middlemen involvement, unavailability of transport, over supply were mentioned by less than 10% of the respondents across all zones as shown in the graph 14.

![Figure 14: Challenges in marketing Uapaca Kirkiana (Source: Survey data 2015)](image)

4.7 Uses of *Uapaca kirkiana* by zones

The main use of *Uapaca kirkiana* fruit is cash sales with more than 90% of the respondents in all sites highlighting as the main use as shown in Figure 15. Other uses mentioned by less than 5% of the respondents include barter trade, consumption, donation and brewing as shown in Figure 15.
Figure 15: *Uapaca kirkiana* uses (Source: Survey Data 2015)

4. 7.1 Quantity of *Uapaca kirkiana* fruits used.

The household which sold the least quantity of *Uapaca kirkiana* fruit had sold 5 buckets (20 litre) while for brewing, barter trading, donation and other uses it was zero. On average 32.2, 5.66, 11.96, 0.73 and 0.01 buckets were used by each household for cash sale, barter trading, consumption, donation and other uses respectively as shown in Table 6. The results shows that value addition of fruits to make products were practiced at very low level with only a maximum of 3 buckets reported used for making bread, buns, sweet beer “maheu” and porridge by respondents. This is mainly practiced in Chivavarirwa VIDCO and these products were not sold but it was only for domestic consumption as shown in Table 6.

Table 6: Quantity (kg) of *Uapaca kirkiana* fruit used (Source: Survey Data 2015)

<table>
<thead>
<tr>
<th>Use</th>
<th>minimum</th>
<th>Maximum</th>
<th>mean</th>
<th>Standard deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buckets sold cash</td>
<td>5</td>
<td>120</td>
<td>32.20</td>
<td>18.14</td>
<td>329.16</td>
</tr>
<tr>
<td>Buckets barter traded</td>
<td>0</td>
<td>30</td>
<td>5.66</td>
<td>5.57</td>
<td>30.00</td>
</tr>
<tr>
<td>Buckets consumed</td>
<td>0</td>
<td>30</td>
<td>11.96</td>
<td>4.50</td>
<td>30.00</td>
</tr>
<tr>
<td>Buckets donated</td>
<td>0</td>
<td>10</td>
<td>0.73</td>
<td>0.90</td>
<td>4.22</td>
</tr>
<tr>
<td>Buckets for other uses</td>
<td>0</td>
<td>3</td>
<td>0.01</td>
<td>0.00</td>
<td>0.03</td>
</tr>
</tbody>
</table>
4.7.2 Income variation across marketing channels

Results on income variation across marketing channels are presented in Table 7 and the significant difference is limited to middlemen and speculators marketing channels.

Table 7: Income across marketing channels

<table>
<thead>
<tr>
<th>Dependent Variable: Source of income from <em>Uapaca kirkiana</em></th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(I) Marketing channels</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mean Difference (I-J)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Standard Error</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sig.</strong></td>
<td></td>
</tr>
<tr>
<td>Farmgate</td>
<td></td>
</tr>
<tr>
<td>Middlemen</td>
<td>-16.64</td>
</tr>
<tr>
<td>Speculators</td>
<td>-1.31</td>
</tr>
<tr>
<td>Agric Markets</td>
<td>-11.49</td>
</tr>
<tr>
<td>Roadside</td>
<td>-6.09</td>
</tr>
<tr>
<td>Middlemen</td>
<td>16.64</td>
</tr>
<tr>
<td>Speculators</td>
<td>15.33*</td>
</tr>
<tr>
<td>Agric Markets</td>
<td>5.15</td>
</tr>
<tr>
<td>Roadside</td>
<td>10.55</td>
</tr>
<tr>
<td>Speculators</td>
<td>1.31</td>
</tr>
<tr>
<td>Middlemen</td>
<td>-15.33*</td>
</tr>
<tr>
<td>Agric Markets</td>
<td>-10.19</td>
</tr>
<tr>
<td>Roadside</td>
<td>-4.78</td>
</tr>
<tr>
<td>Agric Markets</td>
<td>11.49</td>
</tr>
<tr>
<td>Middlemen</td>
<td>-5.15</td>
</tr>
<tr>
<td>Speculators</td>
<td>10.18</td>
</tr>
<tr>
<td>Roadside</td>
<td>5.40</td>
</tr>
<tr>
<td>Roadside</td>
<td>6.09</td>
</tr>
<tr>
<td>Middlemen</td>
<td>-10.55</td>
</tr>
<tr>
<td>Speculators</td>
<td>4.78</td>
</tr>
<tr>
<td>Agric Markets</td>
<td>-5.40</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.

Source: Survey Data (2016)

The table 7 shows that the significance difference of income varying across marketing channels is noted only across middlemen and speculators recording a p value of 0.29. The mean difference of middlemen is significant in ward 4 which is the main channel used by respondents across zones. The middlemen and speculators have a mean income difference of about 15.33 as shown in Table 7. The mean income difference between agricultural markets and middlemen marketing channels is 5.15 which show no significant difference recording a p value of 0.33. This means income obtained from the two channels is similar.
Table 8: Marketing channels income by zones

<table>
<thead>
<tr>
<th>Channel</th>
<th>VIDCO</th>
<th>Minimum(US$)</th>
<th>Maximum($)</th>
<th>Average($)</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm gate</td>
<td>Sarakunze</td>
<td>0</td>
<td>180</td>
<td>9.05</td>
<td>18.85</td>
</tr>
<tr>
<td></td>
<td>Gangarahwe</td>
<td>0</td>
<td>24</td>
<td>6.7</td>
<td>6.39</td>
</tr>
<tr>
<td></td>
<td>Chivavarirwa</td>
<td>0</td>
<td>40</td>
<td>7.00</td>
<td>8.64</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>180</td>
<td>7.63</td>
<td>13.00</td>
</tr>
<tr>
<td>Middlemen</td>
<td>Sarakunze</td>
<td>0</td>
<td>80</td>
<td>20.26</td>
<td>19.08</td>
</tr>
<tr>
<td></td>
<td>Gangarahwe</td>
<td>0</td>
<td>70</td>
<td>11.69</td>
<td>17.74</td>
</tr>
<tr>
<td></td>
<td>Chivavarirwa</td>
<td>0</td>
<td>200</td>
<td>30.38</td>
<td>32.14</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>200</td>
<td>21.66</td>
<td>25.42</td>
</tr>
<tr>
<td>Agriculture markets</td>
<td>Sarakunze</td>
<td>0</td>
<td>120</td>
<td>27.55</td>
<td>22.94</td>
</tr>
<tr>
<td></td>
<td>Gangarahwe</td>
<td>0</td>
<td>60</td>
<td>21.00</td>
<td>18.01</td>
</tr>
<tr>
<td></td>
<td>Chivavarirwa</td>
<td>0</td>
<td>150</td>
<td>31.38</td>
<td>27.89</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>150</td>
<td>27.36</td>
<td>24.05</td>
</tr>
<tr>
<td>Roadside</td>
<td>Sarakunze</td>
<td>0</td>
<td>60</td>
<td>6.81</td>
<td>11.45</td>
</tr>
<tr>
<td></td>
<td>Gangarahwe</td>
<td>0</td>
<td>24</td>
<td>2.5</td>
<td>6.01</td>
</tr>
<tr>
<td></td>
<td>Chivavarirwa</td>
<td>0</td>
<td>45</td>
<td>4.67</td>
<td>8.84</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>60</td>
<td>4.88</td>
<td>9.42</td>
</tr>
<tr>
<td>Other channels</td>
<td>Sarakunze</td>
<td>0</td>
<td>10</td>
<td>0.29</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>Gangarahwe</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Chivavarirwa</td>
<td>0</td>
<td>60</td>
<td>0.24</td>
<td>6.34</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0</td>
<td>60</td>
<td>0.56</td>
<td>3.96</td>
</tr>
</tbody>
</table>

Source: Survey data (2015)

On farm gate marketing channels, households from Sarakunze got the highest income of US$180 and an average of US$9.05 per respondent from the sale of *Uapaca kirkiana* fruits as shown in Table 8. Middlemen provided the highest income of US$200 in Chivavarirwa VIDCO with an average of US$30.38; Sarakunze and Gangarahwe had maximum income of US$80 and US$70 respectively. As shown in Table 8, roadside had a maximum of US$60 in Sarakunze VIDCO against an average of US$6.81 while Gangarahwe had a maximum income of US$24. All sites in the study area in all marketing channels recorded a minimum of zero income which means some respondents were not using other marketing channels as indicated in Table 8. Other channels were used to market the fruit like door to door, children were mainly involved in the door to door marketing channel.
4.7.3: Factors affecting contribution of *Uapaca kirkiana* to Household Income.

The R square value of 66.7% shows that 66.7% of the variations in the contribution of *Uapaca kirkiana* to household income can be fully described by the independent variable in the model. The contribution of *Uapaca kirkiana* fruit to income of households which is significantly affected by age of respondent, amount of *Uapaca kirkiana* harvested and quantity used for barter trade.

Table 9: Factors affecting contribution of *Uapaca Kirkiana* to income

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>24.23</td>
<td>8.215</td>
<td>2.95</td>
<td>0.003</td>
</tr>
<tr>
<td>Age of respondent</td>
<td>-0.402</td>
<td>0.186</td>
<td>-2.16</td>
<td>.031*</td>
</tr>
<tr>
<td>What is your family size</td>
<td>0.178</td>
<td>0.864</td>
<td>0.20</td>
<td>0.837</td>
</tr>
<tr>
<td>How many years have you been residing at Domboshawa</td>
<td>0.167</td>
<td>0.142</td>
<td>1.17</td>
<td>0.243</td>
</tr>
<tr>
<td>How many years have you been harvesting <em>Uapaca kirkiana</em></td>
<td>0.054</td>
<td>0.125</td>
<td>0.43</td>
<td>0.664</td>
</tr>
<tr>
<td>What is the maximum distance you travel to harvest fruits</td>
<td>-0.686</td>
<td>0.717</td>
<td>-0.95</td>
<td>0.339</td>
</tr>
<tr>
<td>How many 20litre buckets did you harvest last season</td>
<td>1.356</td>
<td>0.072</td>
<td>18.73</td>
<td>.000*</td>
</tr>
<tr>
<td>Quantity used for barter trade</td>
<td>-1.023</td>
<td>0.277</td>
<td>-3.696</td>
<td>.000*</td>
</tr>
<tr>
<td>Quantity used for donation</td>
<td>-0.425</td>
<td>0.344</td>
<td>-1.236</td>
<td>0.217</td>
</tr>
<tr>
<td>Quantity used for consumption</td>
<td>-0.473</td>
<td>0.304</td>
<td>-1.556</td>
<td>0.121</td>
</tr>
<tr>
<td>Quantity used for other uses</td>
<td>-0.616</td>
<td>7.981</td>
<td>-0.077</td>
<td>0.939</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Source of income from *Uapaca kirkiana* (*Source: Survey data 2015*).

* Significant variables

**Model summary**

R = **0.817**, R Square= **0.667** and Adjusted R square= **0.656**
The age of respondent (-0.402) negatively affect significantly income contribution from the fruit as age of household had increased the contribution of *Uapaca kirkiana* to household income decreases. Age negatively affect the quantity of fruit harvested thereby leading to reduction in income realised from the marketing of *Uapaca kirkiana* fruits. The quantity of the fruit used for better trade significantly affect the income contribution of the fruit (P=0.003). The more the fruit used for barter trade (-1.023) the lesser the fruit left for cash sales and this will eventually significantly affect income contribution from the sale of *Uapaca kirkiana* fruits (P=0.00). The quantity of *Uapaca kirkiana* fruits harvested last season 2014/15 (1.356) positively affects the contribution of *Uapaca kirkiana* to household income. As the quantity harvested increases, the contribution of *Uapaca kirkiana* fruits income also increases and the respondents indicated that last season 2014/15 experienced a poor harvest of the fruit.

The Standardized Coefficient (Beta) these are coefficient that is obtained after standardized all the variables in the Regression Model including the dependent and independent variables. The Beta coefficient is used to compare the magnitude of the coefficient to find out which one has more effect to the contribution of *Uacapa kirkiana* fruits to household income in Domboshawa ward 4 respondents. Hence, larger Beta are associated with larger t-values and lower p-values (p<0.05). From Table 6, the independent variable of number 20litre buckets harvested 2014/15 season has a Beta coefficient of 0.904 associated with a high t-value of 18.73 and a lower p-value of 0.000 which is less than 0.05. Hence the number of 20litre buckets harvested last season 2014/15 shows a significant effect to the contribution of the *Uapaca kirkiana* fruit to households’ income in Domboshawa Ward 4.

### 4.8 Chapter Summary

The findings and results of this study confirm to the earlier perception regarding the fact that *Uapaca kirkiana* fruits can contribute significantly to the socio-economic livelihood of communities particularly in the study area. The growing population together with a decline of disposable income in the population has increased the uses and competition for the fruits. Instead, the non-existence of a tenure system, which clearly specifies the ownership and user rights of the indigenous fruit trees and fruits, has made it difficult to manage and control the use of the fruits. The study noted that while regulations exist, the majority of them are traditional norms. It is reported that harvesting of fruits is mainly done by women with the help of children. Nevertheless, men are taking up the initiative due to hunger and poverty.
The marketing of fruits is hindered mainly by low market prices as a result of oversupply and competition as well as due to lack of reliable markets. It is clear that while stakeholders are privy to various available value addition knowledge with a few respondents adopting some, very little is being done on the area of full implementation of beneficiation to enhance sustainability of the enterprise. It would seem that current value addition initiatives being applied are being run by default and not a product of strategic policy formulation and implementation by government and development partners. This is as a result of purely lack of stakeholder engagement.
CHAPTER 5
DISCUSSIONS

5.0 Discussions
This Chapter discuss the results presented in Chapter 4 and seeks to compare the results with other studies on the uses, harvesting methods, marketing channels used and the contribution of *Uapaca kirkiana* fruits to household income of respondents. The chapter start by discussing the socio-economic status of the rural communities of the study area. The chapter further on discusses the uses and importance of *Uapaca kirkiana*, harvesting and marketing of the fruit. Lastly, the chapter presents a discussion on the factors affecting contribution of *Uapaca kirkiana* fruit to household income.

5.1 Discussions on the fruit harvesters, uses and importance of *Uapaca kirkiana* fruit in Domboshawa area.
The gathering of *Uapaca kirkiana* fruits is done by rural communities as a way to get income and food; findings indicated that collection of the fruit is mainly done by women (63.7%) and children. This study confirms with what other sources have reported on women and children as being the main fruit collectors (Schreckenberg, 2004 and Ruiz – Perez *et al.*, 1997). According to Schreckenberg (2004), in Benin shea tree (*Vitellaria paradoxa*) is considered a god given product which promotes livelihood of women in rural areas. According to Ruiz-Perez *et al.*, (1997) reported that women were the major indigenous fruit collectors and decision makers in the selling of indigenous fruits. Women are mainly involved in many household activities; most of the women stay in the rural areas and are unemployed so they need a reliable source of income (Museumwa *et al.*, 2013). According to Akinnifesi *et al.*, (2011) reported that collection of NTFPs are of great importance in enhancing rural households level of income by creating and expanding opportunities among women in rural areas. Carr and Hartl (2008) also reported similar to the study that NTFPs is a sector that provides good promise for women by enhancing the reduction of poverty and opportunities for the greater involvement of women.

The participants mostly involved in the harvesting and marketing of *Uapaca kirkiana* fruit were married respondents and female adults. The results support studies carried out in Zambia on *Uapaca kirkiana* fruits and other NTFPs by Mwanza and Kwesiga (1994) and Mkonda *et al.*, (2003) who found that 81% of *Uapaca kirkiana* fruit harvesting and marketing
was done by females of which 92% were married and between age of 21 and 41 years. The results indicated that in Domboshawa ward 4 most of the respondents were experiencing food shortage especially those in Gangarahwe and Sarakunze VIDCO. The main factor contributing to food insecurity as indicated by 80% respondents is due to erratic rainfall which resulted in poor crop harvest which in turn led to food shortages which last for 3 to 4 months per season. The findings from the current study are similar with the results of Akinnifesi et al., (2004) a study of household food security in Mozambique, Malawi and Zambia reported that 60-85% of rural people do not have access to adequate food for a period of three to four months per year forcing households to depend on indigenous fruits for their survival during that period of inadequate food.

The findings from the survey shows that rural households do not depend on single livelihood activity, people in rural areas choose a combination of activities that contribute to their multiple needs and give the greatest utility. The study is in line with findings of Mithofer and Waibel, (2003) which reported that rural people survive on different strategies to meet their multiple objectives so as maximising their utility (Scherr, 1995).

The results on figure 15 shows that *Uapaca kirkiana* fruits are mostly traded for cash with Sarakunze 95.5% quantity of the fruit was sold, Gangarahwe 98.7% and also 90.9 quantity of the fruit was sold in Chivavarirwa. The results are similar to report by Maghembe et al., (1998) that more than 90% of the fruits are used for cash sales. Furthermore, the main reason for selling the fruit is that it presents a survival strategy by households to meet specific cash needs and provide food security (Campbell et al., 2002). In agreement to past reports by Clarke et al., (1998), findings shows that besides trading; brewing and consumption were also recorded especially during the rainy season. The findings concur with those by Chidumo et al., (1997) that the benefits of selling *Uapaca kirkiana* fruits are for cash and non-cash income for households though benefits change across years depending on yields.

The results from the study show that forest constituted an integral component of the livelihoods of rural people through provision of indigenous fruit tress like *Uapaca kirkiana*. Likewise, the various uses which the respondents pointed out emphasized the importance that *Uapaca kirkiana* fruits provide to people. IFTs such as *Uapaca kirkiana* fruit are instrumental to meet a wide range of needs like for food consumption, income generation, medicinal benefits and employment creation (Akinnifesi et al., 2008). In line with Coomes et al.,
results confirm that natural resources such as *Uapaca kirkiana* fruits provide a very important source of livelihood income for rural people thus offer safety nets in times of need. In addition, rural households use natural resources to meet their energy needs, for construction and roofing materials, fodder for livestock, and medicine with wild fruits supporting a healthy diet. Consistent with earlier reports by (Akinnifesi et al., 2008) income from *Uapaca kirkiana* is regularly used to fund other income making activities, such as crop production.

According to Braedt (2003), livelihoods comprise of the capabilities, assets, and activities required for a means of living. Respondents noted that they turned in to fruits collection only as the last resort when all other avenues are difficult to exploit like employment or farming. The respondents utilize *Uapaca kirkiana* fruits as a resource which helps them to earn an average income of US$66.91 annually as it has been noted that some of them engage in the commercialization of the fruits. Natural forests have been seen to be important as part of the general livelihood strategy since they are an integral part of the people's everyday livelihood.

### 5.2 Discussions on *Uapaca kirkiana* fruit harvesting.

Commercialization and concomitant proceeds attracts more individuals from different area in the gathering and marketing of these fruits. Given that the area under study is heavily endowed with *Uapaca kirkiana* tree and also close to Harare, it has witnessed fruit poachers mainly from the Harare city. The main method of harvesting involves shaking trees and gathering of naturally abscised was observed confirming earlier results by McGregor (1991; Kadzere et al., 2001; Ramadhani 2002). The forcibly dislodging of unripe fruits has been reportedly worsened by a lot of competition among communities and as well during periods of drought, a clear sign that the indigenous fruits are an important source of livelihood for the communities (Akinnifesi et al., 2004). From the results on Figure 12 on the *Uapaca kirkiana* fruit harvesting problems, competition among the communities appear to be the major problem with Sarakunze 21.8%, Gangarahwe 58.8% and Chivavarirwa 36.4%. Nevertheless, fruits are damaged during dislodging even when they are unripe and this result in postharvest darkening (Kadzere et al., 2006).

The harvested fruits are sold by the locals as well as by fruit poachers who sale on either the highway to Harare, Domboshava showground market and or some transported to Harare city and neighbouring areas. However, the coming of fruit gatherers from other places especially
Harare resulted in conflicts between these fruit poachers and local communities. Furthermore, given that most respondents solely depends on *Uapaca kirkiana* for fuel wood, it was also noted in line with findings by Nhira *et al.*, (1998) that, most areas with vast forests; commercialization of fuel wood is prevalent resulting in depletion of natural forests especially the indigenous species.

According to Neumann and Hirsh, (2000), fruits collection is mainly a preserve of women given that these tasks are easy to combine with other women tasks as well as low yields on labour. Moreover, results from this study also agree with Neumann and Hirsh, (2000) and Campbell, (1996); that harvesting practices differ between men and women with men mostly involved in collection trips where fruits have been harvested further afield. It must also be noted though that with increased vulnerability, men are increasingly participating in the practice. However, literature suggests that this situation might be attributed by the fact that women have high incentive towards the trade because their husbands allow them to control the money that is obtained from wild fruit sales (Gumbo, *et al.*, 1990). This fact is also supported by studies from South Central Africa, where it is reported that women are only allowed by their husbands to control the money from wild fruit sales even if they sale exotic fruits (Packham, 1993). Results show that producers can obtain substantial household incomes by supplying fruits to local markets (Kaaria 1998; Schomburg *et al.*, 2002; Ramadhani 2002), with women and children being the main beneficiaries, although men dominate transport business and the wholesale market.

The study indicated that respondents in the study area used different fruit harvesting techniques in collecting fruits in the forest due to stiff competition among people. Harvesting is done by shaking the branches or stem, climbing fruit tree, knocking the fruit down with a sticks, picking up from the ground following and throwing objects to dislodge fruit. Poor harvesting methods cause some fruits to sustain bruises hence affecting and reducing the fruit shelf life. The findings from the study are in line with results from Kadzere *et al.*, (2004) who reported that some harvesting methods resulted in the damage and bruising of the fruit.

During the survey it was noted and observed that fruit losses were seen due to poor harvesting and handling of the fruit which led to some fruits sustaining cracks and bruises. Shaking of tree stem and branches also causes some damages to the fruits and most of the respondents revealed that *Uapaca kirkiana* fruits are very prone to this damage due to its
delicate outer covering when fully ripen. The harvesting methods practised in the study area lead to some fruits losses, these losses of fruits reduce the quantity and quality of fruit available for consumption and sale. The findings from the study are similar to Saka et al., (2004) who reported that fresh fruit incur direct and indirect quality losses from the field to the consumer. Lack of harvesting rules enforcement from local authorities and local leadership is a constraint to sustainable usage of the *Uapaca kirkiana* fruit. Forest is regarded as an open area with no property rights hence forest is a resource taken as a common property. According to Hardin (1968) reviewed free access and consequent exploitation of common resources as the ‘tragedy of common’.

**5.3 Discussions on *Uapaca kirkiana* marketing.**

The problem of unreliable markets is the main challenge to the sustainability of marketing of *Uapaca kirkiana* fruits. From the study, it can be stated that marketing of the fruits is informal markets resulting in low market prices. These findings are similar to a report made by Ramadhani (2002) which states that informal market in market stalls, farm gates and along roadside drives the marketing of wild fruits while there is no definite and strategy for pricing indigenous fruits. The absence of formal markets led to the rise in the involvement of middleman and speculators who in turn influence fruit market prices for their own benefit and not for the benefit of the farmer. From the study, respondents from Domboshawa ward 4 market the fruit at the roadside, to the middlemen and agricultural markets especially at Domboshawa Showground Business Centre. The findings from the study are in line with findings from Gondo et al., (2002) and Ham (2003) *Uapaca kirkiana* fruit collectors sell the gathered fruits to consumers within the local community and retailers trading at roadside and some to urban markets.

In the study there is no clear guideline and mechanism for setting up the market price of *Uapaca kirkiana* fruits per unit and inadequate infrastructure and storage facilities available. According to Ham (2003) reported the similar marketing problem of lack of market infrastructure as the major challenge affecting trading of IFTs. According to Ramadhani and Schmit (2002) also reported the same that lack of marketing sheds and storage facilities in Zimbabwe shortened the shelf life of *Uapaca kirkiana* fruits causing great losses as a result of perishability and at the end traders fail to cover costs they incurred like transport cost or harvesting cost. Furthermore, studies that were carried out in Malawi by Kaaria (1998) and in Zimbabwe by Ramadhani (2002) also found out that marketing of Indigenous fruits was
poorly developed (Ham et al., 2000). Similarly, the current study has revealed that trading of *Uapaca kirkiana* exists at Domboshawa Showground market was largely informal and not developed where fruits are being sold on an open area with no infrastructure like selling sheds.

In the study area fruit prices are sometimes charged depending on the size, quality and quantity of the fruit and time of the season. Similarly in the study carried by Tchoundjeu et al., (2008) reported that in Cameroon, a study to determine the relationship between market price and a fruit characteristic in Dacryodes edulis was done. The results found out that consumers were charged higher prices by retailers for fruits with good and desirable traits but wholesalers paid a negotiated price regardless of fruit traits. Furthermore, prices also depend on the availability of the fruit on the market during peak season the prices can go down to US$1 per 20litre bucket and at the onset and end season can goes up to US$2.50. Similar to Ham et al., (2008) reported that in many Southern Africa countries there is no formal strategy for price setting of indigenous fruits.

The perishable nature of many indigenous fruits, combined with the poor infrastructure and high transport costs in remote tropical rain forest areas affect the successful marketing of NTFPs. Arnold and Ruiz Pérez (1998) point out the volatility of many NTFP markets, where prices fluctuate and many NTFPs follow a burst-and-boom cycle which ends up being replaced by domesticated species or synthetic alternatives (Homma, 1992). The problem in the marketing of wild fruits is that there is absence of organisations among harvesters and limited access to credit and storage facilities impede the collectors’ access to markets (Verheij and Reinders, 1998; Van Dijk 1999). This problem is similar to findings from this study; where there is lack of organisations especially NGOs to give assistance to communities in the marketing and processing of *Uapaca kirkiana* fruits. The seasonal availability of the *Uapaca kirkiana* fruit which is over a short period of two to three months discourages some potential investors as the income generation takes place during a very short period resulting in supply-demand imbalances that discourage investors (Mkonda et al., 2003).

Factors influenced by the theory of competition are key determinants to marketing strategies employed which is similar to this study where there was stiff competition among communities in the harvesting and marketing of the fruit. As well, results concur with literature that trading of
IFTs if highly informal with no sophisticated product differentiation (Ramadhani, 2002) and Brigham et al., (1996) resulted in low market prices. The findings from the study area show that during peak period of the fruit prices can go down to $1 per 20 litre bucket.

5.4 Discussions on factors affecting the contribution of *Uapaca kirkiana* to income.

The *Uapaca kirkiana* fruits are sold and contribute significantly to local rural standard of living (Maliro and Kwapata, 2000). The edible fruits are very essential for income source in Southern Africa (Mithofer et al., 2006). In the study area of Domboshawa ward 4 *Uapaca kirkiana* fruit contributes an average of US$66.91 of income per household. The results from regression model table 6, the R squared value of 66.7% shows that 66.7% of the variations in the contribution of *Uapaca kirkiana* to household income can be fully described by the independent variables in the model such as age of respondents, family size, distance travelled to forest, quantity of fruit used for consumption and experience in the harvesting of the *Uapaca kirkiana* fruits. The contribution of *Uapaca kirkiana* fruit to income of households which is significantly affected by age of respondent, amount of *Uapaca kirkiana* harvested and quantity used for barter trade. *Uapaca kirkiana* fruits contribute to socio-economic development through income generation especially in rural areas where gathering of *Uapaca kirkiana* is a viable strategic risk-coping option (Akinnifesi et al., 2006)

The Beta coefficient is used to compare the magnitude of the coefficient to find out which coefficient has more effect to the contribution of *Uapaca kirkiana* fruit to household income in Domboshawa ward 4. The larger the Beta coefficient is associated with the larger t-values and lower p-values (SPSS Annotated Output Regression analysis. 2015). This in line with results from Table 6 where number of 20litre buckets harvested last season 2015 of *Uapaca kirkiana* fruit has a larger beta coefficient (1.356) associated with a larger T value (18.73) and a lower p-value (0.000) which is lower than 0.05. T and Sig are the t-statistics and work together with two-tailed p-values used in testing whether a given coefficient is significantly different from zero (SPSS Annotated Output Regression analysis. 2015). This is in line with results from Regression model Table 6 where the coefficient for the size of family (0.178) is not significant from 0 because its p-value is 0.51, which is larger than 0.05. Hence, the size family does not have significant effect to the contribution of *Uapaca kirkiana* fruits to household income in Domboshava ward 4.
The age of respondent (-0.402) negatively affects significantly income contribution from the fruit as age of household had increased the contribution of *Uapaca kirkiana* to household income decreases. Age negatively affect the quantity of fruit harvested thereby leading to reduction in income realised from the marketing of *Uapaca kirkiana* fruits. The quantity of the fruit used for better trade (-1.023) significantly affects the income contribution of the fruit (0.000<0.05). The more the fruit used for barter trade the lesser the fruit left for cash sales and this will eventually significantly affect income contribution from the sale of *Uapaca kirkiana* fruits. The quantity of *Uapaca kirkiana* fruits harvested last season positively affects the contribution of *Uapaca kirkiana* to household income. As the quantity harvested increases, the contribution of *Uapaca kirkiana* income increases.

It can be concluded that given the high level of importance and benefits wild fruits provide for the households formulation of supporting policies related to forestry and poverty alleviation is inevitable. However, this has not been the case as limited if any support is being offered by government and development partners. The significance of *Uapaca kirkiana* fruits to household income has been presented earlier on but there are threats to sustainability due to degradation and deforestation, as a result of resettlement. In addition, the current harvesting methods are also influencing low productivity thus there is need for sustainable harvesting methods. There is ambiguity about land ownership and user rights of indigenous fruit trees, indigenous trees are regarded as a common pool resource where everyone has free access. According to Hardin (1968) reviewed the same to study that forest is regarded as a free access and consequent exploitation of common resources as the ‘tragedy of common’.

Moreover, existing regulation are to some extent supported by the traditional values that wild fruits are a gift from God hence there must not be sold. On the other hand, the lack of a tenure system, which clearly postulates the ownership and user rights of the indigenous fruit trees and fruits, foists difficulties in managing and controlling the use of the fruits. It seems evident that the forest reserves in the communal area can no longer provide all the needed goods and materials for villagers. The situation is worse in winter, when large amounts of poles, fibre and thatching grasses are needed for building, firewood and fodder. Villagers stated that the availability of woodland resources has dramatically decreased over the last decades attributable also to effects of the fast track land reform program. The availability of poles and firewood has, in particular, continuously decreased. At the same time, as the amount of indigenous fruit trees in the study area is decreasing, people are planting exotic fruit trees,
especially mango and guava. They were already ranked as the most important fruit tree species in the area.

Overall, Zimbabwe requires a national framework to guide coordinated action and investment with regards to exploitation of natural resources such in particular indigenous fruit trees. On the background of a contention by Boyd et al., (2009), who stated that, “with the money potentially on the possible, the time is right for policy-makers and planners to build on their years of experience in both failures and success in development initiatives, to tailor activities in support of positive development outcomes”. More attention must therefore be paid to the institutional challenges facing effective utilization of indigenous trees to ensure that future policy will be planned and implemented successfully.
CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

The main objective of the study was to find out the uses, harvesting, marketing and contribution of *Uapaca kirkiana* fruits to income of communities in Domboshawa Ward 4. The main aim of this research was to find out the uses, marketing channels and the contribution of *Uapaca kirkiana* fruits to households income in ward 4, Goromonzi.

6.1 Conclusion
The study shows that *Uapaca kirkiana* fruits are very important for the livelihood of rural people in Domboshawa ward 4 and can be used for cash sales, consumption, donations, barter trade, brewing and making products like bread, buns and porridge. The main objective of the study is to evaluate the contribution of *Uapaca kirkiana* fruit to the household in Domboshawa ward 4 area. On average a household get US$60 from the sale of *Uapaca kirkiana* fruits during the harvesting and marketing season. The contribution of *Uapaca kirkiana* fruit to household income is significantly affected by age of respondents, quantities of the fruit used for barter trade and number of buckets of fruit harvested. There is a need to put in place mechanisms which ensure the sustainable use of the resources if the people in the study area are to continue benefitting from these forest products. Furthermore, there is also need for education to change the mindsets of the majority of the respondents since they do not have a perception that their natural resources are at risk of being depleted if current patterns of consumption persist. The issues of defining the resource users and empowering them to have more control over the use of their resources may also be important in ensuring sustainable use of the resources. There is lack of knowledge on processing of *Uapaca kirkiana* fruits into products like sweet beer, wine, drink juice and jam.

6.2 Recommendations
Based on the results, the following recommendations offer a way forward to promote sustainable utilisation and management of *Uapaca kirkiana* fruit the challenges.

- The government must avoid over-regulation in forest management. In this view, they must enact laws that are few, simpler to enhance facilitation and control and that promote sustainable natural resources exploitation.
- In order to improve harvesting, processing and marketing of *Uapaca kirkiana* fruit, people in rural areas like in Domboshawa ward 4 people must be given adequate information on harvesting, use, processing and regular marketing information on the potential fruit markets. The government, NGOs and other stakeholders need to link rural fruit producers with possible and reliable markets.

- Value addition of the *Uapaca kirkiana* fruit is recommended and must be done by commercializing fruits products like jam, sweet beer, wine, bread or buns. In line with our national blue print ZIMSSET where value addition of natural resources is being encouraged for better income. Products from indigenous fruit trees like Amarula wine produced in South Africa is now an international product.

- There is need for different organisations like the NGO or government to promote *Uapaca kirkiana* fruit utilisation by organizing some training or workshops in the study area so as to enlighten communities on the importance of *Uapaca kirkiana* tree products that can be produced from this fruit.

- There is also need especially from the government to promote and support domestication of the *Uapaca kirkiana* tree.

- The planting of more trees with improve varieties must be promoted so as to increase the future supply of *Uapaca kirkiana* fruits. The existing forest policy on NTFPs from the Ministry of Water and Environment must be reviewed, modified and enforced so as to provide solution to indigenous resources conservation and loss of biodiversity.

Significant gaps in knowledge on the productivity, market value, net returns and other features of smallholder fruit production and markets in sub-Saharan Africa need to be filled to properly guide future investments by private enterprise, governments and development donors.
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QUESTIONNAIRE ON THE ANALYSIS OF USES, HARVESTING, MARKETING AND THE CONTRIBUTION OF UAPACA KIRKIANA TO HOUSEHOLD INCOME IN GOROMONZI DISTRICT, ZIMBABWE

My name is James Chadzimura. I am doing a Master’s of Science Degree in Agroforestry with Bindura University of Science Education. I am doing a research on the uses, harvesting, marketing and the contribution of Uapaca kirkiana to household income in Goromonzzi district, Zimbabwe. The main objective of this research is to evaluate the uses, harvesting, marketing and contribution of Uapaca kirkiana to the household income in Domboshawa. The finding of this research will help the government to come up with effective policies in addressing issues affecting harvesting, marketing and utilisation of Uapaca kirkiana fruits. The results of this study will also help the Non Government Organisation (NGO) to promote sustainable utilisation, management and also promote value addition of Uapaca kirkiana fruits into finished products like jam, drink juice and wine. The information gathered from this questionnaire will be confidential and be used for academic purposes only. You are being kindly requested to cooperate in this study and answer the questions honestly.

All information provided by the interviewee will be treated as STRICTLY CONFIDENTIAL for the mutual benefit of both the researcher and the respondents

Questionnaire number...................                                  Enumerator name.................................
Ward                         Murape ward 4.                             Date                    ................................
Village name             ....................

SECTION A: HOUSEHOLD DEMOGRAPHIC INFORMATION

A.1 Sex of interviewee | Male(1) | Female(2) | A.2 Age...........years
A.3 Marital status | Single(1) | Married(2) | Divorced(3) | Widow/widower(4)
A.4. Religion | Christianity(1) | Traditional(2) | Muslim(3) | Other (specify)(4)
A.5 Level of education | No formal(1) | Primary(2) | Secondary(3) | Tertiary(4) | informal(5)
A.6 Employment status | unemployed(1) | Formal sector(2) | Informal sector(3)
A.7 What is the size of your family?
A.8 How many years have you been residing in Domboshawa?  ..........years

85
### SECTION B: HOUSEHOLD ECONOMIC ACTIVITIES AND INCOME

#### B.1. What agricultural activities do you practice?

<table>
<thead>
<tr>
<th>Livestock</th>
<th>Crop</th>
<th>Vegetable</th>
<th>None</th>
</tr>
</thead>
</table>

#### B.2. Which crops and vegetables did you grow last season? (Rank 1 as the most commonly grown crop/vegetable)

<table>
<thead>
<tr>
<th>Crop/vegetable</th>
<th>Rank</th>
<th>Area (ha)</th>
<th>Consumption</th>
<th>Sale</th>
</tr>
</thead>
</table>

#### B.3. What type of livestock species do you keep? (Rank specie in terms of importance)

<table>
<thead>
<tr>
<th>Class</th>
<th>Cattle</th>
<th>Goats</th>
<th>Sheep</th>
<th>Chickens</th>
<th>Pigs</th>
<th>Other (specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### B.4. Main sources of income in your area? Rank in order of importance

<table>
<thead>
<tr>
<th>Source of income</th>
<th>Amount per annum US$</th>
<th>Rank in order of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field crops</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Livestock sales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remittances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salary/wage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling <em>Uapaca kirkiana</em> fruit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling of exotic fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling firewood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trading</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational work (building, carpentry, craft, welding etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part time work</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECTION C: HARVESTING AND MARKETING OF *UAPACA KIRKIANA*.

<table>
<thead>
<tr>
<th>C.1. Do you harvest <em>Uapaca kirkiana</em> fruits?</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.2. If YES, what time do you start harvesting <em>Uapaca kirkiana</em> fruits? (month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.3. When do you end harvesting <em>Uapaca kirkiana</em> fruits? (month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.4. How many years have you been harvesting <em>Uapaca kirkiana</em> fruits in Domboshawa?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.5. Where do you harvest the fruits? <em>(you may tick more than 1)</em></td>
<td>Personal farms/ homestead(1)</td>
<td>Natural forest(2)</td>
</tr>
<tr>
<td></td>
<td>Both (3)</td>
<td></td>
</tr>
<tr>
<td>C.6. What is the minimum distance you travel to harvest fruits?</td>
<td>Km</td>
<td></td>
</tr>
<tr>
<td>C.7. What is the maximum distance you travel to harvest?</td>
<td>Km</td>
<td></td>
</tr>
<tr>
<td>C.8. How many 20 litre buckets did you harvest last season (2015)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.9. Harvesting method</td>
<td>Rank in order of preference</td>
<td></td>
</tr>
<tr>
<td>Throwing objects to dislodging fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gathering naturally abscised fruit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaking branches to dislodge fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climbing tree to pick fruits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other methods (specify)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.10. Does the community have rules or regulations for protecting indigenous fruit tree in your area?</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>C.11. If YES, are the following rules adhered to? Tick where applicable.</td>
<td>Always</td>
<td>Seldom</td>
</tr>
<tr>
<td>Harvest the indigenous fruit during the day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never cut indigenous fruit trees.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never throw objects to dislodge fruits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never climb or shake a fruit tree to collect fruits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collect naturally abscised fruits on the ground.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Must acquire a harvesting permit from local authority.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not harvest unripe fruits.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C.12. How many buckets (20 litres) of *Uapaca kirkiana* fruits did you use for the following during the last season (2015)?

<table>
<thead>
<tr>
<th>Use</th>
<th>Quantity (Number of buckets used last season)</th>
<th>Rank in order of preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Sales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barter Trade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brewing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C.13. Do you sell the fruit?  
YES  NO

C.14. If YES, how do you sell *Uapaca kirkiana*?  
Individually(1)  As a group(2)

C.15. How much does the buyers pay for a 20 litre bucket of *Uapaca kirkiana* fruits?  
$

C.16. Which marketing channels/place do you use the fruits last season?

<table>
<thead>
<tr>
<th>Marketing channel/place</th>
<th>Quantity (20L buckets)</th>
<th>Income collected ($)</th>
<th>Rank in order of preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm gate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middlemen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural markets (musika)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadside markets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speculators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any other (specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C.17. At what price did you sell *Uapaca kirkiana* fruits?

<table>
<thead>
<tr>
<th>Container</th>
<th>Marketing channel/place</th>
<th>Price($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Onset of season</td>
<td>Peak</td>
</tr>
<tr>
<td></td>
<td>Price</td>
<td>Price</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plate</th>
<th>Farm gate</th>
<th>Roadside markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Litre container</td>
<td>Farm gate</td>
<td>Roadside markets</td>
</tr>
<tr>
<td>5Litre container</td>
<td>Farm gate</td>
<td>Roadside markets</td>
</tr>
<tr>
<td>20Litre bucket</td>
<td>Farm gate</td>
<td></td>
</tr>
</tbody>
</table>
C.18. Cost of harvesting and marketing of Uapaca kirkiana

<table>
<thead>
<tr>
<th>Marketing Channels/Place</th>
<th>Cost($)</th>
<th>Harvesting cost</th>
<th>Transport cost</th>
<th>Other cost (specify)</th>
<th>Total cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm gate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middlemen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agric markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadside market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C.19. How did you trade *Uapaca kirkiana* fruits?

<table>
<thead>
<tr>
<th>Product</th>
<th>Rank in order of preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td></td>
</tr>
<tr>
<td>Barter trade with clothes</td>
<td></td>
</tr>
<tr>
<td>Barter trade with crop produce</td>
<td></td>
</tr>
<tr>
<td>Barter trade with grocery</td>
<td></td>
</tr>
<tr>
<td>Barter trade with livestock</td>
<td></td>
</tr>
<tr>
<td>Exchange with labour</td>
<td></td>
</tr>
<tr>
<td>Any other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

C.20. Do you receive marketing information of the fruits from the following organisation?

<table>
<thead>
<tr>
<th>Organisation</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private companies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigenous fruit processors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Government Organisation (NGO)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local authority</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middlemen/speculator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arex officials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C.21. Who does the following duties in the harvesting, marketing and processing of *Uapaca kirkiana* fruits? (Put a tick where applicable)
<table>
<thead>
<tr>
<th>Duty</th>
<th>Father</th>
<th>Mother</th>
<th>Male child (&lt;16 yrs)</th>
<th>Female child (&lt;16 yrs)</th>
<th>Adult male (&gt;16 yrs)</th>
<th>Adult female (&gt;16 yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrying fruits home</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Look for markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negotiate prices with buyers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport fruit to the market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grading/cleaning of fruits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Package</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C.22. What problems do you face in the harvesting of *Uapaca kirkiana* fruits?

<table>
<thead>
<tr>
<th>Problem Faced</th>
<th>Rank in order of importance</th>
<th>Problem Faced</th>
<th>Rank in order in importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour shortage</td>
<td>Bush burning</td>
<td>Competition with wild animals</td>
<td>Scarcity</td>
</tr>
<tr>
<td>Deforestation</td>
<td>Labour cost</td>
<td>Other (specify)</td>
<td>Other (specify)</td>
</tr>
</tbody>
</table>

C.23. What problems do you face in the marketing of the *Uapaca kirkiana* fruit?

<table>
<thead>
<tr>
<th>Challenge Faced</th>
<th>Rank in order of importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of storage infrastructure</td>
<td></td>
</tr>
<tr>
<td>Low market prices</td>
<td></td>
</tr>
<tr>
<td>Over supply</td>
<td></td>
</tr>
<tr>
<td>Shortage of local markets</td>
<td></td>
</tr>
<tr>
<td>Lack of market information</td>
<td></td>
</tr>
<tr>
<td>Involvement of many middlemen</td>
<td></td>
</tr>
<tr>
<td>Lack of processing infrastructure</td>
<td></td>
</tr>
<tr>
<td>Short shelf life (high perishability)</td>
<td></td>
</tr>
<tr>
<td>High transport cost</td>
<td></td>
</tr>
<tr>
<td>Unavailability of transport</td>
<td></td>
</tr>
<tr>
<td>High cost and unavailability of packaging material</td>
<td></td>
</tr>
<tr>
<td>Theft</td>
<td></td>
</tr>
</tbody>
</table>
Damage during transportation and at markets
High cost of council levies
Other (specify)

<table>
<thead>
<tr>
<th>C.24. Do you add value to <em>Uapaca kirkiana</em> fruits for maximum returns?</th>
<th>YES(1)</th>
<th>NO(2)</th>
</tr>
</thead>
</table>

If YES, which products do you produce? Jam(1) Wine(2) Juice(3) Other products (specify)

### SECTION D: HOUSEHOLD FOOD SECURITY STATUS

**D.1.** What types of foods did you or anyone else in your household ate yesterday during the day and night at your home. (didn’t eat=0 and ate=1)

- Any foods made from maize, wheat, rice or any other available grain like sadza, bread
- Any potatoes or any other food made from roots or tubers,
- Any vegetables
- Any fruits indigenous or exotic
- Any meat, poultry or offal
- Any fresh or dried fish
- Any foods made from beans, peas or nuts
- Any sugar or honey
- Any other foods such as coffee, tea and condiments
- Any other food, (specify)

**D.2.** What are main sources of food (Rank in order of important)

<table>
<thead>
<tr>
<th>Source</th>
<th>Rank</th>
<th>Source</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop production and livestock</td>
<td>Purchase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food for work</td>
<td>Gifts of food</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garden</td>
<td>Fishing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hunting</td>
<td>Wild food collection (fruits)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Specify): Other (Specify):</td>
<td>Other (Specify):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**D.3.** On average, how many meals do you have per day?

**D.4.** Do you think you have access to enough food? YES(1) NO(2)

**D.5.** How do you rate your level of access to food nowadays as compared to last year (2015)?

- No change
- Better
- Fair
- Worse off

**D.6.** What is causing food shortages in your household? Rank as in order of importance

- Poor harvest due to drought
- Lack of water sources/ reservoirs
Lack of agric inputs
Poor salaries
Retirement
Retrenchment
Increase in household size
Death of the main food provider
Poor harvest due to pests and diseases
Other (specify)

D.7. What adjustments or possible solutions have you made to avoid food shortages if any or improve your diet (rank in order of frequency of use)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Rank</th>
<th>Strategy</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borrow food from shops for future payments</td>
<td></td>
<td>Relied on food aid</td>
<td></td>
</tr>
<tr>
<td>Borrow money from friends or relatives</td>
<td></td>
<td>Look for petty jobs</td>
<td></td>
</tr>
<tr>
<td>Dispose household goods or other assets</td>
<td></td>
<td>Petty trading</td>
<td></td>
</tr>
<tr>
<td>Use credit cards</td>
<td></td>
<td>Sale livestock</td>
<td></td>
</tr>
<tr>
<td>Sale crops</td>
<td></td>
<td>Get loans from money lenders, banks</td>
<td></td>
</tr>
<tr>
<td>Reduction in non-food household expenditure</td>
<td></td>
<td>Reduce in the amount of food</td>
<td></td>
</tr>
<tr>
<td>Reduce the number of meals per day</td>
<td></td>
<td>Did not pay credits already owed</td>
<td></td>
</tr>
<tr>
<td>Resort to prostitution and external relationships to secure food</td>
<td></td>
<td>Over-use of natural resources (e.g. excessive fishing and collection of firewood)</td>
<td></td>
</tr>
<tr>
<td>Changed area of residents (moved to a cheaper place)</td>
<td></td>
<td>Producing or trading forbidden</td>
<td></td>
</tr>
<tr>
<td>Other adjustment mechanisms:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any general comments

......................................................................................................................................................
......................................................................................................................................................

THANK YOU
Appendices 2

Check list used on issues to guide during the Focus Group Discussion (FGD).

1. What are the uses of the *Uapaca kirkiana* fruit?
2. What time do you start harvesting the *Uapaca kirkiana* fruits?
3. What time do you end harvesting the *Uapaca kirkiana* fruits?
4. Who is responsible for the process of harvesting, transporting and trading of the fruits?
5. What are the problems faced in the harvesting, transporting and trading of the fruits in Domboshawa?
Appendices 3

Key informative Interview Questions

1. Where do you harvest the fruits and how long do you travel to the forest?
2. How do you use and sell the *Uapaca kirkiana* fruits?
3. What type of containers do you use?
4. Do you do barter trade?
5. What are the main sources of income in your area?