

FACTORS AFFECTING CASSAVA CONSUMPTION IN AN URBAN POPULATION IN
ZAMBIA

by

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Abstract

Maize is a staple food to many Zambians. It is for this reason that it has received a lot of support from government as a way of maintaining food security in the nation. No other crop in Zambia currently receives such level of support from government. Factors influencing its availability can thus seriously affect food security.

In recent years, Zambia has not been spared by adverse climatic changes that have continued to affect the entire globe. In the early 1980s the southern “maize-belt” part of the country that was devastated by continuous drought that caused villagers to go hungry and lose a lot of livestock that was their main livelihood. The trend of decreasing rainfall in consecutive seasons has continued in many parts of the country.

Because most smallholder farmers, who are the major contributors to the nation’s food supply, depend on rain for crop production, there has been a deliberate policy by government through the Ministry of Agriculture and Co-operatives to encourage the farmers to diversify their on- and off-farm activities to improve food security at household and national level. To this end, the government has continued to encourage the growing of cassava. Several studies have suggested that cassava is a nutritious food crop (Chitundu, Droppelman and Haggblade, 2006). Cassava has a number of industrial uses too. Good attributes of cassava lie not only in the nutrition content of the tuber and leaves but also in the fact that as a field crop it does not require expensive inputs like fertilizer and is better able to withstand drought compared to the maize crop.

This study attempts to understand the economic factors that influence consumption of cassava to shed light on its potential to avert potential crisis associated with prolonged droughts. Based on the survey conducted in 2007 in Lusaka, the study found that price and quality of cassava meal are the principal determinants of cassava meal demand in Lusaka. Direct price elasticity of demand for cassava is -1.32, suggesting that cassava meal is price elastic. The study also found that the cross price elasticity between maize meal price and cassava meal demand is 0.04 suggesting that cassava meal is a substitute to maize meal, but inelastic. The income price elasticity of demand for cassava meal is -0.12. However, income was found to be statistically insignificant in determining the demand for cassava meal. As such these economic factors are

keys to the consumption of cassava. Therefore, the study suggests that the demand for cassava meal in Zambia may be improved through deliberate promotion.

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List of Abbreviations

| | |
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| ASIP | Agriculture Sector Investment Program |
| CSO | Central Statistical Office |
| FAO | Food and Agriculture Organization |
| FRA | Food Reserve Agency |
| FSRP | Food Security Research Project |
| MACO | Ministry of Agriculture and Cooperatives |
| MAFF | Ministry of Agriculture, Food and Fisheries |
| MATEP | Market Access, Trade and Enabling Policy |
| MCB | Maize Control Board |
| MMD | Movement for Multi-party Democracy |
| NAMBOARD | National Marketing Board |
| PAM | Program Against Malnutrition |
| SAP | Structural Adjustment Program |
| UILTCB | USAID International Long Term Capacity Building |
| UNIP | United National Independence Party |
| ZMK | Zambian Kwacha |

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Dedication

This thesis is dedicated to Emmy and the boys; Mushili, Wezi and T. Robert for the support and patience during the time I was studying and working on the thesis. I dedicate the thesis to my mum, brothers and sisters for their unwavering support and encouragement the time I was far away from home, without forgetting my late father who always insisted on good grades in school.

CHAPTER 1 - INTRODUCTION

1.1. Background and problem statement

Maize is a staple food to many Zambians. It is for this reason that it has received a lot of support from government as a way of maintaining food security in the nation. Currently there is a government-supported fertilizer program in place that supports farmers growing maize. No other crop in Zambia currently receives such level of support from government.

In recent years, Zambia has not been spared by adverse climatic changes that have continued to affect the entire globe. In the early 1980s the southern “maize-belt” part of the country that was devastated by continuous drought that caused villagers to go hungry and lose a lot of livestock that was their main livelihood. The trend of decreasing rainfall in consecutive seasons has continued in many parts of the country since the early 1980s.

Because most smallholder farmers, who are the major contributors to the nation’s food basket, depend on rain for crop production, there has been a deliberate policy by government through the Ministry of Agriculture and Co-operatives to encourage the farmers to diversify their on- and off- farm activities as a way to improve food security at household and national level. To this end, the government has continued to encourage the growing of cassava. This can be seen in the number of research programs into developing high-yielding and short-maturity cassava varieties. Also, a government-supported Food Reserve Agency buys cassava chips as strategic food reserves. As a way to assist the Zambian government a number of non profit-organizations have been promoting the growing of cassava as a substitute to maize and serve as an income earner by way of assisting smallholder farmers diversify their farming activities.

Several studies have suggested that cassava is a nutritious crop. Cassava is consumed in fresh form as a raw or cooked snack among both the urban and rural population. In addition to the staple maize meal, cassava meal can be used to prepare meals. Among the urban population, a blend of maize and cassava meals can be used to prepare the common meal, *nshima*¹.

¹ *Nshima* is a thick porridge made from cooked maize flour

Cassava flour is used to prepare bread and some snacks too. In Zambia, consumers can either buy dry cassava chips that they mill into flour or cassava flour for consumption.

Cassava has a number of industrial uses too. It is used in the manufacture of packaging material and glue. Good attributes of cassava lie not only in the nutrition content of the tuber and leaves but also in the fact that as a field crop, it does not require expensive inputs like fertilizer and has a better degree to withstand drought compared to the maize crop. However, there is growing concern as to whether or not cassava has received the attention it deserves to be an effective substitute to the staple maize, and a potential industrial input that provides the much needed income for smallholder producers.

Despite the efforts on the part of government and others to encourage cassava production, the success of cassava as an alternative to maize is dependent on consumers accepting and consuming it. There has not been any attempt to date in Zambia to develop a clearer approach of understanding consumer response to cassava and this poses a strategic challenge to the current government policy.

The purpose of this study is to address this gap in knowledge about the demand side of the cassava market using classical demand theory. Would consumers adapt to consuming cassava in a country that has traditionally consumed maize as a staple for generations? This study focuses on demand for cassava in Zambia given its somewhat “inferior” status in the consumer’s mind.

1.2. The research objective

The overall objective of this research is to understand how the consumption of cassava meal in urban Zambia is influenced by specific economic and product variables to facilitate the development of the right policies to support government in its quest to increase food security. The specific objectives are as follows:

1. Evaluate the relationship between the consumption of cassava meal and the staple maize in an urban population.
2. Determine the effect of quality on consumption of cassava.
3. Determine how income influences cassava consumption in Zambia.
4. Identify some policy strategies that may be used to increase cassava’s potential as a food security solution in an environment with increasing drought periods

1.3. Method

The research used two methods to arrive at the findings: surveys and interviews; and econometric analysis. Due to time and financial constraints, the geographic scope of the study was limited to city of Lusaka, a major population center in the country. The product examined is cassava.

The survey sample was drawn using a random cluster sampling approach. The clusters were three residential areas chosen in the city. The residential areas were categorized as low, medium and high income levels based on population density using the Central Statistics Office classification. These categories of residential areas also provided information on the economic characteristics of the people living in those areas and ensured that our sample covered all income classes. A structured questionnaire and direct interviews were used to collect the data. This was supplemented by primary data with other data available from the Zambian Government and international organizations working on the crop in Zambia.

1.4. Outline of Thesis

Chapter 2 provides an overview of Zambian economy and agriculture's role in it. It also presents information on the crops that make up Zambia's agricultural economy, with a focus on cassava's role in recent years. In Chapter 3 we outline data and methods of the study while Chapter 4 looks at the analysis and results. The conclusions of the research are presented in Chapter 5 with some suggestions on how public policy may be structured to increase consumption of cassava among Lusaka's consumers.

CHAPTER 2 - AGRICULTURE IN ZAMBIA

2.1. Location, Geographical features and Climate

Zambia is a relatively small landlocked country located in the southern part of Africa. The country is surrounded by eight countries namely: Angola, Botswana, Democratic Republic of Congo, Namibia, Mozambique, Malawi, Tanzania and Zimbabwe. Zambia is situated between latitudes 8 and 18 degrees South of the equator and between longitudes 22 and 35 degrees east. Zambia has a land area of about 752,614 square kilometers.

The country has three main topographical features namely: (1) mountains with an altitude of at least 1500 meters above sea level; (2) plateau area with an altitude ranging from 900 to 1500 meters; and (3) low lands with an altitude of between 400 and 900 meters. The country has a tropical climate with three distinct seasons; the cool and dry season, the hot and dry season, and the hot and wet season.

Zambia is divided into three major ecological zones. Zone I generally receives rainfall below 800 millimeters. Zone II receives rainfall between 800 and 1000 millimeters and Zone III receives above 1000 millimeters (Figure1). Northern region in Zone III lies close to countries that are close to the equatorial region that normally receive rainfall throughout the year. Zambia is situated on the great plateau of Central Africa. Much of the vegetation of the country is mainly made up of savannah woodlands in high rainfall regions and grassland in low rainfall regions.

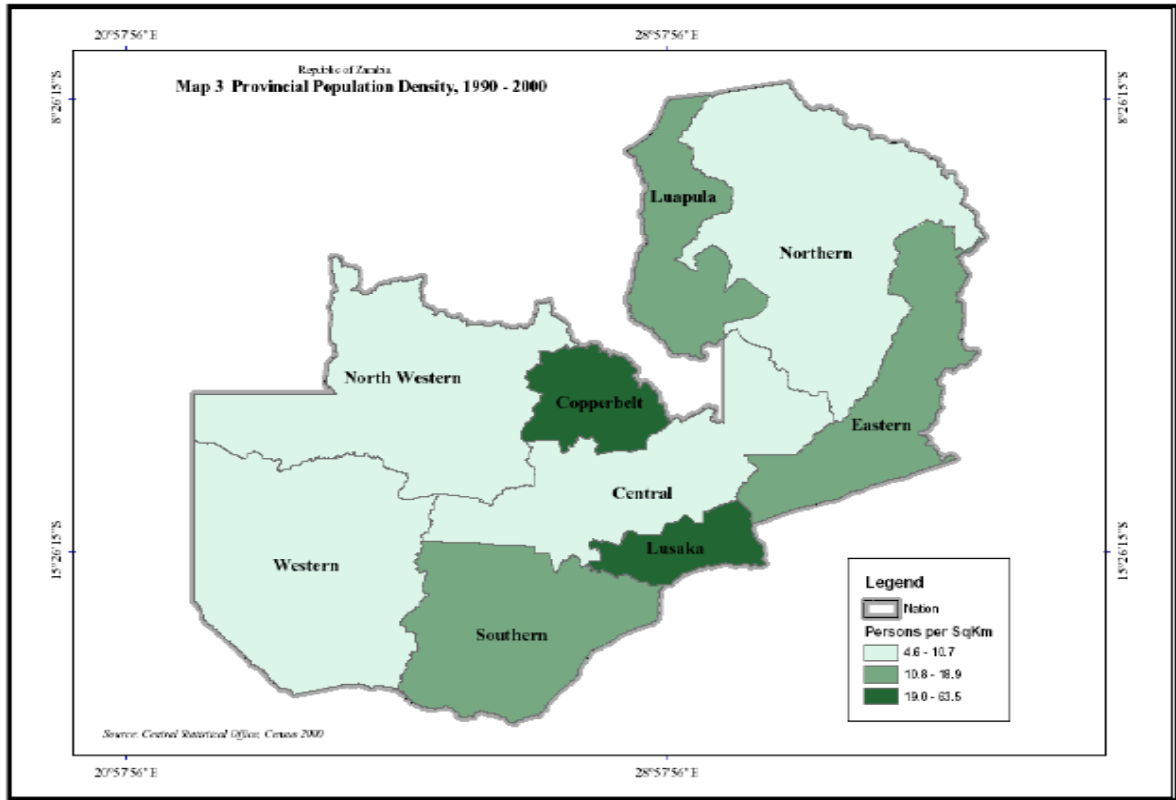
The population count from the 2000 Census of Population and Housing for Zambia stood at 9,885,591 as of 25th October 2000 (Census date) divided equally between males and females (CSO 2000). The CSO monthly bulletin of January 2009 reported a projected population of 12,160,516 for 2007.

Zambia is divided into nine provinces. Going by provincial estimates, Copperbelt province had the largest population followed by Lusaka, Eastern, Northern and Southern provinces. North-western province had the smallest population followed by Western and Luapula Provinces (Figure 2).

Zambia is one of the most urbanized countries in Sub-Saharan Africa with about 36 percent of the population living in urban areas. However, the proportion of the urban population has declined from 39 percent in 1990 to 36 percent in 2000. Lusaka and Copperbelt provinces had the highest percentage of urban population at 82 and 81 percent, respectively. Eastern Province had the lowest at 9 percent.

The average annual inter-censal growth rate for Zambia between 1990 and 2000 censuses was 2.5 compared to 3.1 percent between the 1980 and 1990 censuses. This shows that Zambia's average annual population growth rate declined by 19.4 percent between 1990 and 2000 censuses. The report shows a decline in growth rate in all the provinces except for Luapula province, which recorded an increase. The lowest population growth rate was reported on the Copperbelt province, which declined from 1.5 percent in 1980 –1990 inter-censal period to 0.8 percent in the 1990- 2000 inter-censal period. The highest population growth rates were recorded in Lusaka (3.5 percent), Luapula (3.2 percent) and Northern Province (3.1 percent) (CSO 2000). The decline in the growth rate may be attributed to issues such as the HIV/AIDS pandemic.

Figure 2: Map showing Provincial population Density, 1990-2000



Source: CSO, 2000 Census of Population and Housing, Zamsat

2.3. The Economy of Zambia

The Zambian economy has traditionally moved in tandem with fluctuations in the international price of copper. High prices prior to the early 1970s meant higher income and encouraged increased production that further boosted export revenues. Zambia's economy was over dependent on the export of copper from the mining industry. Since copper prices started falling at the London Metal Exchange, in the latter half of the 1970s, the government has been facing difficulties covering its budget deficits. This led to a downward trend in economic growth since the early 1980s. National copper production fell from 700,000 tons a year in the mid-1970s to less than 250,000 tons by 2000. Prices undoubtedly played a role but global demand continued to rise (Ford and Neil, 2007).

Change in the political system in 1990/91 saw change in the general economic policy. In 1991, government changed hands: The Movement for Multi-Party Democracy (MMD) took over from the United National Independence Party (UNIP). The World Bank and the International

Monetary Fund asked the new government to adopt and implement a Structural Adjustment Program (SAP). This included a range of measures that were aimed at restructuring and stabilizing the economy in order to restore growth. These actions included the following: removing subsidies especially in the agriculture input and output markets, rationalizing the civil service and cutting public expenditure, devaluing the local currency, and opening up the local economy to foreign investment. This brought about privatization, which led to closing or selling of public enterprises and the closure of most of the manufacturing industries. The poor operational state of the mines and manufacturing sector and increasing inflation rate saw a big decline in economic growth. The key factors contributing to slow economic growth were: drought affecting agricultural production in the early to mid 1990s; delays in the privatization of the copper industry combined with reduced production, stagnant investment, and a deterioration of key infrastructure; and increased unemployment in the formal sector.

With these developments, the government has been looking at alternative economic sectors like agriculture and tourism to get the economy back on its track. However, Government finances seem to be currently benefiting from record copper prices over the past two years since privatizing the mines. The international price of copper increased from just \$ 1,319 a ton, in 2001 to a record \$8,800 by May 2006 but fell during the rest of 2006, dropping to \$5,389 by early February 2007 (Ford and Neil, 2007), dropping further to \$2,000 levels in late 2008.

2.4. Significance of Agriculture in Zambia

Agriculture seems to be an alternative to the not-so-reliable mineral wealth of Zambia. However, the real growth rate in the agricultural sector has fluctuated significantly due to a number of factors. Among them is the sector's high dependence on seasonal rainfall, reduced investments and the failure to strategically position the sector according to its comparative advantage. The sector's contribution to GDP averaged 18 percent from 1980 through 2000. Despite its relatively small contribution to the GDP, agriculture is the primary employer in the rural areas. Non-traditional export, mainly agriculture-based export earnings increased from \$46.5 million in 1995 to \$133.9 million in 1999 (CSO, 2000). This shows big potential for Zambia's development. The agricultural sector plays an important role in providing employment to the rural community (about 50 percent of the total labor force).

2.5. Structure of Zambia's agriculture

About 75 percent of Zambia's population is engaged in agriculture. The agricultural sector is composed of three categories of farmers.

These are: (1) large-scale farmers, (2) medium-scale farmers and (3) small-scale farmers. The large-scale farmers comprising about 2 percent of the farmer population and consist of farmers who cultivate more than 20 hectares. Medium-scale farmers account for about 13 percent of the farmer population. This group comprises farmers who cultivate a land area between five and 20 hectares. Small-scale farmers make up 85 percent of farmer population and include all those who cultivate land area that is less than 5 hectares.

The large scale farmers use machinery and modern inputs to carry out most of the farming activities. The medium scale farmers use some machinery as well, while the small-scale farmers rely so much on traditional methods to work on the farms. All the three groups are involved in animal, poultry and crop production. The 2000 Census report shows that a good number of crops are grown in significant amounts in all the nine provinces of Zambia. The major crops grown include: maize, sorghum, millet, rice, cassava, beans, cowpeas, wheat, cotton, paprika, sweet potatoes, Irish potatoes, ground nuts, sunflower, Soya beans, sugar cane, cashew nuts, vegetables, burley and Virginia tobacco.

Growing of crops among the small scale farmers is mainly influenced by tradition, government or other organization support, markets and season. Maize is grown in most parts of the country as it is a staple food crop and has received a lot of government support through a number of programs. Data collected during the 2000 population census show that maize was grown by 85.1 percent of all the agricultural households in the country. Groundnuts and sweet potatoes had 63.1 and 60.8 percent respectively.

2.6. Zambia's staple foods

There are a number of different food and cash crops that households grow in different regions of Zambia. Among the food crops, maize, cassava, millet, sorghum, groundnuts and beans are the most common. Rice is grown in a number of regions too. These crops are grown

for home consumption and commercial purposes. These crops are produced by smallholder farmers, who are the contributors of major food crops consumed in the nation. These producers rely mainly on rain for their crop production. However, a number of them make use of irrigation by way of small hand-operated irrigation equipment. All these crops significantly contribute to food security in the nation. Most traditional crops like sorghum and millet are mainly consumed by the local population in the areas where there are produced. However, traders and farmers alike do transport some of these to urban markets. The majority of farmers growing sorghum and millet are in the Northern Province. This province accounted for 29.5 percent of the total number of households growing sorghum and 40.6 percent of the households growing millet (CSO, 2000). Smallholder farmers grow cash crops too. They grow cotton, tobacco, soybeans and sugar cane.

2.6.1. Maize production and consumption

Small-scale producers account for about 80% of the maize consumed in the country. The remainder is produced by large and medium scale producers.

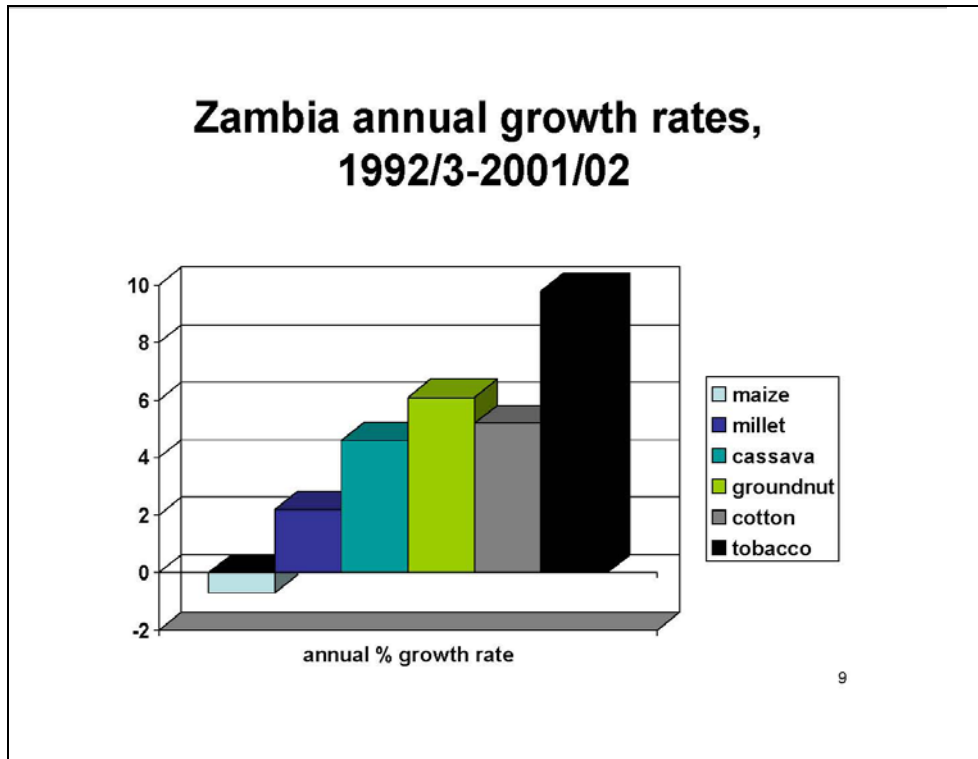
Maize production and marketing has received and continue to receive government support. Government support for maize growing has been there through the use of fertilizer subsidy programs, marketing and education. Kumar (1978) observed that support to marketing has seen a number of programs that started a long time ago when government assisted commercial farmers during the pre-independence era; Zambia attained political independence in 1964. It is clear from historical evidence that government policies have played a central role in evolving patterns of production and marketing for maize (Kumar, 1978). Maize Control Board (MCB) procurement policy clearly favored the white settlers through differential pricing and the allocation of internal and export quotas during the colonial days under British rule (Wood et al., 1990). Controlled marketing continued after the nation attained independence. Good rainfall patterns saw an upsurge of maize production as the locals were encouraged to grow for local consumption. Maize producers were assured of markets as government used marketing boards to buy the bulk of the crop at fixed prices. This was coupled with consumer subsidy. Centrally organized marketing saw the formation of the first marketing board in 1935. After independence, the National Marketing Board (NAMBOARD), a parastatal company, played a big role in providing a market for the small-scale maize farmers. Since maize requires fertilizer to improve yields, government supported input subsidy. In the 1980s, up to 17 percent of the national budget

was devoted to maize and fertilizer policies, while in the past two to three years the government has allocated only 6 percent of its budget to the entire agricultural sector (Govereh et al., 2006). The dismantling of NAMBOARD, and the Zambia Cooperative Federation organizations that took over maize marketing, saw the formation of the Food Reserve Agency, another government parastatal, during the 1990s that has continued to play a role in marketing maize. The Food Reserve Agency (FRA) was established with the purpose of maintaining national strategic reserves to ensure national food security. The FRA's mandate was then extended in view of the slow response by the private sector to provide marketing services. The FRA became involved in the distribution of fertilizer.

In 1996 government began implementation of the Agriculture Sector Investment Program (ASIP). With an assured urban market and subsidized fertilizer, small-scale farmers have continued growing maize. In Lusaka and Copperbelt Provinces, the area under maize increased as a response to the liberalization process that gave incentives to low value high bulk crops near consumption centers (McEwan et al, 2006). However, with the dwindling fertilizer subsidy maize production has become unprofitable for most farmers lately. The situation has been compounded by unfavorable rainfall patterns in the past and an unpredictable government policy. The FSRP/MATEP Research outreach team, 2006 observed that policy and policy implementation unpredictability lead to markets not being able to function effectively to stimulate production and marketing improvements. The unfavorable rainfall patterns in the southern parts of the country, which is also a "maize-belt", in the early 1980s caused significant yield reduction for years, this trend was followed by a nationwide drought in 1992, 1994, 1998, 2001 and 2004 that affected maize yields throughout the entire country (Figure 3). Following the major drought of 1991/92, the rural poverty² rate increased to 92 percent in 1993 (Govereh, et al 2006). In particular, the drought in 1991-92 devastated maize production in Zambia, Zimbabwe, and Malawi (Smale and Jayne, 2003). The role of maize has diminished considerably in Zambia's post-reform years. Total cropped area devoted to maize has fallen from nearly 80 percent in 1982 to around 60 percent in 1999 (Zulu et al., 2000). Small-scale farmers and some medium-scale mainly depend on rainfall for their crop production which remains vulnerable to weather fluctuations.

² Poverty here means limited or no access to food and income

Figure 3: Trend of annual growth rates of selected crops in Zambia



Source: FSRP/MATEP: Making Zambian markets work for small farmers/traders, 2006

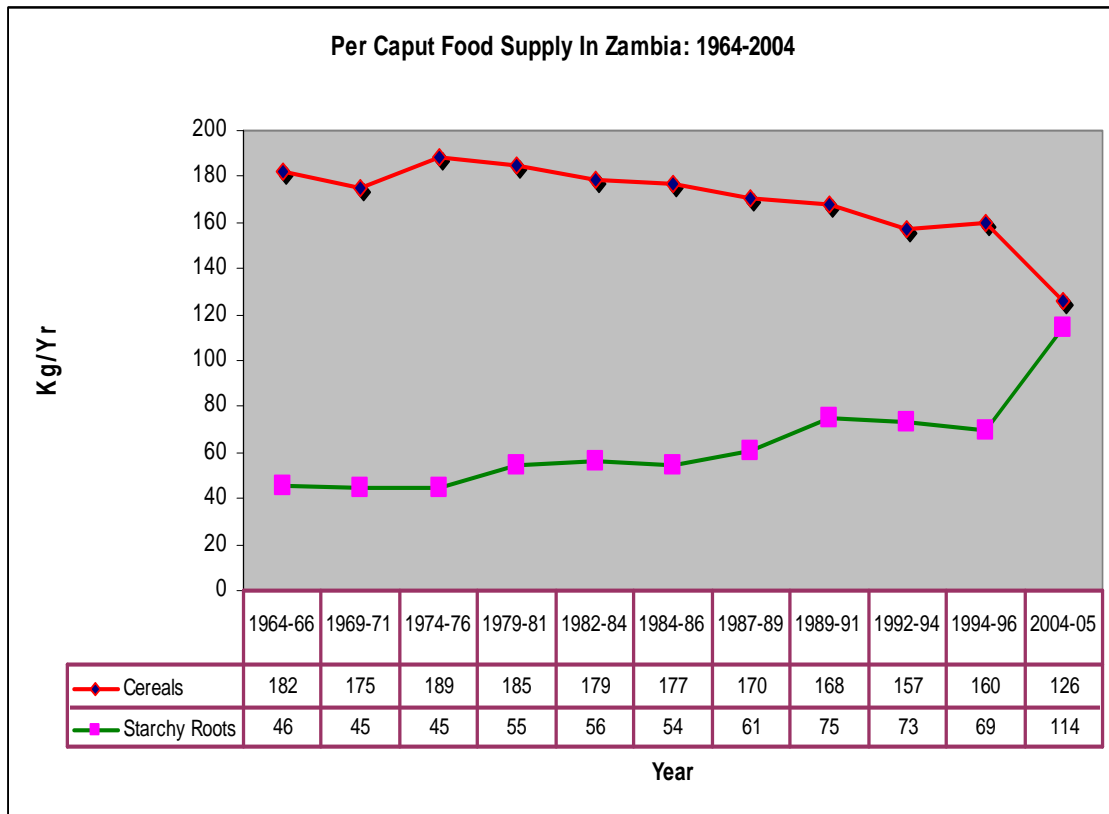
With this development an alternative to maize has to be sought if food security in the country is to be achieved.

2.6.2. Cassava production and consumption

Cassava can be a good substitute for the staple maize. Production and consumption of cassava seem to be on the increase. In the past, cassava was generally grown in the northern parts of Zambia. Accompanying the in-migration of the Bemba people from the West, cassava became well known in northern Zambia by the early 1700s (Haggblade and Zulu, 2003). However the production trend has changed in recent years due to a number of economic, social and climatic factors. Recent annual growth rate figures suggest a decline in the production of maize, while that of cassava has gone up (Figure 3). This shift in production of maize and cassava may be attributed to a number of factors ranging from production cost and unfavorable rainfall patterns.

A few studies have shown that production per capita in cereal crops like maize, sorghum, millet and rice have declined in Zambia (Hichaambwa, 2005). On the other hand, production of starchy crops like sweet potatoes and cassava is seen to be on the rise in recent years. Figure 4 shows this production pattern; there has been an increase in the production of starchy roots compared to the traditional cereals like maize. This is attributed to a number of reasons already highlighted in the report; mainly increased production cost for maize and unfavorable weather condition. Cassava, potato, sweet potato, and yam rank among the most important food crops worldwide and, in terms of annual volume of production, cassava, potato, and sweet potato rank among the top 10 food crops produced in developing countries (Scott, et al 2004).

Figure 4: Trend showing Per Caput Food Supply in Zambia: 1964-2004



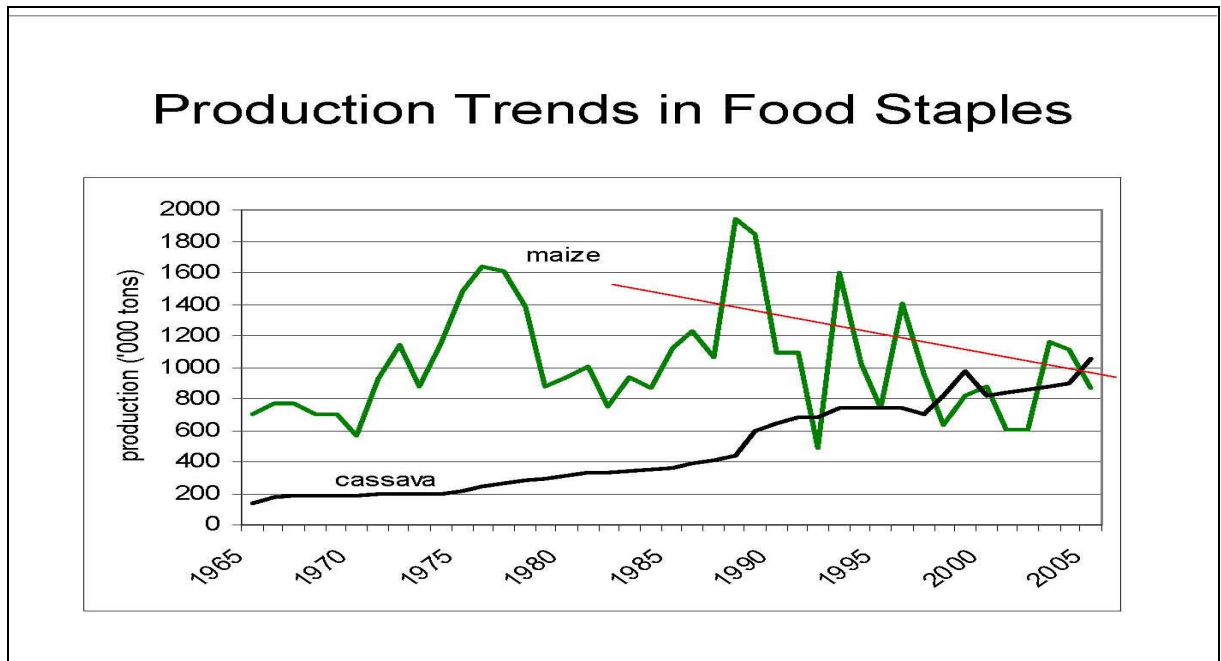
Source: FAO Food Balance Sheet 1994-96

Cassava production in Zambia has taken an upswing. While the crop is traditionally grown in the northern parts of the country recent production trends show that production has spread to other parts; Luapula and Northern provinces are traditional cassava growing areas

followed by Northwestern province. However, the 2000 population census report shows that all the nine provinces had households that grew cassava (Figure 5). This can be attested by a number of findings. Over the past decade, cassava production in Malawi and Zambia has probably grown between 6 percent and 8 percent per year, among the fastest rates of growth in Africa – indeed in the world (Haggblade and Zulu, 2003). Gradually shrinking landholding sizes over the past decade have led to shifts in cultivation towards crops that provide greater calorific value per unit of land such as cassava and higher value crops. The value of cassava and sweet potato production now amount to about half of the value of maize production in Zambia (Jayne 2005).

compared to 50,000MT for cassava in 1995/96 season; changes in maize and cassava production trends have continued emerging in the country (Figure 6). In 1998, 2001 and 2004 seasons, there were poor rains too that saw swings in the production pattern. By 2004/5, maize contribution was 866,187MT compared to cassava's 1,056,000MT.

Figure 6: Trend in production of Cassava and Maize/Corn since 1965



Source: FSRP, Factors affecting Zambian maize prices, 2005

This increase can be attributed to a number of factors, among them, improved crop diversification (a move to include drought tolerant crops). Also, others attribute this to improved data collection on cassava and other agricultural activities. Simply by improving collection of production and yield statistics, government has taken the first steps towards improving the profile and status of cassava in food security. FAO has been developing guidelines and methodology for collecting statistics on roots and tuber crops (Hichaambwa, 2005).

Cassava is Africa's second most important food staple, after maize, in terms of calories consumed. In the Democratic Republic of Congo, cassava contributes more than 1000 calories per person per day to the diet and many families eat cassava for breakfast, lunch, and dinner (Nweke, 2004). Cassava is considered a staple food by 30 percent of Zambians.

However, the role of cassava has been downplayed for a long time dating back to colonial Africa under foreign occupation. Cassava has been viewed as a famine reserve crop. As elsewhere in British Africa, colonial authorities not only urged but even ordered Zambian farmers to produce cassava only as a precaution against periodic famines (Jones, 1959). This is reflected today in many countries in Eastern and Southern Africa -- Malawi, Tanzania, and Zambia -- maize is the preferred food and cassava is planted as a famine-reserve crop (Nweke, 2004). Furthermore, some studies show that cassava is considered an inferior food. Negative messages have continued; Nweke further writes that many critics point out that cassava is a subsistence crop that depletes soil nutrients, a woman's crop produced and consumed by impoverished households, and a lethal and nutritionally deficient food. These criticisms explain why some colonial government administrators discouraged cassava cultivation and, in some cases forbade it. Studies have found that policy of colonial master has stigmatized cassava in the minds of many African farmers as a colonial crop (Marter, 1978). Many food policy analysts consider cassava an inferior food because it is assumed that its per capita consumption will decline with increasing per capita incomes; without an empirical evidence to support the claims, however. In retrospect, some recent studies have shown that this trend can change (Nweke, 2004).

Recent reports by the Food and Agriculture Organization (2005); report on the proceedings of the validation forum on the global cassava development strategy (Volume 2) shows that income elasticity of demand for fresh and dry roots was positive in Nigeria, Tanzania, Ghana and Uganda. This suggests that consumers, both in urban and rural areas and among different income groups, are consuming cassava in different forms.

Cassava tuber, leaves, branches and peels provide good feed for livestock, especially cattle, sheep, goats and pigs. Cassava has industrial uses too. The high starch content makes it suitable for the production of industrial glues. There are numerous other products prepared from the cassava roots in various countries of the world and these have been catalogued more fully by (Lancaster et al., 1982).

In this study, we focus on the economic factors that might influence cassava meal (flour) consumption among the urban consumers. We know that demand is a desire and willingness to pay a price for a specific good or service. Also, we know that in econometric studies, this is supported by the fact that, all other things being equal, when the price of a good rises, the

amount of it demanded decreases. However, there are exceptional cases, and reason lies in quality. Quality of certain products will lead consumers to buy more of an expensive good.

Consumption information on cassava in Zambia is limited since most studies have focused on production and marketing issues and questions. A few studies in other parts of Africa have suggested that expenditure elasticity of demand for cassava in rural population is about 1.0 for fresh and processed cassava (Scott, Rosegrant, and Ringler, 2003). Another study suggested that expenditure elasticity of demand for processed cassava, gari, showed that it is a normal good among urban population (Nweke et al, 1994). Further, FAO (2005) report on the proceedings of the validation forum on the global cassava development strategy (Volume 2) shows that income elasticity of demand for fresh and dry roots were positive in Nigeria, Tanzania, Ghana and Uganda (Table 1).

Table 1: Estimated Income Elasticities in Selected African Countries

| Study | Country | Income Elasticity |
|------------------|---------------|--|
| Nweke (2001) | Nigeria | 0.57 (dried roots, low income) |
| Nweke (2001) | Uganda | 1.17 (dried roots, low income) |
| Ezenamari (1998) | Nigeria | 0.53 (dried roots, (all cassava)high income) |
| Ezenamari (1998) | Tanzania | 0.8 (dried roots, low income) |
| Elderman (1990) | Ghana (rural) | 0.70 (all cassava) |
| Elderman (1990) | Ghana (urban) | 1.46 (all cassava) |

2.6.3. Characteristics of cassava

Cassava (Manihot esculenta Crantz), also known as yuca, manioc, mandioca or tapioca, is a species belonging to the family Euphorbiaceae and is of Amazonian (North-East Brazil) origin. Cassava is believed to have originated as a cultivated plant either in south Mexico and Central America or in northern South America (Rogers, 1963; Renvoize, 1972). It was introduced to Africa along the Atlantic coastal of Angola and Congo in the 1500s by Portuguese traders and explorers and to Zambia about the same period by both the Portuguese traders and explorers and the Bantu migrating from the Congo basin into northern Zambia.

2.6.4. Cassava's preparations and processing

Roots and tubers have become an important source of energy in a number of countries. Cassava can compete favorably with maize since it can be used as a source of energy. Cassava is a cheap source of energy, comparable to maize and rice, since its production cost is lower. Cassava varieties that are sweet can be consumed as a fresh tuber eaten raw and/or boiled. Cassava can also be dried, stored and eaten as fried and roast chips or milled into flour later. The principal uses of cassava around the globe are presented in Table 2. The cassava leaf is richer in protein and energy than rape, a commonly accepted urban vegetable (Hichaambwa 2005). Cassava leaves are an important vegetable in other African countries like Democratic Republic of Congo, Tanzania Sierra Leone and Madagascar.

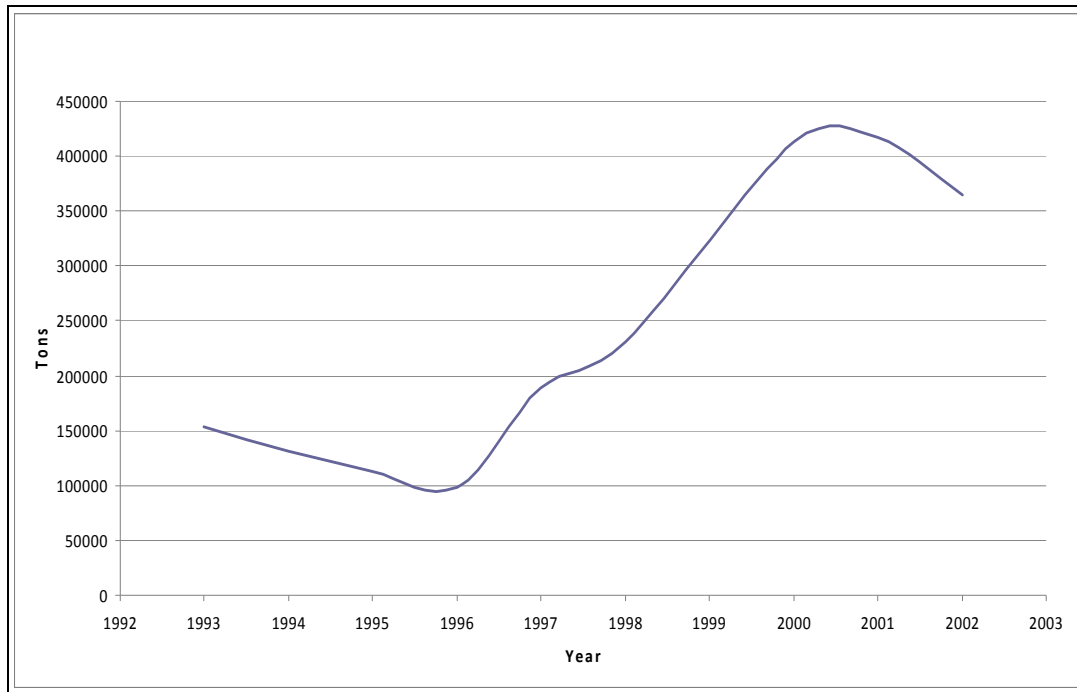
Table 2: Main global utilization of cassava

| Product | Process | Consumer | Conditions |
|------------------------------|--|----------------------------------|--|
| Fresh Tuber | Raw as salad or snack Boiled or roasted Roasted chips Boiled and pasted – Fufu Peels | Humans Livestock | Sweet varieties Supplements |
| Meal and Flour | Gari Farinha Retted cassava Nshima Refined Flour for Baking | Human | Processed |
| Chips and Pellets and starch | Industrial raw materials Glucose Grocery tapioca Textiles Confectionery Glues | Industrial Livestock Human | |
| Leaves | Pondu Katapa | Human Livestock | Processed |

Source: Cassava commercialization, trends & patterns-Hichaambwa, FAO, 2005

Dried cassava roots can be stored or marketed as chips and flour in many African countries. Chips are milled into flour at home by pounding with a pestle and mortar and used in preparation of meals. In Zambia, cassava roots are usually soaked, according to taste, and mixed with a fermentation starter to remove any toxic substance that may be harmful to human and animals. The mixture is left to ferment then sun-dried, pounded and sifted into flour. Figure 7 shows the trend of cassava flour production. Production has fluctuated over the years. A steady rise is noticeable starting in 1996-98 period through the early 2000 when the country experienced droughts. We see a drop as maize fertilizer subsidy is introduced in later years. Also, the adoption rate was slowed down as the weather conditions started normalizing, coupled with maize production subsidy; the vulnerable farmers started producing maize again.

Figure 7: Trend showing production of cassava flour in Zambia



Source: FSRP/Ministry of Agriculture and Cooperatives 1993-2002

The flour is commonly used in the preparation of Nshima. Cassava flour is sometimes mixed with flours from other crops such as millet and maize and made into porridge. In Nigeria and Ghana cassava is processed into Gari, grated cassava and stored ready for consumption. A variety of methods are used traditionally for storing dried chips.

As much as cassava has advantages over maize as a source of high calories, it has its disadvantages. Cassava contains some toxic cyanogenic glucoside substances that can only be removed through careful processing or the use of specific varieties. Many of the traditional ways known to remove hydrogen cyanide appear to be designed specifically to bring about the contact between substrate and enzyme by cell rupture. For example, by grating or pounding, the released hydrogen cyanide (HCN) can be eliminated by volatilization or solution in water (Coursey, 1973a). In Zambia, various methods are used to eliminate the hydrogen cyanide.

The cassava root is highly perishable in fresh form. The roots are not inherently adapted for survival and once harvested deteriorate rapidly, developing a vascular discoloration within a few days which renders the roots unpalatable and also unsuitable for subsequent processing (Montaldo, 1973; Noon and Booth, 1977). There are traditional methods used of storing cassava.

The roots are left in the ground until needed and are consumed or processed immediately into a dry form with a longer storage life. However, large areas of land may be occupied by a crop which is already mature and is thus unavailable for further use. Also the roots become more fibrous and woody and their starch content and palatability declines when left in the ground longer than necessary. In general, most cassava, if not used immediately after harvest, is processed into a more durable form and a wide variety of food products and beverages are traditionally prepared from the root using a large number of often very complex processes (Lancaster et al., 1982).

Cassava is being adopted for a number of reasons in many African countries, including Zambia. A number of reasons have been cited earlier. Government in Zambia this supports through enhanced research and extension service support. A more recent investigation found that 60 percent of farmers in the northern regions of Zambia, the principal cassava growing zones- were growing improved varieties (MAFF, 2000). Also, the Program against Malnutrition, for example, has been pursuing deliberate cassava promotion programs.

Some studies have shown that cassava consumption is affected by lack of a deliberate promotional drive that include common forms of cassava products, uses and nutritional information (Hachaambwa, 2005). The supply of cassava products may have an impact on the consumption. However, supply can be driven by demand. As such our report emphasizes analysis of some economic factors that may impact the demand and thus supply of cassava among the urban population of Zambia.

There is literature suggesting that cassava is both an inferior and normal good. This may suggest that cassava consumption is strongly influenced by socio-economic factors. It is, therefore, a fact that cultural factors as well as income levels can influence consumption of certain goods. Looking at the influence of cultural background and diversity of income levels in urban population in Zambia, evaluation of the role that money income plays in cassava consumption in an urban population is important. Therefore, would income affect the consumption of cassava in Lusaka?

Further, literature has suggested that colonial masters favored maize production and only encouraged growing cassava as a famine crop, among the African community. This production trend seems to have an effect on the consumption pattern of the two products. Also, maize

production and marketing received and continue to receive unequalled support in form of subsidies. This background suggests an imbalance in the promotion of these staple foods. Since cassava and maize are close substitutes it would be interesting to evaluate the effects of prices of the two commodities on their substitutability. Maize in Zambia, just like in other parts of Africa is a popular staple. Maize is Africa's important food crop and is held up as a model food crop to meet Africa's growing urban demand for convenient food products (Mellor et al, 1987, Blackie, 1990 and Byerlee and Eicher 1997).

CHAPTER 3 - DATA AND METHODS

A survey was conducted in the city of Lusaka, Zambia in June to August of 2007. Information was collected from households to understand the consumption and expenditure on the staple food maize and other cereals and tubers. With regard to the procedural nature of the methodology, the geographic scope of the study was limited to the city of Lusaka where samples of cassava consumers were taken. The Central Statistical Office's Census of Population and Housing report of 2000 shows Lusaka with a population of 1,084,703 (about 10.9 percent of the country's population and an annual growth rate of 3.5 percent). Lusaka is a big commercial town that has many people in the working and educated class with an equally large population of non-working and un-educated class. Only one district was chosen for time and budgetary constraints.

Practically, the study's approach involved conducting interviews and surveys in selected residential areas within the city. Three residential areas were chosen according to income levels. Kanyama, New Chilenje and Chalala were chosen. These categories of residential areas also provided information on the economic characteristics of the people living in those areas and ensured that our sample covered all income classes.

3.1. Data collection

Data was collected from respondents in the form of personal interviews that covered questions posed to them from standardized questionnaires. Responses were filled in the spaces provided by the interviewer. The interviews were conducted on location and were voluntary. A random cluster sampling method was used, since houses were numbered and arranged in a specific manner.

In preparing for the interviews, three interviewers were trained for three days in Lusaka prior to commencement of the survey. The purpose of this was to ensure that they understood the purpose of the survey and equipped them with the necessary methods to capture quality information. The interviewers contracted were extension officers in the Ministry of Agriculture and Cooperatives. These are officers with a three-year diploma, in addition to high school

education, and had participated in some form of surveys conducted by the Central Statistical Office in the past.

The questionnaire was designed to capture demographics of selected households in the three selected residential areas. The respondent was expected to be the head of household or the spouse. However, in the absence of the head of household or the spouse, somebody who was responsible for the purchase of food items in the household was interviewed. The food items covered in the questionnaire were mainly the staple foods, maize and other cereals and tubers. Also, investigated were the role of quality perception and availability in the choices of the food items. Information collected on the quality of food items showed the household's perceived satisfaction after consumption. The value of the food items bought in the last 30 days was captured as opposed to the quantities because it is easier to recall values than quantities. Respondents were asked to provide the amount of money spent on cassava and maize meals. To arrive at the prices of maize meal and cassava meal for use in our analysis, monthly expenditure on both commodities and the ruling nominal retail prices on major markets in Lusaka collected by MACO during the period the survey was conducted were used. This helped generate average prices of cassava and maize meal. To help capture the economic well being of the households, information on certain indicators including monthly income, homeowners and type of property they owned were collected. Income focused on money received. Each respondent provided the average income of the household. Additionally, demographic information collected included gender, age and family composition and size. The total number of households interviewed was 120, with equal number of households in each residential category.

3.2. The Model

As noted in Chapter 2, cassava is not the premier food crop in Zambia. The food staple in many parts of the nation, both rural and urban, is maize. However, cassava is consumed as a staple in certain regions of the country. In addition to the staple maize meal, cassava meal can be used to prepare meals. Among the urban population, it is common that a blend of maize and cassava meals are used to prepare the common meal, *nshima*. Cassava flour is used to prepare bread and some snacks too. In Zambia, consumers can either buy dry cassava chips that they mill into flour or cassava flour for consumption.

To better understand the demand, both qualitative and quantitative factors that might have influenced cassava meal consumption were looked at. For instance, households were asked how they perceived the quality of the cassava they consumed, in general. The underlying factors are that access to food and its perceived quality do influence demand. Since cassava is perceived as a “poor man’s food”, monthly income levels were used to determine if this factor did influence demand, income affects the demand of specific food items in a household. Further, since cassava meal is a source of carbohydrates just like maize meals, the price of both cassava and maize meals were used in the analysis. This helped to look at the relationship of the two starchy foods that can be used as a source of energy.

The conceptual model was defined as follows:

$$X_q = f(P_c, P_m, Y, Z_c) \quad (1)$$

Where X_q is the amount of cassava meal purchased while P_c , P_m , Y and Z_c are respectively price of cassava meal, price of maize meal, money income of the household and quality of cassava.

(X_q): This represents the quantity of cassava in Kilograms.

(P_c): This represents the nominal retail price of cassava, in Zambian Kwacha³, ZMK per Kilogram.

(P_m): This represents the nominal retail price of maize meal, in ZMK per Kilogram.

(Y): This represents the average monthly money income, in thousands of Zambian Kwacha

(Z_c): This represents quality of cassava meal, in Likert-Type scale. The quality of cassava meal was classified as follows: 4= Very good; 3= Good; 2= Fair; 1= Poor

³ 100 ngwee (units) make up 1 ZMK. ZMK 3, 700 was equivalent to \$1 at the time of the survey.

3.3. Ordinary Least Square (OLS)

The Ordinary Least Square (OLS) model assumes the following expression:

$$(Y_i, X_{i1}, \dots, X_{ij}), i = 1, \dots, n \quad (2)$$

The relationship between Y_i , the dependent variable, and X_{i1}, \dots, X_{ij} , independent variables may be possibly imperfect. A disturbance term ε_i , which is a random variable too, is added to this relationship to capture the influence of everything else on Y_i other than X_{i1}, \dots, X_{ij} . Therefore, the multiple linear regression models take the following form:

$$Y_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_j X_{ij} + \varepsilon_i, i = 1, \dots, n \quad (3)$$

This function consists of a linear combination of model parameters, β called regression coefficients. β is an unobserved scalar parameter. The coefficients are used in interpreting the effect of predictors on Y_i .

The linear regression is used to achieve two major things;

1. To predict what value will occur for a quantity of interest when other related variables take given values.
2. To test whether a given variable does have a statistically significant effect on a quantity.

To achieve the above, a number of assumptions are necessary:

- ε_i , the error term, has an expected value of zero
- the errors are serially uncorrelated and are drawn from distributions with constant variance
- ε_i and x are uncorrelated, and therefore, under certain regularity conditions the second term has an expected value conditional on x of zero and converges to zero in the limit
- It is assumed the ε_i has a normal distribution
- Linearity between dependent and independent variables

To predict what value will occur for a quantity of interest when other related variables take given values, the model parameters must be estimated. A random sample is used, and an ordinary least square estimator is achieved.

Assuming data with a single independent variable:

$$Y_i = \alpha + \beta x_i + \varepsilon_i \quad (4)$$

Then the ordinary least square estimator is:

$$\hat{\beta}_{OLS} = \frac{x'y}{x'x} = \frac{x'(x\beta + \varepsilon)}{x'x} = \beta + \frac{x'\varepsilon}{x'x}. \quad (5)$$

Given the assumptions mentioned above, the estimator is unbiased and consistent. In a number of instances, when x and ε are correlated, the OLS estimator can be generally biased and may be inconsistent for β . However, it must be noted that even when the OLS estimator is inconsistent it is still valid to use the estimates to predict values of y given values of x , but the estimate does not recover the causal effect of x on y . The signs of the coefficients can be used to indicate the direction of the change of the predicted arising from a change in the predictor.

The OLS method has a number of limitations. These include:

1. The assumption that the errors are drawn from distributions with the same or constant variance does have problems especially in cross-sectional data analysis. This condition is known as Heteroskedasticity. The OLS estimators will still be unbiased but inefficient; the standard errors used to make significance test may be misleading (Maddala, 2001). The Breusch-Pagan test was used to test for Heteroskedasticity, and found that it was present at the 1, 5 and 10 percent levels. The White sandwich robust variance estimator was used to correct this.
2. Misspecified model leading to biased estimators.

A number of economic variables, normally used in demand functions were used to ensure that relevant independent variables were not omitted leading to bias of the OLS

estimators. Initially, both demographic and product variables were used in testing the model until we settled for price of cassava, price of maize, its close substitute, income and quality of cassava meal. We know consumption of cassava is influenced by a number of factors other than those captured in the model but we assumed this was part of the error term.

Goodness of Fit

R square and F statistic were employed to determine the goodness of fit of the model. The models were ran a series of times using different variables.

Even if ‘y’ does not form a normal distribution, Ordinary Least Square method can be used to make inference. As earlier indicated; heteroskedasticity was tested for and corrected. Also, the Central Limit Theorem is used to conclude that the OLS estimators are approximately normally distributed, at least in large samples sizes, based on asymptotic normality (Woodridge, 2002); a random cluster sampling approach was used to collect data and the sample size was 120 observations; a sample size of 30 observations is deemed large enough (Woodridge, 2002). The Central Limit Theorem states that the average from a random sample for any population, with finite variance, has an asymptotic standard normal distribution. Most estimators encountered in statistics and econometrics can be written as functions of sample averages (Woodridge, 2002). Therefore, the t statistic was used to verify the inference test of the model, based on the law of large numbers and the Central Limit Theorem.

3.4. Research Hypotheses

Because cassava is not the primary staple food in Zambia and has only been introduced in the last couple of decades in some regions, there is very little research on its consumption, as indicated in Chapter 2. However, there are theoretical foundations to develop some hypotheses about how the exogenous variables are expected to behave in the model. Particular attention is paid to cassava price, maize price, and income. For example, economic theory predicts that consumers will consume less of a staple starch as their income goes up (Hertel, Preckel and Reimer, 2001). This is particularly true when the staple starch is not. On the basis of this; the following hypotheses were developed and tested in this research:

Hypothesis 1: The income of consumers no influence on consumption of cassava.

$$\begin{aligned} H_0 : \beta_y &= 0 \\ H_1 : \beta_y &< 0 \end{aligned} \tag{1}$$

Where; β_y is the regression estimate for the monthly money income.

This hypothesis is based on the cultural attitude towards cassava among the population. Many people look at cassava as the food of the poor and thus will consume less or none if they believe they are affluent or rich.

Hypothesis 2: The price of maize meal has no influence on consumption of cassava meal.

$$\begin{aligned} H_0 : \beta_{pm} &= 0 \\ H_1 : \beta_{pm} &\neq 0 \end{aligned} \tag{2}$$

Where; β_{pm} is the regression estimate for the price of maize meal.

This hypothesis is based on the fact that maize meal consumption has been promoted heavily because it is a preferred staple among most Zambians. Based on preference and convenience, we expect that the price of maize meal will have no influence on the quantity of cassava consumed.

CHAPTER 4 - RESULTS AND ANALYSES

As earlier indicated in Chapter 3, a survey was conducted and captured data using questionnaires. A total of 120 households were interviewed. To help appreciate cassava demand among in the dataset, Table 3 shows age of respondents, family size and composition and independent variables in summary statistics of households.

Table 3: Summary statistics of households and variables

| | Unit | Minimum | Maximum | Mean | Std. Deviation |
|---------------------------------|-----------|---------|---------|-----------|----------------|
| Age of respondent | | 19 | 58 | 34.91 | 9.191 |
| Number of adults in household | | 1 | 8 | 3.18 | 1.426 |
| Number of children in household | | 0 | 9 | 2.59 | 1.526 |
| Total num of hhold members | | 1 | 15 | 5.58 | 2.210 |
| Household income | ZMK('000) | 300 | 5000 | 2442.50 | 1780.221 |
| Quantity of cassava | Kilo | .00 | 60.73 | 11.5036 | 12.91913 |
| Price of maize meal | ZMK | 833.07 | 2113.37 | 1441.7817 | 228.41445 |
| Price of cassava | ZMK | 296.41 | 1297.62 | 780.1909 | 185.53269 |

The value of the cassava and maize meals bought in the last 30 days was captured as opposed to the quantities. Respondents were asked to estimate how much money they spent per month on food items. Quantities of cassava and maize products were then computed using average nominal prices collected from major markets in Lusaka during the time of the survey by the government. This was done to minimize the risk of price recall since consumers frequently purchased products many times every month and hardly paid the same price for them because prices are not standardized. Fortunately, the government surveys the commodity markets monthly and this provided a rich source of data to use in a Monte Carlo simulation to generate prices based on the value and quantity of purchases. The price of cassava meal was estimated to range from ZMK296.41 to ZMK 1297.62 per kilogram with a standard deviation of ZMK185.53. The price of maize meal ranged from ZMK833.07 to ZMK2113.37 per kilogram with a standard deviation of ZMK228.41.

Expected monthly money income per month was captured. The monthly income of respondents ranged from ZMK300,000 to ZMK5,000,000 with a mean of ZMK2,442,500 and standard deviation of ZMK1,780,221. The distribution of the income of respondents is presented in table 5.

Table 4: Distribution of average monthly money income among households

| | | Frequency | Cumulative Percent |
|----------------------------|-------|-----------|--------------------|
| Household income ZMK('000) | 300 | 17 | 14.2 |
| | 750 | 19 | 30.0 |
| | 1250 | 15 | 42.5 |
| | 1750 | 11 | 51.7 |
| | 2250 | 8 | 58.3 |
| | 2750 | 7 | 64.2 |
| | 3500 | 8 | 70.8 |
| | 4500 | 9 | 78.3 |
| | 5000 | 26 | 100.0 |
| | Total | 120 | |

To understand the relationships between cassava and maize consumption, and income and cassava consumption we used the linear, doublelog and semi log regression models in an attempt to “discover” the appropriate demand function given the variables of interest.

The specific structures of the models are as follows:

Linear:

$$X_q = \alpha + \beta_1 P_c + \beta_2 P_m + \beta_3 Y + \beta_4 Z_c + \varepsilon \quad (6)$$

Non- Linear Double log:

$$\log(X_q) = \alpha + \beta_1 \log(P_c) + \beta_2 \log(P_m) + \beta_3 \log(Y) + \beta_4 \log(Z_c) + \varepsilon \quad (7)$$

Non- Linear Semi log:

$$\log(X_q) = \alpha + \beta_1 (P_c) + \beta_2 (P_m) + \beta_3 (Y) + \beta_4 (Z_c) + \varepsilon \quad (8)$$

Results of the three models, showing the coefficients of the four principal independent variables, the t-statistics and standard errors of the coefficients, the F-statistics, R square and adjusted R square are presented in table 5. We tested for heteroskedasticity. It was present at 5 percent, and corrected using the White sandwich estimator method. The results show that the linear model had an R-square of 0.546. This means that about 55 percent of the variability in the cassava consumption in the sample is explained by the specified linear model. The R-square for the double log and the semi log models were respectively 0.30 and 0.44. Similarly, the F-value for the linear model was 28.27 compared to only 14.20 and 15.11. Based on these fit indicators, statistically and theoretically, the Ordinary Least Square regression model was employed, in the analysis and discussion of results

Table 5: Summary results of the three models

| Model | (Constant) (α) | Price of maize meal (P_m) | Price of cassava (P_c) | Cassava Quality (Z_c) | Household Income (Y) | R square | Adjusted R | F-stat |
|-----------------------|----------------------------|--|----------------------------------|---------------------------------|--------------------------------|----------|---------------|--------|
| Linear | | | | | | | | |
| coefficient | 17.21 | 0.003 | -0.02 | 5.47 | -0.001 | 0.546 | 0.527 | 28.27 |
| t-stat | 2.24 | 0.08 | -3.38♦ | 10.40♦ | -1.28 | | | |
| std error | 7.69 | 0.004 | 0.006 | 0.527 | 0.0004 | | | |
| Double log | | | | | | | | |
| coefficient | 12.97 | 0.13 | -1.61 | 0.10 | -0.10 | 0.297 | 0.258 | 14.44 |
| t-stat | 2.87 | 0.20 | -5.91♦ | 0.44 | -1.14 | | | |
| std error | 4.511 | 0.636 | 0.272 | 0.239 | 0.068 | | | |
| Semi log | | | | | | | | |
| coefficient | 199.27 | 3.09 | -29.75 | 2.39 | -1.15 | 0.441 | 0.41 | 15.11 |
| t-stat | 3.58 | 0.52 | -5.92♦ | 0.78 | -1.02 | | | |
| std error | 55.72 | 5.914 | 5.029 | 3.056 | 1.13 | | | |

♦Significant at 5%; 1-tailed

Although the signs on all the variables were consistent with theoretical expectations, the linear model offered superior results based on the t-test, F-value and Adjusted R-square values. Therefore, the rest of the discussion is limited to the estimates from the linear model.

The quantity of cassava demanded goes down when there is a price movement upwards, holding other factors constant (Table 5). Quantity of cassava demanded goes down by 20

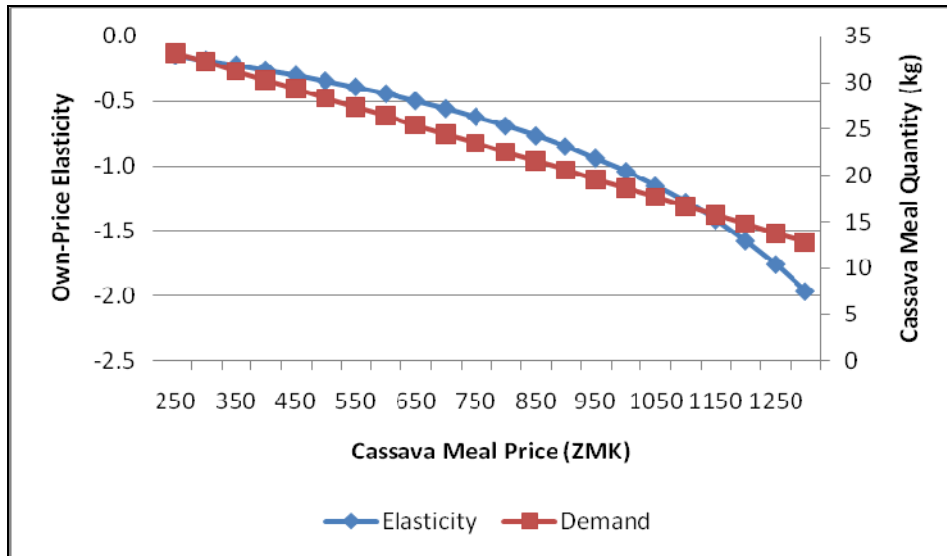
kilograms when there is an increase of ZMK1,000 in the price of cassava. The t-statistic for price of cassava is statistically significant at 3.38. This is expected by theory; it is expected that the quantity demanded for a good to go down when the price of that good goes up. The result suggests that if the price of cassava remains high then less would be consumed. This means that if the demand for cassava meal is to be maintained and improved then the price must not be too high for consumers. As such ways must be devised to keep the prices low. Among them is to improve production, processing and marketing through enhanced efficiency.

Direct price elasticity of demand for cassava is -1.32 at the values of price and quantity demanded. Because the own price elasticity is greater than absolute one, suggests that cassava meal in own price elastic. This suggests that the quantity demanded for cassava meal is highly sensitive to its own price: a 1 percent increase in price results in 1.32 percent decrease in quantity of cassava meal demanded.

How does the elasticity change with price? The answer to this question can provide insights into how policy makers may act to ensure cassava is consumed at a decent level to facilitate its ability to insure food security. The relationship between the own price elasticity and price is presented in Figure 8. It shows that the own price elasticity decreases at an increasing rate with own price. Indeed, the first and second derivative in the fitted quadratic equation yields the following results:

$$\begin{aligned} \frac{\delta \varepsilon_{cp}}{\delta P_c} &= 0.59 - 0.085P_c \\ \frac{\partial^2 \varepsilon_{cp}}{\partial P_c^2} &= -0.085 \end{aligned} \tag{1}$$

Figure 8: Relationship between own price elasticity and price



The implication of the foregoing result is that any increases in cassava prices lead to an increase in the absolute own price elasticity, i.e., making it more elastic. Therefore, if the government seeks to improve consumption of cassava to ensure food security in times of severe drought, then it is imperative that it finds ways to reduce increases in cassava prices.

The estimated coefficient for cassava meal quality was 5.5 and it was significant at the 5 percent level with a t-statistics of 10.40 (table 5). The sign on the quality variable is expected because consumers always respond positively to increasing quality for normal goods. Indeed, changes in quality yielded the highest effect on the demand for cassava.

The coefficient on the household monthly income variable is -0.001 and not significant (t-statistic = 1.28 at the 5 percent level) (table 5). Although not statistically significant, the negative sign suggests that the quantity of cassava demanded decreases when household income increases, a result that has been found in other parts of southern Africa (Scott, Rosegrant and Ringler, 2003). As a result of the income estimate being statistically not different from zero, the hypothesis that the higher the income of consumers, the less likely they are to consume cassava can neither be rejected nor accepted. However, it is plausible to note that for the sample in this study, changes in income have no effect on the quantity of cassava consumed.

The behavior of the income variable may be explained by its distribution. Recall that the sample was drawn from three “income” classes in Lusaka, leading to categories of income at three relatively distinct levels. The low variability in income may explain this result. To check if this was indeed the case, the income groups were separated and re-run the model. However, the results remained insignificant even with the separation. Therefore, it was concluded that within the structure of the model, income was ineffective in contributing to the explanation of cassava consumption. This perspective is supported by Scott, Rosegrant and Ringler (2003) who note that per capita use of cassava is also influenced by factors such as taste, preference, and demographic and cultural factors.

Also the hypothesis that the price of maize meal has no influence on the consumption of cassava meal can neither be rejected nor accepted. The coefficient on the price of maize meal variable is 0.0003 with an insignificant t-statistic of 0.08 at the 5 percent level (table 5). Thus, it is plausible to note that for the sample in this study, changes in maize meal price have no effect on the quantity of cassava consumed. This may be due to the fact that although cassava meal is a substitute to maize meal, it is a weak substitute. When maize meal prices are low, consumers prefer it to cassava meal and when they are high, consumers have no choice but to consume maize meal due to its effect on caloric requirement. Thus, consumers in the research sample behaved as expected with respect to the important role of maize meal in their diet. The study also found that the cross price elasticity between maize meal price and cassava meal demand is 0.04 suggesting that cassava meal is a substitute to maize meal, but inelastic.

CHAPTER 5 - RESULTS, IMPLICATIONS AND RECOMMENDATIONS

5.1. Summary

As earlier noted in Chapter 2 the main staple food in Zambia is maize. However, poor rainfall in recent decades is threatening the ability of Zambians to depend on maize for their food security. The price of maize and its by-products available on the market during these drought conditions tends to go up, challenging the food and nutrition security of many consumers in both rural and urban communities. This situation has motivated the government and other non-governmental organizations in the country to promote cassava as an alternative crop.

Cassava's success in this role as famine prevention crop depends on consumers consuming it on a regular basis, i.e., making it a part of their diet. This will secure supply during the times when it is most needed. However, there is very little information on consumer demand for cassava in a major urban city like Lusaka despite anecdotal evidence that consumers see it as an inferior commodity. Thus, the rationale for this study was conceived. The research question was this: What are the critical variables determining the demand for cassava?

Data was collected from respondents in form of personal interviews that covered questions posed to them from standardized questionnaires. If the respondent was not the head of household or the spouse, somebody who was responsible for the purchase of food items in the household was interviewed. Three residential areas were chosen according to income levels, which also gave an approximation of population density. A random cluster sampling method could be used, since houses were numbered and arranged in a specific manner. In each location, forty households were interviewed. Houses were arranged in rows and a respondent's house was selected every after a space of ten houses in each row. Interviewers moved from one row end to the next. The food items covered in the questionnaire were mainly the staple maize and other cereals and tubers. The value of the food items bought in the last 30 days was captured. Respondents were asked to provide the amount of money spent on cassava and maize meals. To arrive at the prices of maize meal and cassava meal for use in our analysis we used the monthly

expenditure on both commodities and the ruling nominal retail prices on major markets in Lusaka collected by MACO during the period the survey was conducted.

An econometric model was used that specified demand of cassava meal as a function of own price, maize meal price, income and cassava meal quality, the model explained only about 55 percent of the variability in demand for cassava. This low R-square is often observed in cross-sectional data such as the one used for this study. The results of the estimated model showed that while both cassava meal price and cassava meal quality were statistically significant at the 5 percent level in explaining, neither income nor maize meal price were significant. The results also showed that the own price elasticity was decreasing in own price at an increasing rate. This implies that as price increased, the demand for cassava meal became more elastic, *ceteris paribus*.

5.2. Conclusion

The results of the study are important in a number of ways. For example, there is now some empirical evidence about the relationships between cassava demand and its own price and that of quality. This information might be helpful for both government agencies responsible for food security and food processors handling cassava to focus attention on maintaining or improving the quality of cassava coming to urban consumers like those included in this study.

For example, because of the finding that quality is a critical variable in demand, it makes sense to add value to cassava through processing to protect its quality through the supply chain. It will also make sense for the government and others interested in the problem to undertake intensive marketing and promotions to increase consumer awareness about the quality of cassava vis-à-vis other starchy grains.

Niche markets may come into play. Currently very few processors sell well labeled cassava flour. Also, there are few grocery stores that stock these. As more and more households acquire more income, the demand for food may change. Consumers may demand a variety of food products made from cassava meal, not only *nshima* made from a blend of cassava and maize meal. A number of food products can be made from cassava meal (Chitundu, Haggblade

and Droppelman, 2006). Organizations such as cassava producer, processors, nutrition commission, Program against Malnutrition and government line ministries and departments should be encouraged to promote the commercialization of cassava food products too. This should improve both the production and consumption of the products at household level.

Also, because of the increasing absolute own price elasticity of demand of cassava, it is important for government and non-governmental organizations working on increasing cassava production to focus significant attention on lowering production and logistics costs within the cassava supply chain. The results show that consumer adverse response to cassava price increases once price goes past about ZMK950. This would imply that undertaking steps to improve production efficiency in the cassava supply chain to bring its price down below the levels seen in this study could do well to enhance the crop's ability to achieve its expected role as a famine security. Unfortunately, if consumers do not consume the product in normal times, then farmers will not grow it for it to be available when it is most needed.

But all these efforts are constrained by the social limitations facing cassava. Government and other non-profit organizations have already taken the initiative to promote the production and consumption of cassava products (Chitundu, Haggblade and Droppelman, 2006). Government through the Ministry of Agriculture and Cooperative has tried and continue to provide sweet varieties that are early maturing and easy to process, through deliberate research programs. Also, government has been working with organizations such as the Program against Malnutrition and the Food and Agriculture Organization to promote the production and consumption of cassava among the rural and urban communities that are vulnerable. These are communities that may have farming land but people are too poor to grow crops like maize because they cannot afford expensive inputs like fertilizer and seed. In urban communities, it is common to find families that are too poor to buy the stable maize meal and whose nutrition is generally poor thus are taught ways to improve their diets. This is achieved through deliberate promotion of inexpensive but balanced foods in their diets. Organizations like Program against Malnutrition and the Ministry of Agriculture and Cooperative are looking at ways of improving and promoting how cassava can be prepared and consumed to increase its attractiveness. They are using education programs to help consumers adopt these new foods that use cassava as

principal ingredients. Advancing such programs may be one big step in ensuring cassava is available when *Zambians* need it the most.

5.3. Recommendation

Specific government policies and programs to enhance cassava consumption can focus on three main areas; food security, income generation and nutrition. Hence the following areas may be vital:

- Food security by buying cassava from producers and ensure it is available when the maize crop fails and/or prices of maize meal are becoming unaffordable. The operations of the Food Reserve Agency must be enhanced in the area of cassava purchases.
- Producers' incomes must be assured if production is to be enhanced. This means government must ensure that research funds are available to develop more varieties with good attributes; high-yielding, disease-resistant, early-maturing and sweet varieties.
- Development and enhancement of quality and standards of cassava products to ensure food and feed safety.
- Improved value addition; support producers and processors and also ensure that marketing is improved. One way would be making sure transport costs are minimized by maintaining good roads from production to consumption areas.
- Enhanced deliberate nutrition programs that can lead to increased use of cassava in the diet; like feeding programs in hospitals and schools.
- Deliberate promotional campaign programs on the nutritional aspects of cassava products.

5.4. Suggestion for future research

There is a need to investigate further the broader demand for cassava meal among urban populations in Zambia. This study was limited to Lusaka and a relatively small population. Expanding the number of cities and size of samples in each city will be extremely helpful in confirming the results presented in this research.

In conducting any future broader studies on cassava consumption in Zambia, it is important for researchers to pay attention to potential measurement errors that arise from consumer recall of information. Possibly, conducting diary research like those done to track nutrition and food consumption in the United States must be investigated for consideration. This will take care of the risks with qualities, quantities and prices.

Demand for a food is affected by a number of factors that including economic, social, religion, ethnicity, health and others. This study has only highlighted a few economic factors. We suggest that future studies include a number of social factors especially that cassava has long being viewed as an inferior food mainly consumed in famine times. It would be interesting to see whether or not factors like level of education and demographic composition of household, for instance, do affect the demand for cassava among consumers.

In the end, this research provides a good foundation for such future research to build on. These improvements will help the Zambian Government and non-governmental organizations supporting Zambians in their effort to minimize the adverse effects of drought on human health, nutrition and security to develop more robust and effective policies to achieve their objectives.

CHAPTER 6 - References

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