

**UNDERSTANDING THE HORTICULTURAL VALUE CHAIN IN ZAMBIA: CASE
OF RAPE, TOMATOES, ONIONS AND CABBAGES**



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Musika Development Initiative

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Foreword

This report was generated to serve as a reference document for Musika and its implementing partners. Musika Development Initiatives (Musika) is a non-profit company that works to stimulate private sector investment in rural agricultural markets. It does this by helping businesses develop mutually beneficial and transparent commercial relationships with smallholder farmers that integrate the provision of information and technology adoption, and provides long term incentives for farmers to invest in their farming businesses. It provides its clients with high quality, commercially focused technical advice and business model support, and were relevant smart subsidies to bring down the initial risks of doing business with the smallholder market. Musika also supports innovative market-based solutions to environmental issues and strives to ensure that women are key participants in improved agricultural markets. Musika acknowledges and appreciates the financial support from the Swedish Embassy in Lusaka.

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Table of Contents

Foreword.....	i
List of Figures.....	iii
List of Tables	iii
Executive Summary	iv
Abbreviations and Acronyms	vi
Introduction.....	1
Methodology and Data	2
Key Findings.....	4
Production Actors	4
Market Actors and trend.....	5
Support Actors	8
Horticultural Production.....	10
Access to Extension	13
Horticultural Marketing	15
Commercialization Index	17
Vegetable Contribution to Household Income	20
Policy Interventions	23
Key Challenges	25
Conclusions.....	25
Recommendations	26
Reference	27

List of Figures

Figure 1: vegetable production trend (2009 to 2019).....	4
Figure 2: vegetable export and import trend (2016 to 2020)	5
Figure 3: Price volatility of tomatoes and rape (2010 to 2018)	7
Figure 4: Simplified schematic Actor Relationship in the Horticultural Value Chain	9
Figure 5: Household involvement in horticultural production between 2012 and 2019.....	10
Figure 6: Crops Grown in Wetland/Dambo Areas.....	11
Figure 7: Household involvement in horticultural production by gender.....	12
Figure 8: National Production trends of Onion and Tomatoes (2014-2019) in tons.....	13
Figure 9: Availability of government extension services between 2015 and 2019	13
Figure 10: proportion of households involved in the marketing of specific vegetables	15
Figure 11: markets for the vegetables 2018/19 agricultural season	16
Figure 12: Commercialization Index for Rape.....	17
Figure 13: Commercialization Index for Onion.....	18
Figure 14: Commercialization Index for Cabbage.....	19
Figure 15: Commercialization Index for Tomatoes	19
Figure 16: Number of Months sales took place (2018/19)	20
Figure 17: Income generated from specific vegetables during the 2018/19 agricultural season	21
Figure 18: Gender decision to Sale Specific vegetables	22
Figure 19: Gender decision on how to use revenue from Specific vegetable sales	22

List of Tables

Table 1: Policy interventions bordering on the vegetables and fruits	24
Table A 1: Gross Margins for Specific Vegetable Enterprises for One Hectare	28

Executive Summary

The horticultural sub sector is recognized as a key driver for economic development and poverty reduction because it contributes to increased employment and household incomes. However, lack of technological development has proven to be a major constraint in the sector. Further, lack of marketing opportunities, inadequate processing centers at primary and secondary nodes of the value chain impacts the value of the produce and inherently lowers the total remuneration accrued to the farmers. It is against this background that Musika undertook the horticultural value chain study to understand the various players involved as well as gauging the significance of the sub sector to the rural smallholder farmers. Rural Agricultural Livelihood (RALS) data (2012-2019), Key Informant Interviews (KII) and other secondary sources were used for the analysis. Below were the key highlights from the study;

- **Horticultural production;** during the 2018/19 agricultural season, 77% of the rural households indicated that they were involved in the production of atleast one type of vegetable. Participation in vegetable production was highest in Luapula province (96%). It was further established that 27% of the households that grew vegetables, grew the vegetables in the wetland or dambo area. In terms of respective vegetables considered in this study, rural household participation in the growing of cabbages and onions was 4% and 3% in 2019, respectively. An average of 11% and 20% of rural households were involved in the production of tomatoes and rape in 2019, respectively.
- **Access to Extension;** the study revealed that 41% of the households engaged in vegetable production had observed more availability of extension services. However, 28% felt that extensions were less available, 31% did not observe any change. Households engaged in vegetable production were located approximately 12.4 km away from the agricultural camps.
- **Markets:** Zambia has over the years seen a reduction in both exports and imports of vegetables by almost the same margin of 43%. And despite an influx in retail chain stores, and other off take markets for vegetables in the past few years, the market for vegetables for smallholder farmers is largely informal with more than 80% of the horticultural products being traded on the informal market. Less than 20% of the horticultural produce is channeled through the supermarkets. Price volatility is a key feature of horticultural

markets, resulting mostly from underdeveloped marketing channels. The study found that the majority of rural households sold vegetables either within their communities or districts. Thus horticultural trade is largely localized partly due to the nature of the produce, being highly perishable.

- **Support Actors:** Despite an increase in the number of stakeholders in the horticultural value chain, efforts of these stakeholders have largely been uncoordinated.
- **Vegetable Contribution to Household Income;** Vegetables contribute about 16% towards the overall income generated from farm activities, crop sales (74%) contribute the most revenue followed by vegetables. Households generated an annual average of ZMW2,071 from vegetable sales. Male headed households generated about ZMW2,201 whilst the female headed households generated ZMW1,600 from vegetable trade.

Abbreviations and Acronyms

CFU	Conservation Farming Unit
CSO	Central Statistical Office
FAO	Food and Agriculture Organization
FISP	Farmer Input Support Programme
GDP	Gross Domestic Product
GoZ	The Government of Zambia
HH	Household
HCIs	Household Commercialization Indices
IAPRI	Indaba Agricultural Policy Research Institute
IDC	Industrial Development Corporation
IDE	International Development Enterprises
Kg	Kilogram
KII	Key Informant Interviews
Km	Kilometer
PHT	Post-Harvest Technology
PMRC	Policy Monitoring and Research Centre
PSU	Primary Sampling Unit
RALS	Rural Agricultural Livelihoods Survey
SEAs	Standard Enumeration Areas
SNAP	Second National Agricultural Policy
SOEs	State Owned Enterprises
ZDA	Zambia Development Agency
ZICTA	The Zambia Information and Communications Technology Authority
ZMW	Zambian Kwacha
ZNFU	Zambia National Farmers Union
US\$	United States Dollars

Introduction

Horticulture is recognized as a key driver for economic development and poverty reduction because it contributes to increased employment and household incomes. Muwowo and Hamusimbi (2020) noted that the horticultural sub sector is one of Zambia's fast growing and key agricultural value chains contributing an average of 1.3% to the national GDP. It has great potential in enhancing food security and improving nutrition through household retention of fruits and vegetables. Zambia's abundant land and water resources also presents a number of production and value-addition investment opportunities that could help increase its output volumes and quality (ZDA, 2018).

Agricultural diversification through the production of a variety of crops, livestock and promotion of fruits and vegetables have been touted as a feasible and practical approach to improve smallholder farmers' incomes whilst realizing nutritional benefits (SNAP, 2016; Hichaambwa and Mofya-Mukuka, 2018). The horticultural sector, in particular, is well poised and offers most potential in improving smallholder farmers' livelihoods due to sustained and increasing demand for horticultural commodities and products from the growing cities over the past years (Mumba *et al.*, 2015). For instance, Hassan *et al.*, (2021) revealed that horticulture is the most important source of cash income from agriculture, exceeding maize, cash crops such as cotton and tobacco, and livestock (Hichaambwa and Tschirley, 2006).

However, inadequate technological development such as irrigation and marketing facilities have proven to be a major challenge in the sector. Further, lack of marketing opportunities, inadequate processing centers at primary and secondary nodes of the value chain impacts on the value of the produce and inherently lowers the total remuneration accrued to the farmers (Bakhtaver *et al.*, 2021). Therefore, proper infrastructural development like road connectivity, communication networking and adequate agricultural extension, and market information dissemination at regular intervals are critical for better productivity and production of the horticultural crops in the value chain.

Thus a horticultural¹ value chain analysis was needed to understand the various players involved, the contribution of the value chain to the rural smallholder farmers' livelihoods, and also the

¹ In our study, horticultural produce concentration was on tomatoes, onions, rape and cabbages.

efficacy of the chain. The analysis provided an opportunity to map the chain, locate the actors involved, as well as understand the different challenges and opportunities that could arise in the movement of the horticultural products from the producers to the consumers.

It was expected that the findings from this study would provide an opportunity for Musika to document the socio-economic effects of market access on the welfare of rural households in the horticultural sector, as well as serve as a value-chain analysis for the opportunities and challenges in the horticultural sector for both small-scale farmers and key industry players. Below were the main objectives which the study endeavored to achieve;

1. To ascertain the opportunities for the private sector, as well as review the policies and statutory instruments in the horticulture sector and the effect on the value chain.
2. To determine the effect of horticulture farming on smallholder farmers' household income, and establish the share of smallholder farmer fresh produce supply to major urban markets.
3. To ascertain the levels of smallholder farmers' access to extension and price information in the value chain.
4. To assess the changes in gender dynamics in relation to decision making for smallholder farmer households in the value-chain.
5. To identify different marketing channels (including market opportunities themselves and points of access within those markets).

Methodology and Data

The study used a secondary dataset from the Rural Agricultural Livelihoods Study 2012-2019 (RALS12-RALS19) but largely relying on the RALS19 data for quantitative analysis as well as Key Informant Interviews (KIIs) with the horticultural sector industry players i.e. farmers, supermarkets, fresh produce aggregators to provide qualitative information on the value chain. The RALS19 is a panel survey continuing from the RALS 2012 and 2015 survey. The sampling frame for the RALS19 survey was based on the 2010 Census of Housing and Population. A stratified two-stage sample design was used for the RALS 2012 sampling. The first stage involved identifying the Primary Sampling Unit (PSU). The PSU was defined as one or more Standard Enumeration Areas (SEAs) with a minimum of 30 agricultural households. The SEA is the smallest area with well-defined boundaries identified on census sketch maps. At the second stage, all

households in selected SEAs were listed and agricultural households identified. Listed agricultural households were then stratified into three categories, A, B, and C, on the basis of total area under crops; presence of some specified special crops; numbers of cattle, goats and chickens raised; and sources of income. Systematic sampling was then used to select 20 households distributed across the three strata in each SEA (IAPRI, 2015). A total of 7,241 households were interviewed for the 2019 RALS, and these households were used for analysis in this study.

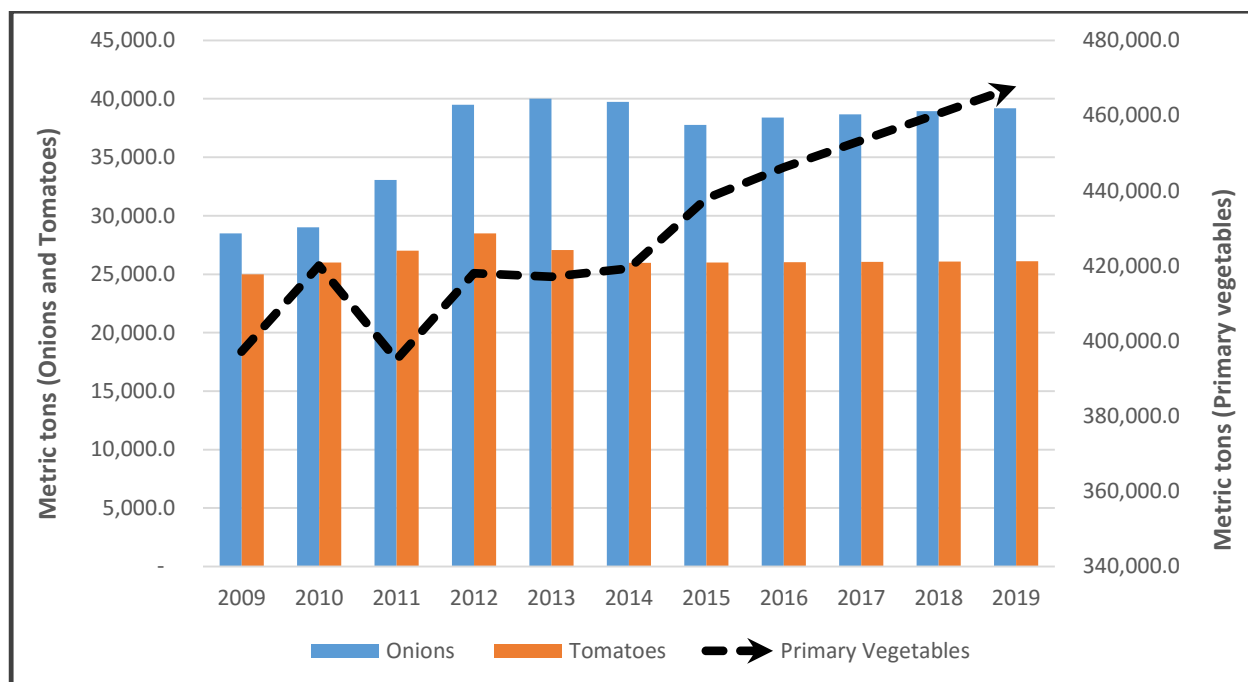
Key Findings

Production Actors

Mumba *et al.*, (2015) estimated that over 20% of smallholder farmers engage in horticultural production. There has generally been an upward swing in primary vegetable production over the past 10 years with an estimated 18% increase in production. The trend in both onion and tomato production has stagnated, however, production of onions between 2016 and 2019 slightly improved, see figure 1 below. Although, the majority of vegetable producers are smallholder farmers, there is a small proportion of emergent farmers engaged in the production and off take of vegetables from smallholder farmers.

One key issue with fruits and vegetables are post-harvest losses. Horticultural products are among the most perishable agricultural products. The losses could occur due to a number of reasons and at different stages of the supply chain. For instance, damage or spoilage could occur when handling immediately after harvesting, when transporting the produce between farm and retail market. FAO (2011) notes that losses can also occur during processing due to damage, spillage, and degradation; at distribution in the market system such as wholesale markets, supermarkets, retailers or during consumption. GoZ (2018) notes that while food loss in grains and legumes is widespread across Zambia, food loss in horticultural products is more pronounced, with losses reaching 50% in some instances.

Figure 1: vegetable production trend (2009 to 2019)



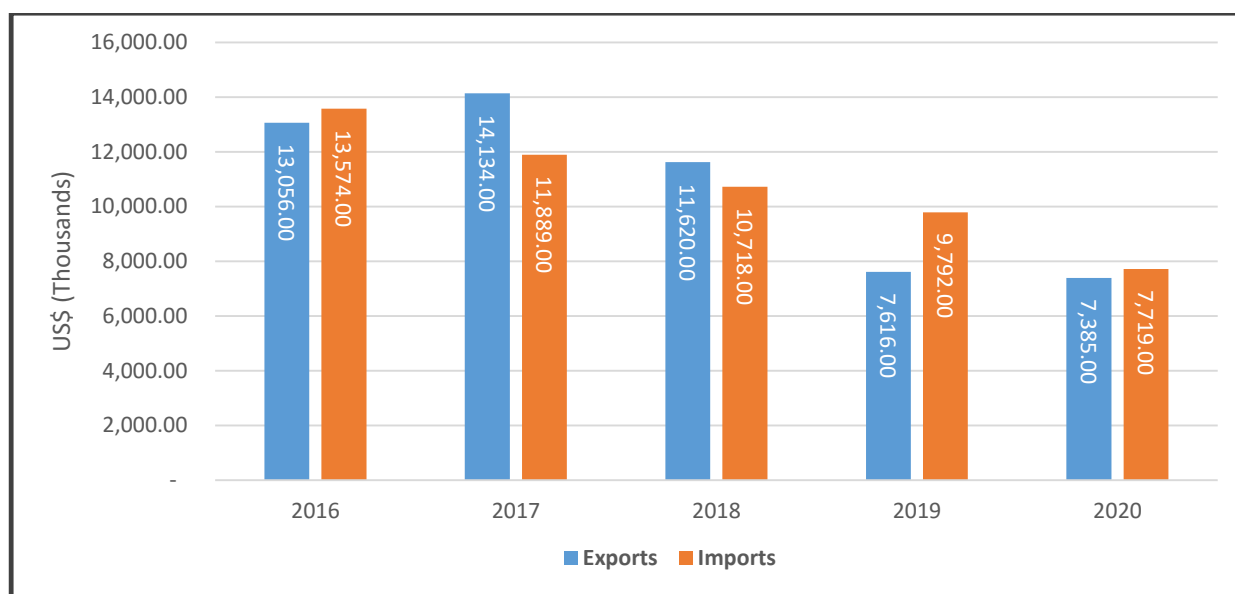
Source: FAOSTAT data & Author's computations (2021)

Market Actors and trend

Zambia has over the years seen a reduction in both exports and imports of vegetables by almost the same margin of 43%, see figure 2. Zambia's vegetable exports have largely been destined to DR Congo, accounting for 26% of the total value of vegetable exports. South Africa dominates Zambia's import of vegetables, contributing 72% towards the total value of vegetable imports. Zambia's imports of vegetables were valued at US\$7.7 million whilst the exports were valued at US\$7.4 million in 2020. In 2019, preserved vegetables and dry onions were the two most important imports contributing 44% and 14% towards the overall import values for vegetables, respectively.

Figure 2: Vegetable² export and import trend (2016 to 2020)

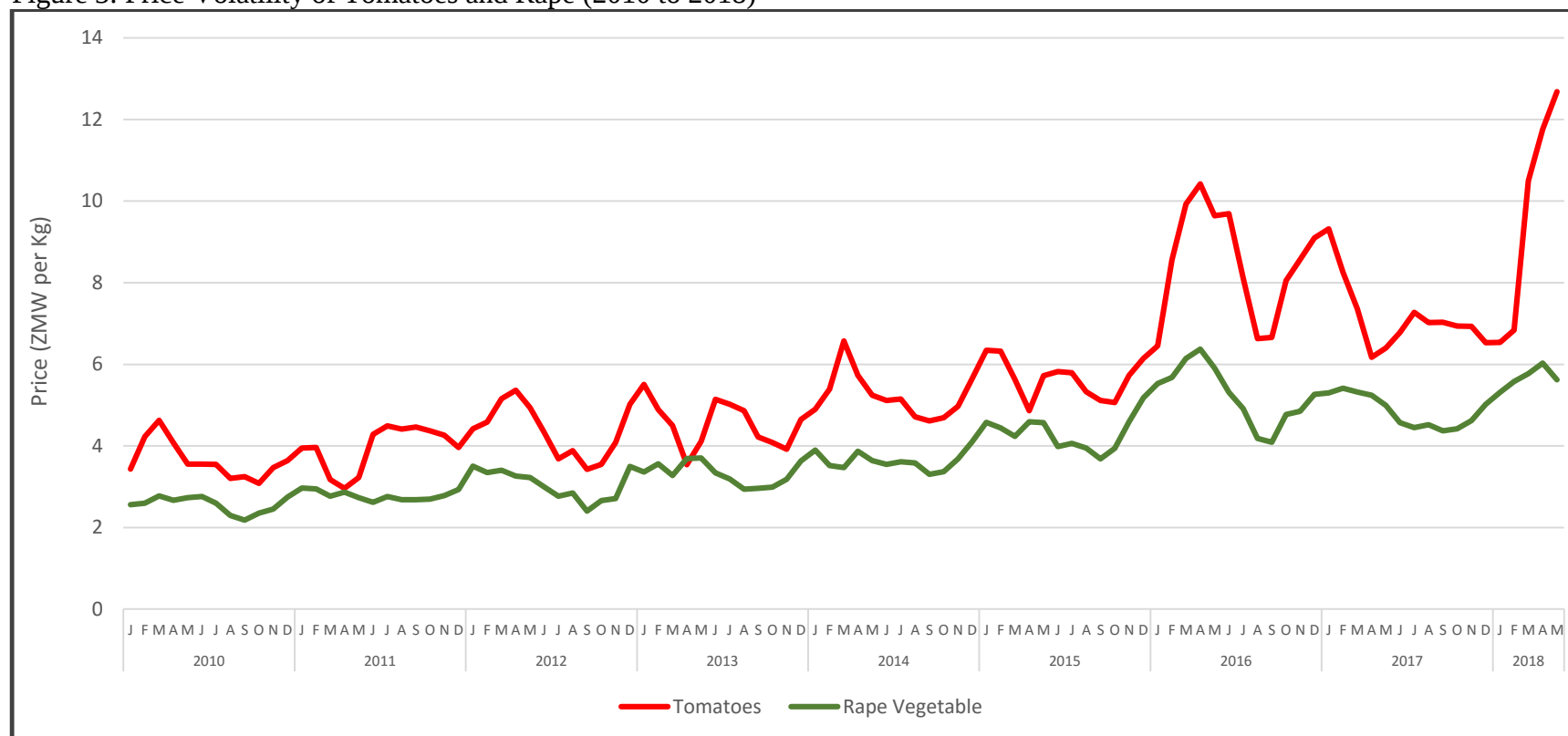
² This includes largely edible vegetables and certain roots and tubers



Source: ITC data & Authors' computation (2021)

Despite an influx in retail chain stores and other off take markets for vegetables in the past few years, the market for vegetables for smallholder farmers is largely informal with more than 80% of the horticultural products being traded on the informal market (Chapoto, *et al.*, 2018). Less than 20% of the horticultural produce is channeled through the supermarkets. Mwanamwenge and Cook (2019) argued that horticultural production currently could be sufficient to meet the rising demand in the consumption of the vegetables, however, the major constraint lies mostly on the marketing side. It has become apparent, and this study validates this, that the sector faces very high price volatility which increases trade risks and reduces profitability for most poorly resourced smallholder farmers. Price volatility arises mostly from underdeveloped marketing channels. Figure 3 below shows that peak prices for vegetables are observed between January and April, prices have normally been higher before most farmers harvest their fresh produce, and as expected tomatoes experience relatively more price instability than other vegetables. Generally, the trend in price spikes aligns with the rainfall dependency of most smallholder farmers. Farmers with access to water and irrigation are most likely to realize the most returns from their vegetable enterprises.

Figure 3: Price Volatility of Tomatoes and Rape (2010 to 2018)



Source: CSO data & Authors' computation (2021)

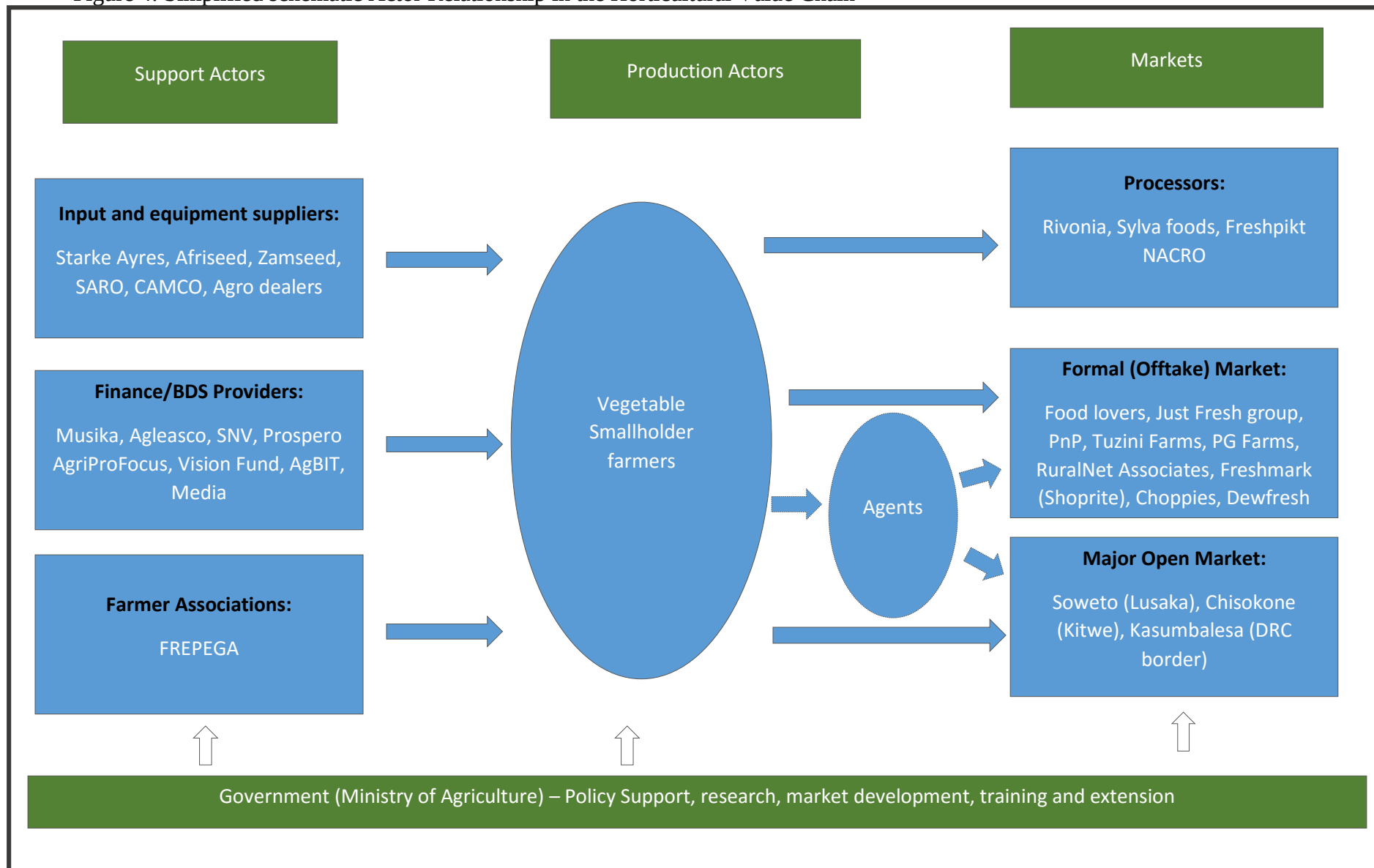
The study also found that the local council played a role in the marketing of horticultural products, especially in terms of storage of produce. District center markets were found to charge an average of ZMW15 per space/compartment per day for a storage shed for vegetables in the markets. There was also a provision to pay monthly especially for traders that usually use the makeshift facilities longer and more frequently. However, the structures were noted to be inadequate in accommodating a large number of farmers and traders. There was also lack cold-chain facilities to freeze or keep vegetables fresher for longer times. Most smallholder farmers normally sold their produce within a week as the buyers purchased the produce from the farmers' gardens using light trucks.

Nonetheless, IAPRI and Musika (2018) pointed out key factors likely to sustain the demand for horticultural products. These included a sustained increase in urbanization expected to increase by 121% in 2035 from 5.6 million in 2011. Another critical factor would be the increase in low income household's expenditure on vegetables, low income households have more than doubled their food expenditure share on vegetables from 14% to 32% in the last 20 years; the growing health consciousness has also fueled vegetable consumption by medium income households. Vegetable consumption has been estimated to be increasing between 10% and 15% in the last 5 years.

Support Actors

Zambia has over the past decade also seen an increase in the number of stakeholders in the horticultural value chain. Key among these stakeholders are the support actors whose role partly overlaps with that of market providers. Whilst there has been a general increase and sustained concentration of input suppliers, especially on the seed, financial facilities and lobbying groups have had limited presence to influence significant development in the horticultural sector. And despite a number of support actors, efforts have largely been uncoordinated.

Figure 4: Simplified schematic Actor Relationship in the Horticultural Value Chain

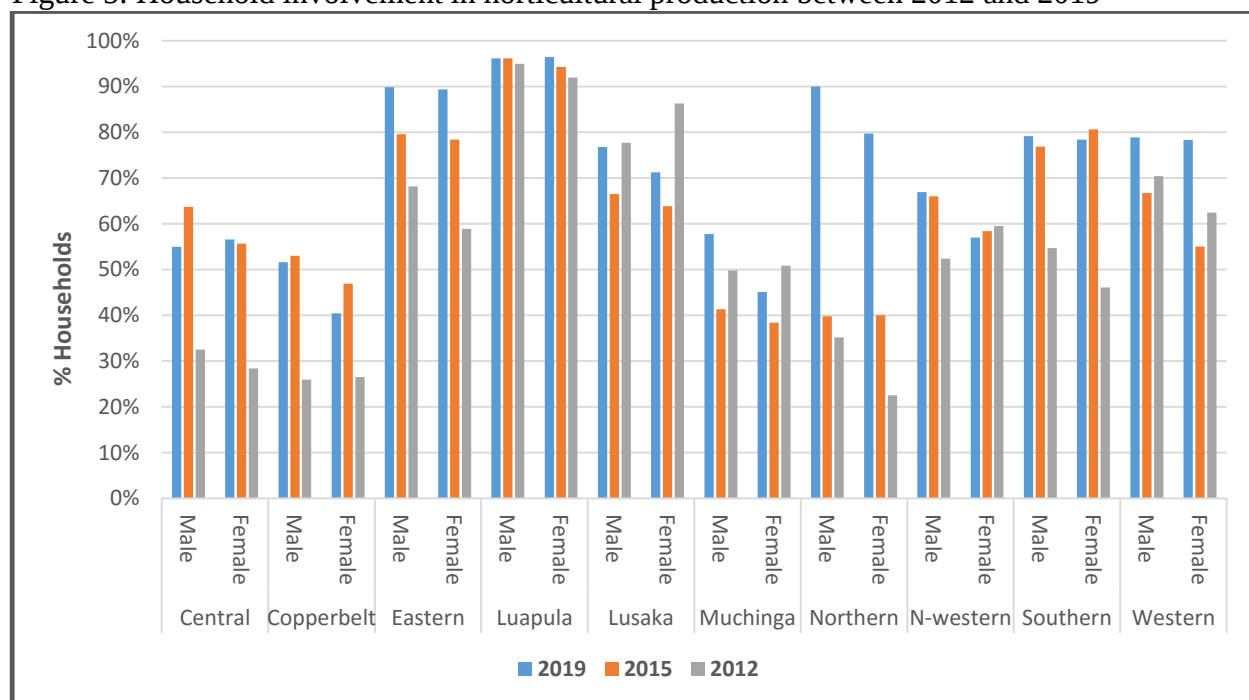


Source: Adapted from Mumba et al., 2015

Horticultural Production

During the 2018/19 agricultural season, 77% of the rural households indicated that they were engaged in the production of at least one type of vegetable. Participation in vegetable production was highest in Luapula province (96%) followed by Eastern province (89%) whilst Northern province (87%) came in third, see figure 5 below. Least participation in vegetable production was observed for Copperbelt province (49%). Households grew an average of 2 types of vegetables during the 2018/19 agricultural season, and out of the total number of vegetables considered in the sample, pumpkin leaves were the most commonly grown (22%) followed by rape (11%) and cassava leaves (11%). This trend was similar between 2012 and 2015, pumpkin leaves and rape were the most grown and consumed vegetables by rural households. Nevertheless, the vegetable distribution suggests that households had grown a wide variety of vegetables, selection was done over 60 known and locally grown vegetable varieties.

Figure 5: Household involvement in horticultural production between 2012 and 2019



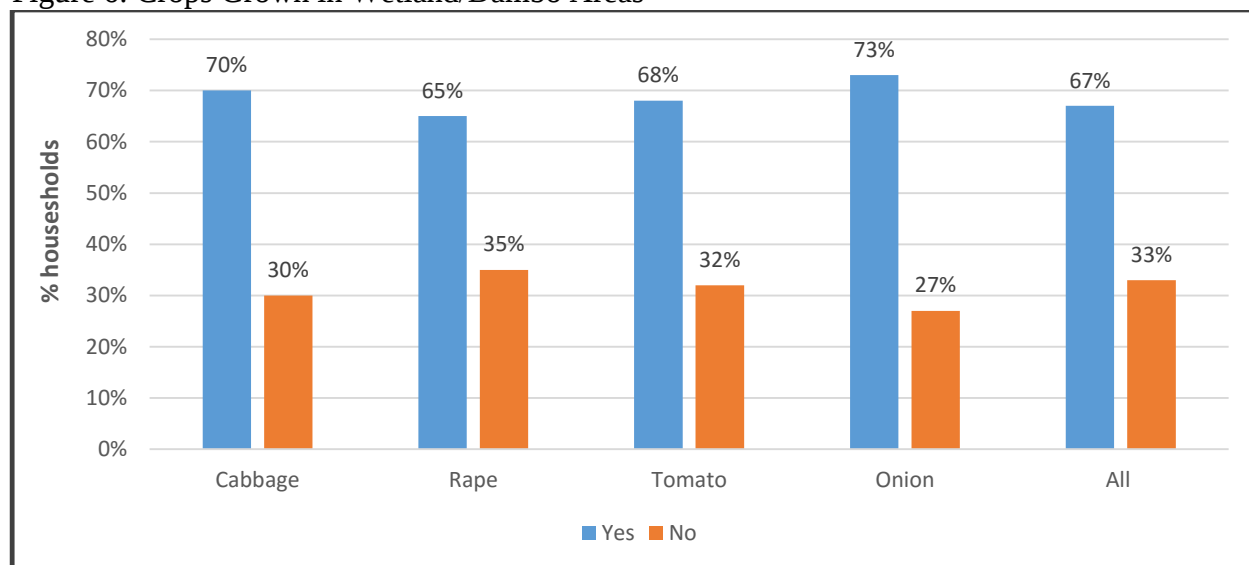
Source: RALS2019 & Authors computations

It was further established that 27% of the households had grown vegetables in the wetland or dambo area. The highest proportion of households that used dambos or wetlands for their vegetable production were from Western province (38%) and the least proportion was from North Western province (16%). On average, 27% of the households used irrigation for vegetable production, use

of irrigation was highest in Southern province (55%) and the least proportion of households that used irrigation on vegetables was in North western province (18%). This makes sense given that Southern province is one of the provinces most prone to high temperatures and droughts, in fact it reported drought occurrences in the reference year (Mpundu and Sichilima 2020). In a study by Sebele and Mpundu (2020) on the key enablers of irrigation use by smallholder farmers, it was revealed that of the households which irrigated their fruits and vegetables, the majority of the irrigated fields were in wetlands/dambos. The study also revealed that informal irrigation for fruits and vegetables was more prevalent than for field crops among smallholder farmers in Zambia, with the majority of the irrigated fields located close to water sources (Kazekula, 2014).

The majority (67%) of farmers involved in horticultural production under the four (4) vegetables of focus indicated that they grew the vegetables predominately in the dambo/wetland areas, a further look into individual crops showed that 73% of onion smallholder growers and 70% of cabbage smallholder growers grew the vegetables around the wetlands.

Figure 6: Crops Grown in Wetland/Dambo Areas

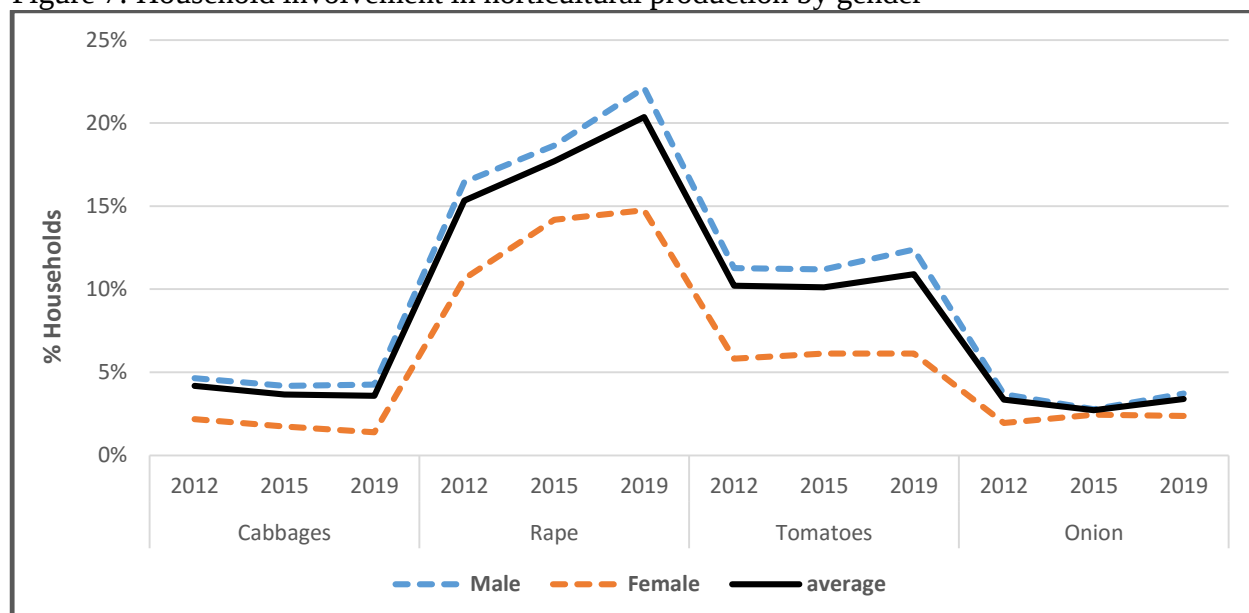


Source: RALS2019 & Authors computations

In terms of respective vegetables considered in this study, participation in the growing of cabbages and onions has stagnated since 2012. For instance, the study established that an average of 4% of rural households were involved in the production of cabbage in 2012, this proportion was maintained in 2019. A similar trend was observed for onions, 3% of the rural households were involved in the production of onions in both 2012 and 2019. Marginal improvements were noticed

for tomatoes (1%) whilst rape recorded a 4% increase in the participation of households between 2012 and 2019, see figure 7 below. It was further found that the households had planted the vegetables about twice during the 2018/19 agricultural season.

Figure 7: Household involvement in horticultural production by gender

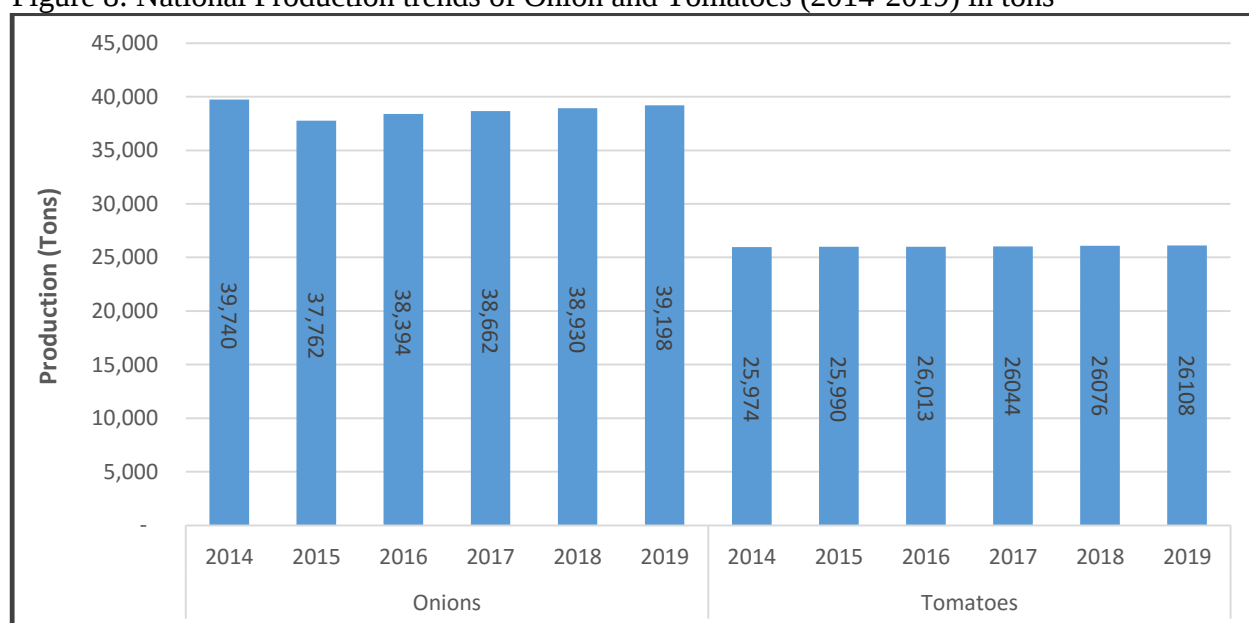


Source: RALS2019 & Authors computations

At household level, an average of 1,737.1 kg of cabbages were harvested during the 2018/19 agricultural season, male headed households harvested 1,587.8 kg whilst female headed households harvested (3,199.1 kg) almost twice the quantities harvested by the male headed households. An estimated 331.9 kg of rape was harvested. Male headed households harvested 343.0 kg of rape whilst female headed households harvested 279.4 kg. An average of 1,403.9 kg of tomatoes were harvested during the 2018/19 agricultural season, female headed households harvested (2,403 kg) almost twice the quantity harvested by male headed households (1,249 kg). An average of 612.8 kg of onions were harvested, and in contrast to tomatoes, male headed households (670.7 kg) produced more than twice the quantities of onions harvested by female headed households (321.8 kg).

Like observed at household level, production at national level stagnated between 2014 and 2019, see figure 8 below. Onion and tomato production in Zambia was approximated at 39,198 tons and 26,108 tons in 2019, respectively.

Figure 8: National Production trends of Onion and Tomatoes (2014-2019) in tons



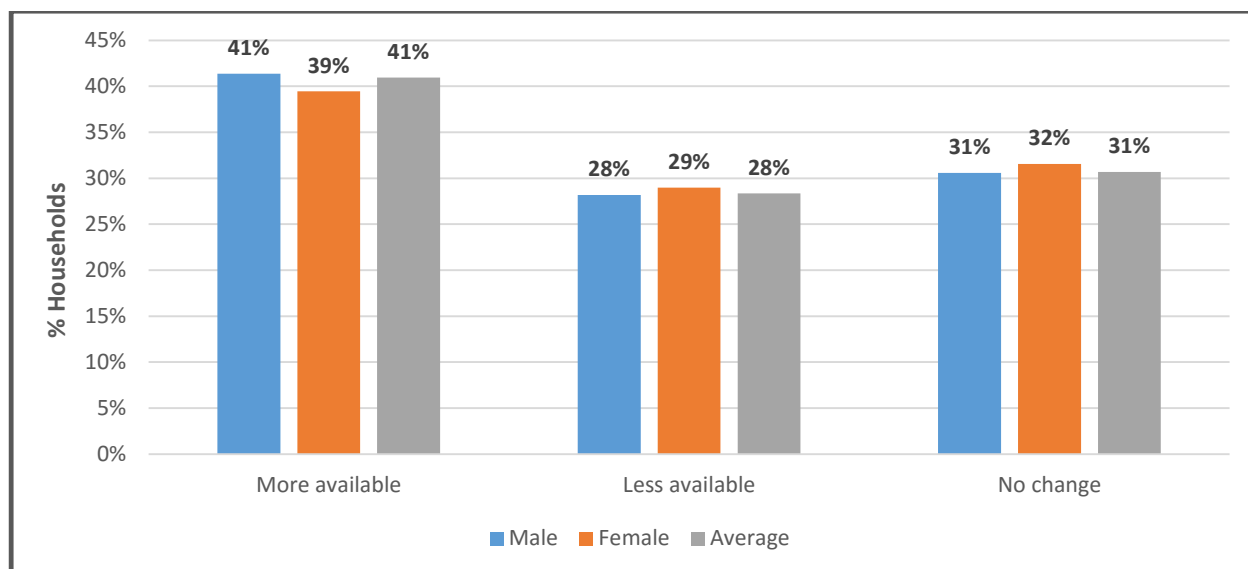
Source: FAOSTAT data & Author's computations (2021)

Access to Extension

The majority of the households were members of a cooperative (54%), 43% of these were female headed households. It was also revealed that 22% of the households had at least a member who belonged to a women's group. Belonging to a group could be critical in offering a platform for information access, it could also be a conduit for accessing other market services and products.

It was also learnt that 41% of the households engaged in vegetable production had observed more availability of extension services, 28% felt that extension services were less available whilst 31% did not observe any change, see figure 9 below. Households engaged in vegetable production were located approximately 12.4 km away from camp extension offices.

Figure 9: Availability of government extension services between 2015 and 2019



Source: RALS2019 & Authors computations

Qualitative interviews with farmers in Central and Lusaka province revealed that generally farmers lacked knowledge on improved farming practices, fresh produce quality requirements, and disease and pest management, especially on tomatoes. It was also noted that there was need for continuous trainings because both public and private agricultural extension services were inadequate on horticultural farming. It was further observed that the public extension was usually present around the FISP activities. However, Central province, specifically Mumbwa district, had access to private extension service provision between 2015 and 2020 from International Development Enterprises (IDE Zambia). The organization used to link farmers to professionals to train them on different aspects of farming. At the time of the interview, the organization was not offering this service anymore.

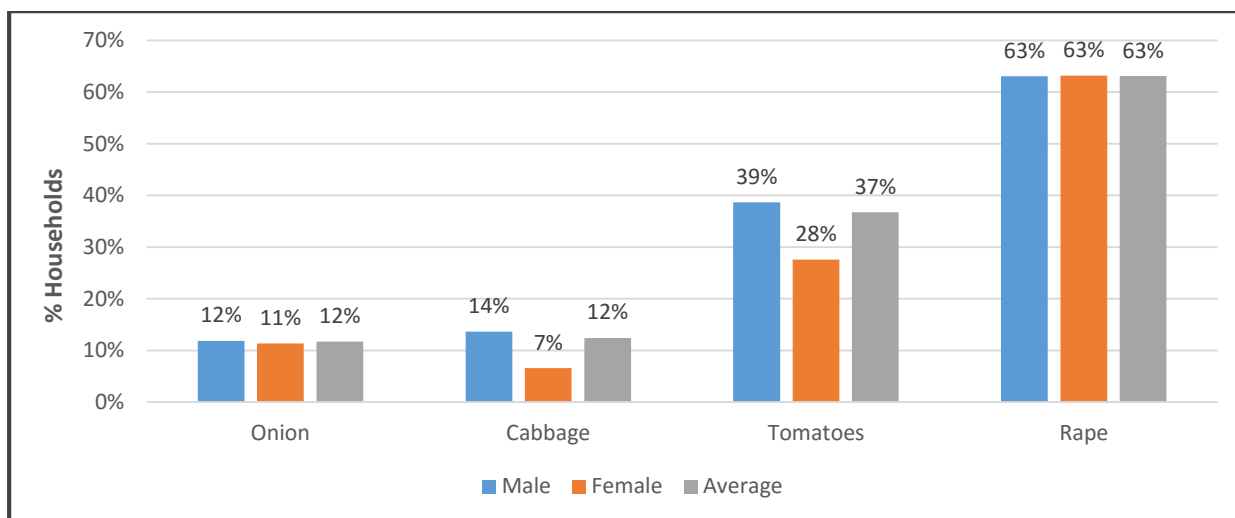
It was also learnt that farmers in both provinces had no information on the standards they were required to meet for the export of horticultural products. Nevertheless, farmers had neither explored opportunities nor obtained information required to export or inquired on standards required by the hospitality industries that have a notably large demand share for fresh fruits and vegetables. In a study by (Kazekula, 2014) it was noted that there was a need for continued horticulture sub-sector institutional support that is targeted at providing farmers with essential services such as the provision of pesticides, consulting advise on the quantities and timings of crop planting, harvesting, storage, and packing practices so as to grow the sub-sector.

In another study by (AgBIT, 2015), it was noted that generally the horticultural subsector had an uncoordinated market information system. Despite Zambia attaining a penetration rate of over 100.2% for mobile phones communications (ZICTA, 2020), there was no robust mobile phone trading platform where stakeholders such as smallholder farmers could check for prevailing market prices, make informed decisions and make business deals before taking their goods to the market. Significant price variations exceeding 50% between preceding days coupled with post-harvest losses lead smallholder farmers to incur large losses. Smallholder farmers have not had opportunities to access information on prices for inputs, chemicals, equipment, and fertilizers. They equally did not have platforms they could use to disseminate information about their produce. Market information and trading platform would empower the smallholder farmers with information about whether to take their goods to a particular market, enter prior deals before they transport the good to a market of their choice, this would save on transport that they incur when they move goods speculatively to the market.

Horticultural Marketing

The study found that on average only 26% of the households in rural areas were involved in the marketing of vegetables during the 2018/19 agricultural season, this implies that less than half of the households engaged in the production of vegetables sold their produce. It was further learnt that male headed households (29%) had participated much more in the marketing of vegetables than female headed households (19%). Households had participated significantly more in the marketing of rape than the other horticultural crops. On average, 63% of the rural households were engaged in the marketing of rape. This suggests that rape is one of the most marketed vegetables by rural households, see figure 10 below.

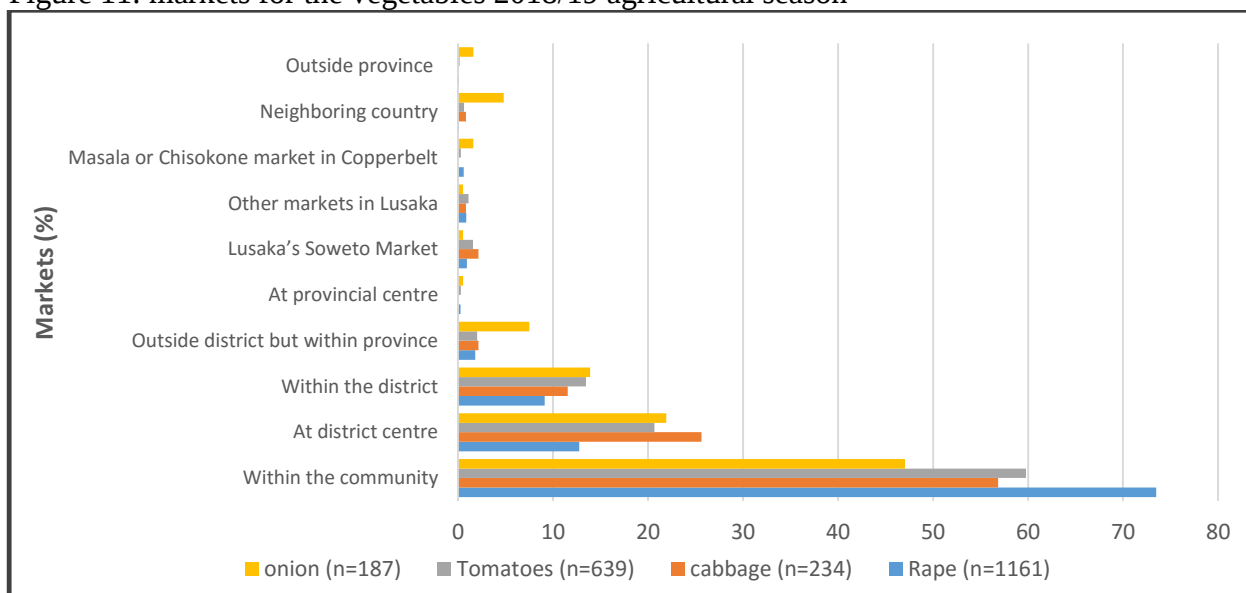
Figure 10: proportion of households involved in the marketing of specific vegetables



Source: RALS2019 & Authors computations

In terms of the marketing channels, the majority of the rural households sold vegetables either within their communities or districts. Thus horticultural trade is largely localized partly due to the nature of the produce; highly perishable. The most traded vegetable outside the communities were onions, and to some extent cabbages, see figure 11 below.

Figure 11: markets for the vegetables 2018/19 agricultural season



Source: RALS2019 & Authors computations

Less than 20% of the vegetables were supplied to chain stores by smallholder farmers. Major chain stores were able to procure most of the vegetables produced by the smallholder farmers, the purchase of the vegetables by the chain stores depended on the demand of the particular vegetables by consumers. Generally, the most demanded vegetables by chain stores were the leafy vegetables

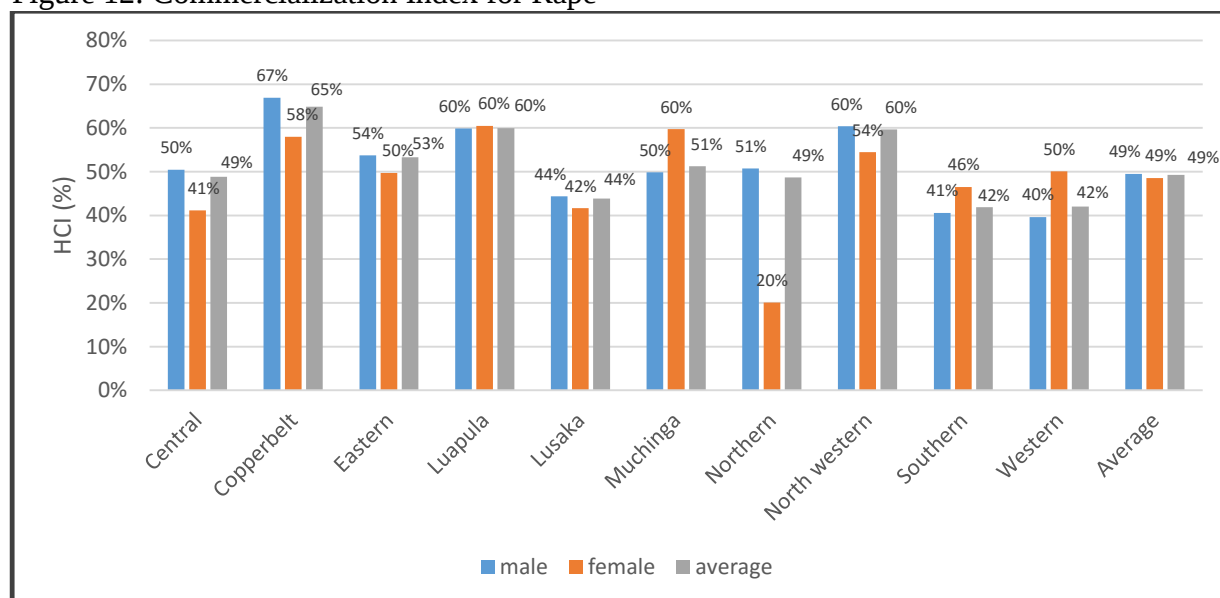
such as rape, chinese cabbage and spinach. However, the major challenge noted by the chain stores was the inconsistency of supply by the smallholder farmers, the smallholder farmers did not meet the supply volumes required by the chain stores. Trade between the chain stores and farmers, involved entering into negotiated individual agreements with the smallholder farmers based on the quantity and also the price of the vegetables to be supplied.

Commercialization Index

To examine the intensity of households' participation in various markets through quantities sold, the study estimated household commercialization indices (HCIs) for crops marketed during the 2018/19 agricultural marketing season. The HCI is defined as the ratio of total value of crop output sold to the total value of all crops produced, and in this case vegetables. A value of zero would signify a totally subsistence-oriented household and the closer the index is to one (1), the higher the degree of commercialization.

Despite 63% of the households being involved in the marketing of rape, 49% of the produce harvested was actually sold, see figure 12. On average, 97.6 kg of rape was sold by a household during the 2018/19 agricultural season. Male headed households had sold an average of 101.3 kg whilst female headed households had sold an average of 80.4 kg during the agricultural season. Households had participated in the selling of rape over a period of 2.8 months.

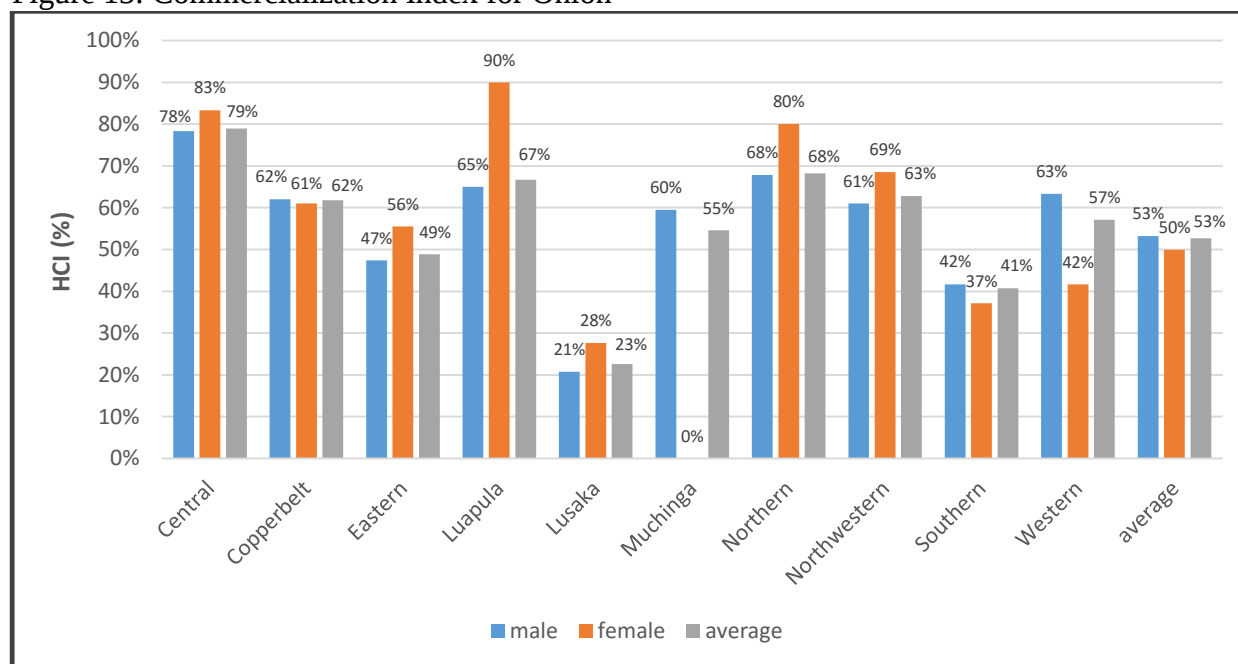
Figure 12: Commercialization Index for Rape



Source: RALS2019 & Authors computations

Only 12% of the rural households were involved in the marketing of onions. The commercialization index for onions was found to be 53%, implying that almost half of the onions harvested were actually sold, see figure 13. On average, 462.4 kg of onion was sold by households in 2018/19 marketing season. Male headed households sold (508.7 kg) more than twice the quantities sold by female headed households (229.7 kg). Rural households participated in the selling of onions over a period of 1.5 months.

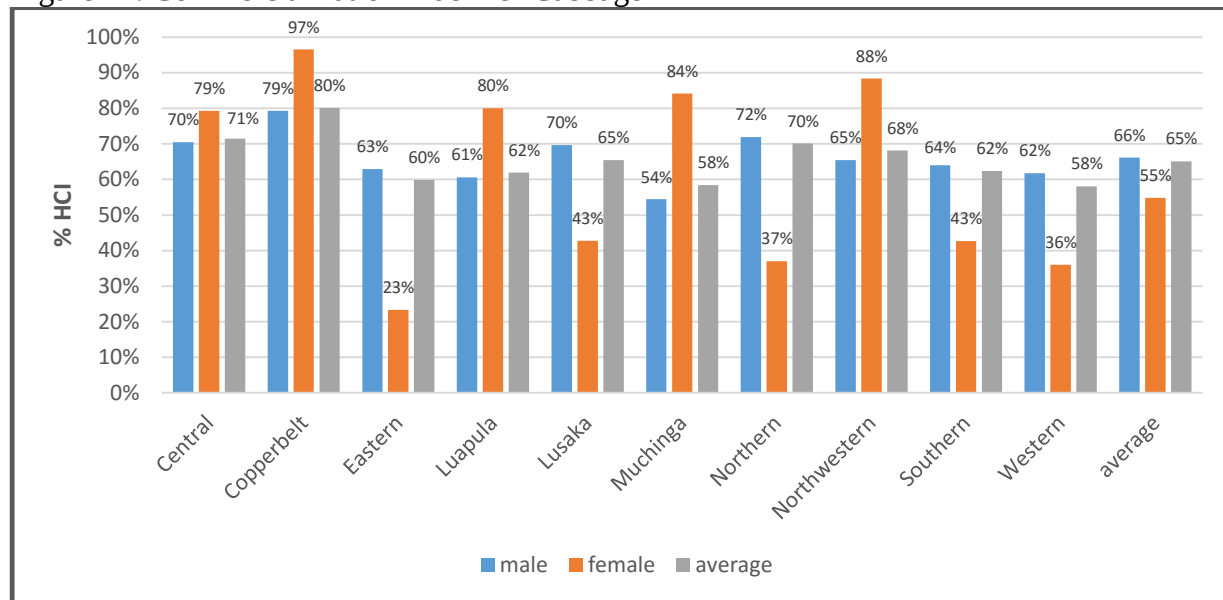
Figure 13: Commercialization Index for Onion



Source: RALS2019 & Authors computations

The study found that cabbages had one of the highest rates of commercialization (65%) despite only 12% of the households being involved in the selling of cabbages, see figure 14. On average, 1275.5kg of cabbages were sold during the 2018/19 agricultural season. Female headed households sold an average of 1335.6 kg whilst male headed households sold 1269.4 kg, unlike the other value chains, female headed households sold relatively much more than male headed households. It took an average of 1.5 months for households to sale cabbages, 1.6 months for male headed households and 1.4 months for female headed households.

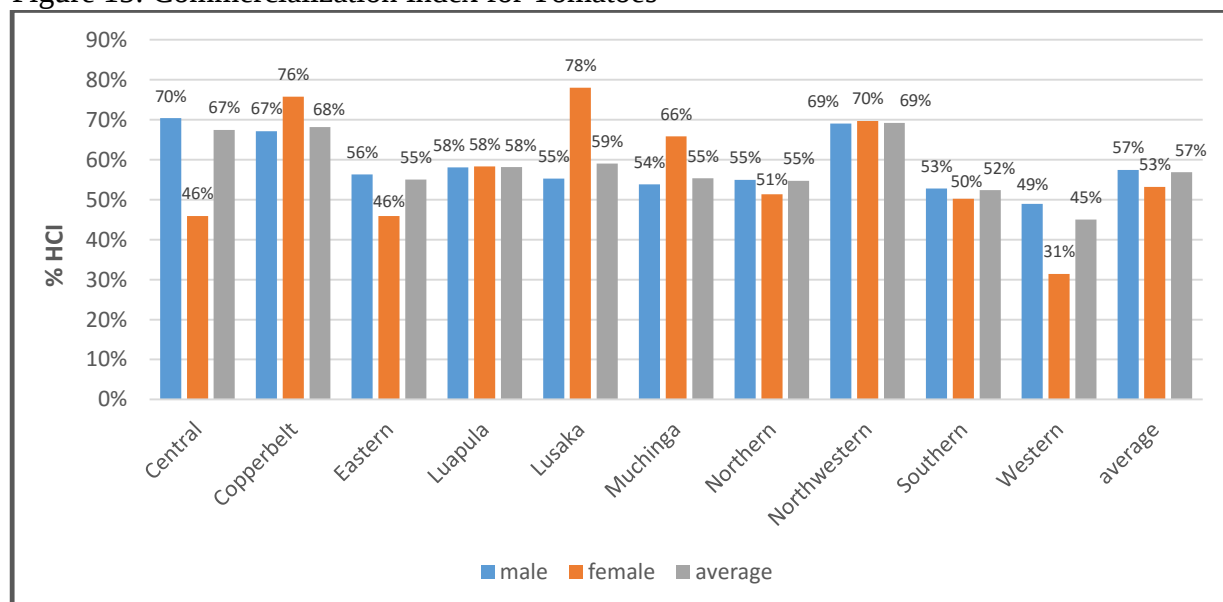
Figure 14: Commercialization Index for Cabbage



Source: RALS2019 & Authors computations

The study further found that 37% of the rural households were involved in the marketing of tomatoes. Commercialization index was estimated at 57%, see figure 15 below. On average, 1080.9kg of tomatoes were sold during the 2018/19 agricultural marketing season. Female headed households sold almost twice the quantities sold by male headed households, female headed households sold 1710 kgs whilst male headed households sold 983 kgs. Households traded tomatoes over a period of 2.2 months.

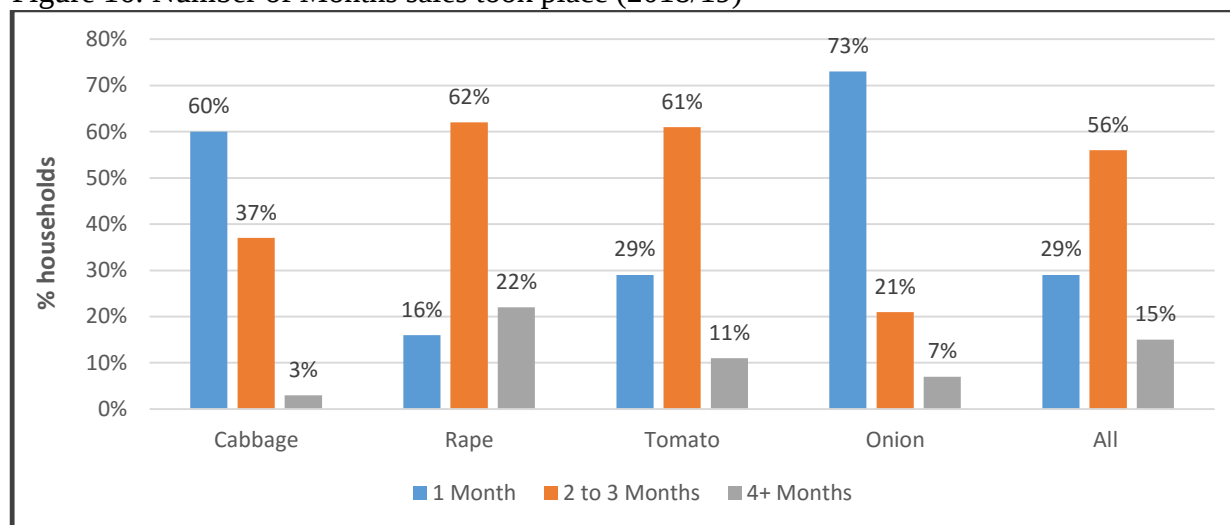
Figure 15: Commercialization Index for Tomatoes



Source: RALS2019 & Authors computations

The majority (56%) of the smallholder farmers that grew the four (4) crops of focus sold their vegetable produce for an average period of 2 – 3 months, a further look showed that for cabbage (60%) and onion (73%) crop, majority of the farmers sold their produce within a month. However, rape and tomato crop farmers (62%) took an average of 2 – 3 months to harvest their produce.

Figure 16: Number of Months sales took place (2018/19)



Source: RALS 2019 data & author's computation

Vegetable Contribution to Household Income

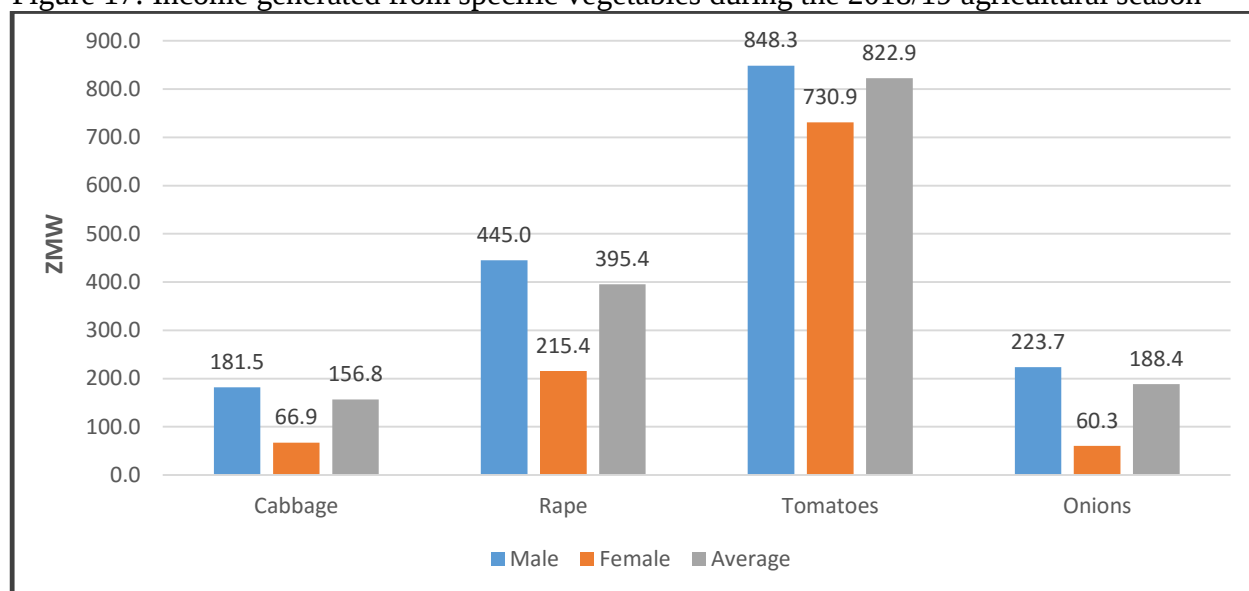
Household income among rural smallholder farmers in Zambia was found to average ZMW21,529. Male headed households (ZMW25,440) generated more than twice the revenue generated by female headed households (ZMW11,299). Generally, a significant proportion of income (60%) was earned from farm activities such as non-vegetable crop, livestock, and fruit and vegetable production; 40% was generated from off-farm activities such as business and wage employment.

Vegetables contributed about 16% towards the overall income generated from farm activities, crop sales (74%) contributed the most revenue followed by vegetables. Households generated an annual average of ZMW2,071 from vegetable sales. Male headed households generated about ZMW2,201 whilst the female headed households generated ZMW1,600 from vegetable production.

For the vegetables under the study, the most revenue was generated from tomatoes (ZMW823) followed by rape (ZMW395). The relatively low revenues generated from onions (ZMW188) and cabbages (ZMW157) could be explained by the low levels of participation in the markets (12%)

despite the relatively high commercialization index of over 50%. Thus there is huge unexplored potential of the vegetables contributing significantly towards household income.

Figure 17: Income generated from specific vegetables during the 2018/19 agricultural season



Source: RALS2019 & Authors computations

In terms of economic returns, vegetable enterprises have been found to be profitable. Table A1 in the annex shows simplified gross margins for onions, cabbages and tomatoes generated from enterprise budgets developed by ZNFU in 2019. For onions, a look at cost contribution reveals that 45% of the costs were incurred on seeds and labour whereas for cabbages, approximately 39% of the variable costs were on transport and labour. For tomatoes, 63% of the variable costs were incurred on seedlings and transport.

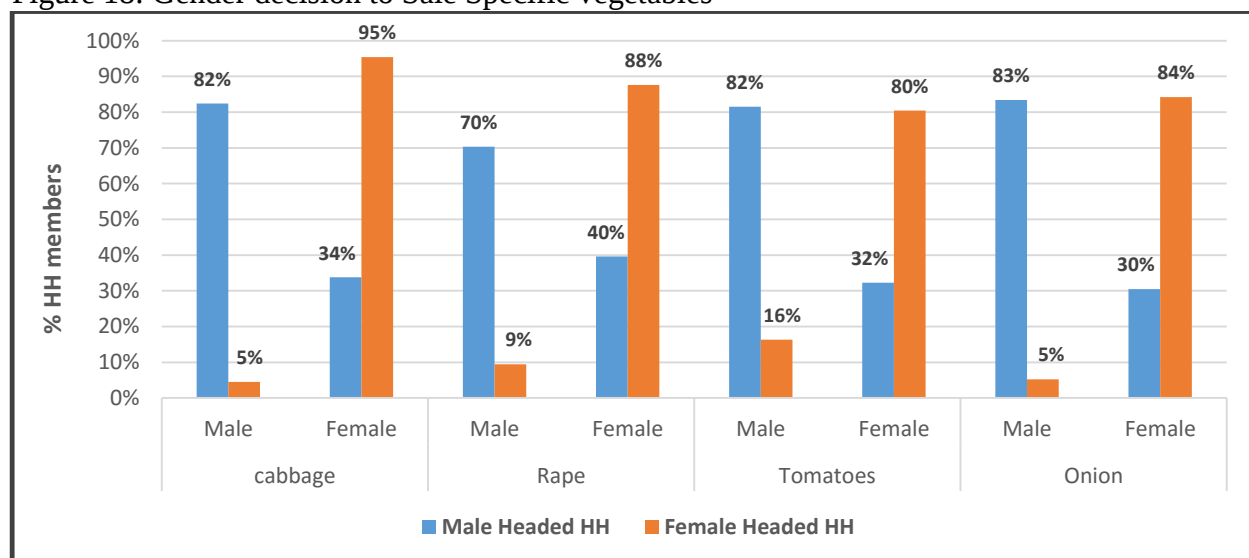
Gender related intra-household control over agricultural economic decisions / factors of production within the value-chain.

Farmers' indicated that generally male members of the household were responsible for the planting of horticultural produce, while all members of the household were generally responsible for the application of pesticides and fertilizers. Similarly, for harvesting, all members of the household participated in this activity. However, when it came to selling, male household members were responsible for negotiations of price and discounts but generally all member in the household were responsible for the selling of produce especially at homestead/farmstead. Farmers in Central and Lusaka province indicated that they had separate fields/gardens for household consumption

therefore did not need to retain some produce for household consumption. However, female members of the household were responsible for the fields/gardens.

Using the RALS data, the study found that generally, 46% of female household members made decisions to sale vegetables compared to 60% of male household members involved in making marketing decisions. In terms of specific vegetables, there was relatively more participation of female household members in male headed households in making selling decisions for rape than any other vegetable, see figure 18 below. This suggests that rape offers better chances of incorporating women in economic decision making than the other vegetables. Conversely, male household members participated relatively more in decision making in female headed households over sales of tomatoes than any other vegetable.

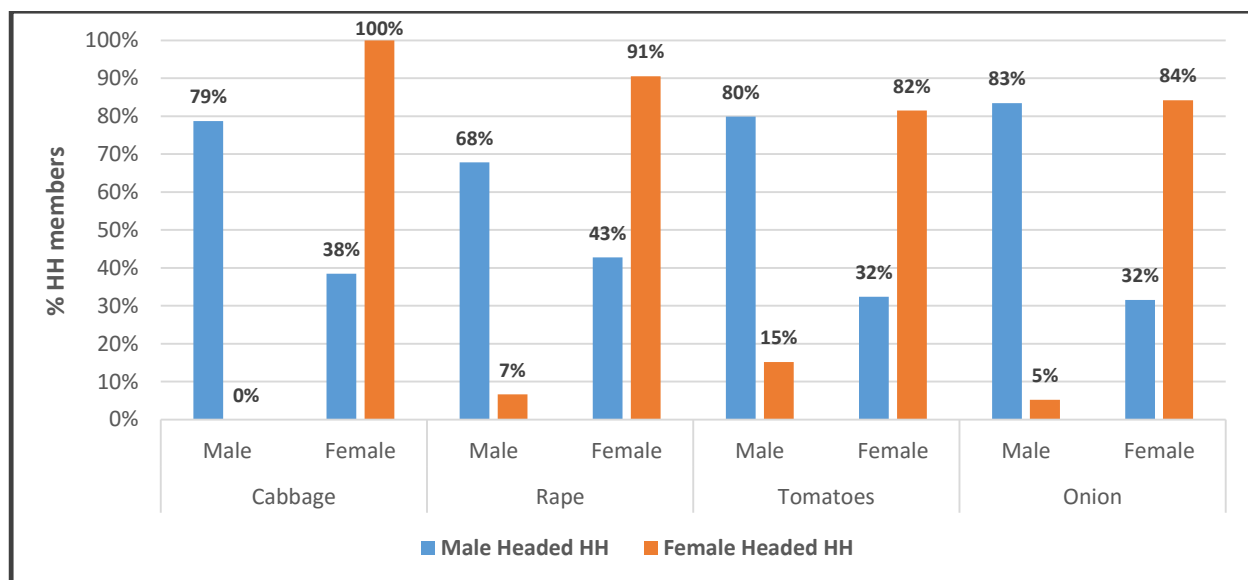
Figure 18: Gender decision to Sale Specific vegetables



Source: RALS2019 & Authors computations

There was a marginal improvement in the proportion of female households who made decisions on how to use revenue from vegetable sales, approximately 48% of female household members made decisions on how to use vegetable revenues, see figure 19. Like observed earlier over decision making in selling rape, more female household members made decision on how to use revenue from selling of rape than over other vegetable enterprises.

Figure 19: Gender decision on how to use revenue from Specific vegetable sales



Source: RALS2019 & Authors computations

Policy Interventions

The horticultural sector has largely been governed by the National Agriculture Policy (2012 to 2030). One of the key objectives of the policy is to improve access to productive resources and services for small-scale farmers in outlying areas, especially women and young farmers, to enable them increase production of staple foods, including fruits and vegetables, for own consumption and the surplus for income generation. This objective is aligned to one of the three (3) goals of Zambia's agricultural sector, which seeks to contribute to the reduction of poverty and food insecurity in the rural and urban areas.

Zambia has over the years seen ad hoc policy shifts in the horticultural subsector, see table 1. Most of the shifts have had one common goal, and that is to promote and strengthen the local horticultural value chain. After the implementation of the government ban on onions and potatoes in 2021, PMRC (2021) postulated that restricting the importation of horticultural crops particularly onion and table potatoes could promote and strengthen the horticultural value chain, which had shown positive growth potential over the years whilst enhancing crop diversification among small-holder farmers. However, in all instances of import bans, the policy shifts were short lived as they had economic ramifications.

In 2014, the Industrial Development Corporation (IDC) became the holding company for all State Owned Enterprises (SOEs), the main vehicle for investment in strategic sectors where the private sector was not able to venture. This saw two twin state owned ventures in 2020; Eastern Tropical and Kalene Hills enter the fruit and vegetable market.

Zambia's ratification of the Africa Continental Free Trade Area (AfCTA)³ is poised to accelerate its industrial and export capacity, the expected outcome of the trade agreement is the elimination of tariffs and non-tariff barriers. Whilst this could be a positive move on the grain crops, this might not have any positive impact on the fruits and vegetables in the short and medium term given the state of infrastructure in the horticultural subsector.

Table 1: Policy interventions bordering on the vegetables and fruits

Timing	Policy intervention
2014	Public Sector Reforms, incorporation of the Industrial Development Corporation (IDC)
2017	Ban on the importation of some fruits and vegetables: tomatoes, onions, carrots, mangoes, potatoes, pineapples, lemons and watermelons
2018	SI No. 12 of 2018 (Street Vending and Nuisances); Selling fruits and vegetables from the ground, open vans, wheel burrows or other conveyances is prohibited
2018	Ban on imports of some foods from South Africa, including processed meats, vegetables and other dairy products (Listeriosis outbreak)
2019	Good agricultural practices for fruits and vegetables (Standards Act No. 4 of 2017)
2020	Ratification of the African Continental Free Trade Area (AfCFTA) agreement
2021	Restriction on the importation of onions and potatoes

Source: GoZ, 2014-2021

Nevertheless, current investment, contract, competition, consumer protection and metrology laws are adequate to support planned investments in wholesale market structures that adequately protect the market players and foster transparent and secure trade. There is also increasing realization that incorporation of high-value fruit and vegetable crops into an integrated sustainable farming system will improve smallholder incomes, improve family diets, reduce incidence of non-communicable diseases, enhance the livelihood and well-being of families and village communities.

³ Zambia's national AfCFTA strategy has not yet been made public

Key Challenges

Inadequate infrastructure; the Zambian fresh fruit and vegetable market lacks modern, transparent, and competitive produce wholesaling markets. As a result, its growth is hampered by structural challenges including but not limited to: Informal-open air markets operated by unregulated brokers, with non-transparent and uncompetitive pricing and trading practices, which disadvantage producers and consumers.

Price volatility; related to the preceding challenge is the issue of high price variability, the sector suffers from high supply inconsistencies and high price volatility with producers and consumers paying the highest opportunity costs of poorly discovered prices. Lack of access to post-harvest management equipment leads to huge post-harvest losses (as high as 20%) due to limited cold chain facilities, chaotic marketing systems which often result in unhygienic trading conditions especially in informal markets which have high potential of turning into communicable disease hubs. This has triggered food safety concerns, unpredictable volumes and quality usually forces formal retail chains to import even when local producers can easily meet the demand.

Low production levels; smallholder farmers also often have low yields, over-use pesticides time and again, and lack proper post-harvest management skills. The low production levels have consistently been evident whenever import bans were implemented resulting in national shortages of the respective vegetables. Contributing to this is also the inherent lack of business connections and financing, climate change impacts, restrictive regulatory environments, and insufficient access to information; all these are constraining the possibilities of growth for the sector and increase in incomes.

Conclusions

The study found that despite a generally fair participation of households in vegetable production, it is fraught with a number of constraints which will need addressing if the sector is to realize its potential in contributing agricultural diversification. Key among these issues are inadequate marketing opportunities, access to extension information, inadequate processing centers to impact the value of the produce and inherently lower down the total remuneration accrued to the farmers. There might also be a need for a much more coordinated approach by support actors.

Recommendations

A need to improve the market infrastructure: there is a need to improve the market infrastructure as it is one of the most critical challenges for the farmers. This includes the cold chain systems, part of this could involve the development of the cold storage chains in different geographical areas corresponding to production levels. There is still need for interventions to improve irrigation uptake and improving access and availability of finance and insurance.

Low cost processing interventions; inadequate value addition due to lack of fully developed agro-industries resulting in excessive post-harvest losses. There is need to innovate around household level processing initiatives.

Structured market access is key; improving access to assured markets could encourage farmers to participate more in assured markets. There is still need for stronger market linkages between smallholder farmers and market players. Currently, there are a few agricultural firms in the horticultural markets working with smallholder farmers, out growers.

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Annex

Table A 1: Gross Margins for Specific Vegetable Enterprises for One Hectare

	Tomatoes (Irrigated)	Cabbage (Conventional)	Onion (Irrigated)
Revenue	550,000	75,000	270,000.00
Variable costs	84,243.31	24,480.39	72,560.25
Gross Margin	465,756.69	50,519.76	197,439.75

Source: ZNFU (*simplified enterprise budgets*), 2019.