SUBSISTENCE AGRICULTURE STUDY

The Cassava Industries in Mozambique and Tanzania: PRODUCTION, PROCESSING, DISTRIBUTION AND CONSUMPTION OF CASSAVA AND ITS RELATED POLICY CHALLENGES

PROMAR CONSULTING

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1. Introduction

1.1 Project Background

The objective of this project “Fundamental Survey for the Support of Aid to Developing Countries” is to collect and analyze information regarding Sub-Saharan Africa and present it in a format which can become a solid basis for the future implementation of efficient aid activities in Sub-Saharan Africa by international cooperation organizations, particularly in the field of agricultural development. The environmental, geographic and social conditions in Sub-Saharan African countries vary widely. Therefore, it is important to have an understanding of the present situation and the existing challenges within specific countries and for specific crops before determining targets and methods for aid activities. This project looks at this issue from two points of view: the role of subsistence crops in contributing to increases in food security and famine reduction and the role of high-value agriculture in contributing to poverty reduction and income generation, in order to determine ways to approach the current challenges related to these crops.

This project has been executed through the Overseas Development Assistance (ODA) budget framework established by the Japanese Ministry of Agriculture, Forestry and Fisheries. The Ministry’s own commitment to international aid and cooperation activities is based on the following six principles:

1. There are a large number of malnourished people in the world, the majority of whom live in Sub-Saharan Africa;

2. There is concern that global food supply will be insufficient for the world’s growing population;

3. In Africa, primary industries support more than 50% of the workforce, with agriculture and fisheries being the key industries;

4. The continuing destruction of rain forests and increasing desertification are leading to global environmental issues;

5. There is a need to increase the number of countries that understand and share concerns with Japan during WTO and EPA negotiations;

6. When engaging in post-conflict recovery assistance in developing countries, the agriculture
and fishery industries are highly important.\(^1\)

In order to respond to these core issues, it is important to use ODA funding strategically, and the Ministry of Agriculture, Forestry and Fisheries has defined the main aims to be supported by the ODA budget as: 1. Insuring food security in Japan and internationally 2. Facilitating international negotiations related to the agriculture and fishery sectors in WTO and EPA trade talks and 3. Responding to critical global environmental problems and cross-border diseases\(^2\).

This project primarily supports the first aim, i.e. insuring international food security and it includes two studies. One study focuses on a subsistence crop, collecting and analyzing information on subsistence crops, in order to inform more efficient international agricultural cooperation, as well as to improve the production technology of subsistence crops. This year’s subsistence crop study targets cassava in Mozambique and Tanzania. In previous years, studies have focused on products such as beans from Benin, maize from Zambia and Malawi, grains from Niger and plantains from Uganda.

The second study focuses on a high-value agricultural crop and looks at how a high-value agricultural industry contributes to poverty elimination, as well as analyzing production, processing and trade related to this product. This year’s study targets coffee in Tanzania and Ethiopia. Previous studies have focused on sericulture in Uganda, medicinal crops in Ethiopia, apiculture in Kenya and natural plant fibers in Ghana.

This report in hand summarizes the research on cassava. Our research on a high-value crop, focusing on coffee, is summarized in a separate volume.

1.2 **Subsistence Agriculture Research Background and Project Objective**

The continent of Africa covers 30 million km\(^2\) and is home to just over 1 billion people. While population density is relatively low in much of the continent, its population is increasing at a rate of 2.2 % per year. Therefore food security is a key concern for many African nations.

There are 53 countries in Africa with differing natural and political environments as well as varying levels of economic development. However in countries within the Sub-Saharan African

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region, income levels are particularly low and malnutrition and food insecurity is not uncommon. The majority of Sub Saharan Africans live in rural areas and are engaged in agriculture. As the share of agriculture in Sun-Saharan economies is very high, agricultural development is necessary for economic development, poverty reduction and food security.

The importance of root crops and cassava in Africa
Root and tuber crops, particularly cassava, are extremely important in Africa. The share of cassava out of total root/tuber crops in Africa is 54.5 %, and Africa's share of world cassava production is about 50 %.

African's production volume of root and tuber crops (216 million tons) is higher than its production of cereals (151 million tons), and root/tubers are a staple food in many African countries. It has been said that root/tubers crops have been a key element in Sub-Saharan population growth, because cassava is tolerant against draught, can grow in poor soil and requires only simple tools for cultivation. For these reasons cassava is a very important crop for food security in Sub-Saharan Africa.

The largest producer of cassava in Africa is Nigeria, and other West African countries such as the Congo and Ghana also produce large volumes of cassava. However East African countries also produce a significant volume of cassava, and cassava plays important role in food supply in both Mozambique and Tanzania, the countries which are the focus of this study.

Current situation of cassava production
Although cassava is an important crop in Africa, and many governments have made an effort to improve varieties and production technology, the yield of cassava in Africa (9.8 t/ha) is still lower than in South America (13.5t/ha) or Asia (19.2t/ha). Cassava retains an image of being simply a rural subsistence crop and the development of a commercial cassava industry with value-added cassava products is still lacking.

However research on cassava has progressed over the past 20 years, especially thanks to the Collaborative Study of Cassava in Africa (COSCA) project (1989-1997), which was coordinated mainly by the International Institute of Tropical Agriculture (IITA). Since the COSCA project, there have been many other projects related to cassava in African countries and many proposals for ways to support the development of the cassava industry have been offered.

Current state and possibility of value-added cassava
Most of these proposals and reports insist that the development of African cassava production is critical for food security, economic development and poverty reduction. They encourage
reforming the current system of cassava production as a rural subsistence food and developing a commercial cassava industry through increasing the number of value-added cassava products.

Examples of these proposals and programs include the Natural Resources Institute (NRI) in the UK who are conducting Cassava: Adding Value for Africa (C:AVA) project, and the FAO which proposed “The Global Cassava Strategy” in 2000. On the national level, the government of Nigeria has started Presidential Initiatives on the cassava industry.

Nevertheless, despite the existing research and projects, the development of the cassava industry in Africa has still been lagging, especially in Mozambique and Tanzania, which are targeted countries in this project.

Objectives
While globally there are many cassava experts and much literature exists on cassava in Africa, in Japan there is less awareness and understanding of cassava especially in East Africa because of the lack of resources written in Japanese.

The aim of this report is to provide up-to-date information on cassava (production, processing, marketing and consumption) in Mozambique and Tanzania and insure that it will be available in both Japanese and English languages.

We have investigated current situation of cassava industry in those countries, and analyzed the differences between Mozambique, Tanzania and other countries. We have identified opportunities and bottlenecks in the cassava development, and in doing so, we aim to provide a resource to support policy making and agricultural aid programs.

1.3 Project Methodology and Execution
A summary of how the research was conducted is found below. This project also included an advisory board of experts in related fields who helped insure efficient research with their experience and insight, participated in lively debates and provided feedback for fine-tuning conclusions.

1.3.1 Project Team

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<td>Rie Yoshida, Promar Consulting Executive</td>
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International Cooperation Expert Advisor

Ichiro Tambo, Japan International Cooperation Agency (JICA), Africa Department,
Executive Advisor to the Director General
In order to get a deep understanding of the cassava industry, a thorough desktop review of existing literature, data and statistics was conducted.

To prepare for our interviews in Tanzania and Mozambique, in October, we visited the Natural Resources Institute (NRI) at Greenwich University in England, a leader in international cassava research, and interviewed cassava expert Dr. Andrew Westby. In addition, interviews were conducted at the FAO at Rome related to cassava research projects and African economic development.

Field research in Mozambique and Tanzania was conducted in November-December 2010 in order to discuss the current cassava situation with researchers, processors and producers.

The types of interviews conducted are summarized in the table below.

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<th>Dates</th>
<th>Interviewee</th>
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<td>October –November, 2010</td>
<td>Japanese Expert</td>
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<td>Natural Resources Institute (UK)</td>
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<td>FAO</td>
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<tr>
<td>Research in Mozambique</td>
<td>November 22-26, 2010</td>
<td>Government organizations</td>
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<td>Research Institutes</td>
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<td>Aid organizations</td>
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1.4 Project Outline

This report consists of 7 chapters. The next chapter (Chapter 2) gives an overview of cassava’s position within Africa’s food supply. We will also discuss the importance of root and tuber crops to the growing population of Africa, as well as analyze cassava production and trades trends over the past 50 years.

In chapter 3, we will take a look at cassava production, processing and consumption methods. We first describe the characteristics of cassava, and later explain how they are cultivated. Then we go into further detail on the processing and consumption of cassava.

Chapter 4 analyzes the “cassava transformation,” the term used to describe how cassava usage is expanding through increased methods of value addition and improved high yield plant varieties. Moreover, this chapter will outline the plans for cassava industry development as laid out by the Food and Agriculture Organization of the United Nations (FAO) and the International Fund for Agricultural Development (IFAD) in the Global Cassava Development Strategy launched in 2000.

As we move into chapter 5, we will provide an overview of the current situation of cassava production, processing, and consumption in Mozambique. We will first summarize cassava’s position among agricultural crops, and then outline the significance of cassava within food supply. Furthermore, we will look at cassava production, usage trends, and price fluctuations. Finally, we will provide a more detailed look at cassava production and consumption in the two areas of Mozambique which were the focus of our field research, Inhambane and Nampula.

In chapter 6, we will take a look at the cassava production, processing and consumption in
Tanzania. Following the same pattern as the previous chapter, we will look at cassava's role among agricultural crops, the production trends, and also identify the issues related to increasing production and processing. Lastly, we will look more closely at cassava production and consumption trends in Mkuranga, Tanzania, where we concentrated our field research.

Chapter 7 summarizes the issues facing the cassava industries in Mozambique and Tanzania. This chapter looks at the expansion of cassava industries, the issues they are encountering and the actions they should take. Lastly, we discuss our recommendations for overcoming these obstacles.
2. The Role of Cassava in African Food Supply and Demand

2.1 Overview

Africa covers an area of 30.31 million km², which is 1.7 times the size of South America and 3.3 times the size of Europe. Africa is the second largest continent in area after Asia. The population of Africa is 1.03 billion, which is 2.6 times South America (390 million) and less than the population of India, a country with just 1/9th the land area. The average population density (34 people/km²) is relatively low.

2.1.1 Climate and Geography

Africa spreads across both the Northern to Southern hemisphere. Tropical rainforest found in the equatorial zone and as one moves away from the equator both towards the north and south, there are savanna, desert, and finally Mediterranean climate zones in that order. The natural environment of Africa is diverse. Both ends of the continent feature deserts, with the Sahara desert at latitude approximately 20 to 30 degrees north and the Kalahari Desert and the Namib Desert at approximately 20 to 30 degrees south latitude.

Africa is a fairly flat continent although it has high plateaus and mountainous areas in eastern areas along the Great Rift Valley, such as the Ethiopian Highlands and the iconic Mt Kilimanjaro in Tanzania. It also has huge rivers such as the Nile, Niger, Congo, and Zaire. Major civilizations and economies on this continent were formed mainly around these drainage basins.

This diversity of climate and geology significantly affects the forms and diversity of agriculture in Africa.
Currently, there are 53 countries in Africa, a quarter of the total number of countries in the world. Countries with the largest population in Africa are Nigeria (158 million), Ethiopia (85 million), Egypt (84 million), Congo (68 million), and South Africa (50 million). These 5 countries constitute 43% of the total African population. Africa has another 10 countries with populations larger than 20 million.

North African countries have quite a different culture from central and southern African countries. Many Northern countries are Arabic-speaking and predominantly Muslim. Supply and demand structures for food are also different in North Africa.

In sub-Saharan Africa, climates vary among regions. Therefore forms of agriculture are diverse. There are also differences in the culture of various countries depending on what European country they have historical colonial ties.

### 2.1.2 Population Growth and Food Supply

Africa’s population increased 2.8 times in the past four decades and 1.6 times in the last two decades. The growth rate is higher than Asia’s (2.0 times over the past four decades and 1.3 times in the past two decades) and South America’s (2.1 times in the past four decades and 1.3 times in the last two decades).
In Africa, under pressure of population growth, food shortages have occurred repeatedly, often caused by civil wars and droughts, and have become international challenges. Currently, it is estimated that there are 239 million people who are suffering from nutritional deficiency in sub-Saharan Africa and eliminating malnutrition has proved to be a big challenge.

Over the last two decades, production of cereals increased 1.5 times and production of starchy roots increased 2.2 times in Africa. Because the growth rate of cereal production is lower than the rate of population growth and the evolving livestock sector has led to an increase in livestock feed demand, imports of cereals to Africa have doubled in the past two decades.

### 2.1.3 Trends in African Economy and Agriculture

Africa’s economy had been stagnant for many years. In many African countries, the growth rate of the economy was less than that of the population and hence, the growth rate of GDP per capita was less than zero. For example, the average economic growth rate in Africa during the ten-year period 1985-94 was 1.9% (IMF statistics), which was lower than the population growth rate for this period (annual rate 2.7%).
However, in recent years, African economic growth has gotten back on track. From 2001 until the global financial crisis, the economic growth rate has been more than 5%. Even in sub-Saharan Africa, the average growth rate from 2000 to 2008 was 5.2%. While these are not comparable to the economic development in eastern Asia, the situation in Africa is far from the stagnation of the past.

But, at the same time, significant poverty remains. For example, the percentage of people living on less than 1.25 dollars is as high as 88.5% in Tanzania, 74.7% in Mozambique, 64.9% in Nigeria, and 59.2% in Democratic Republic of Congo.

Agricultural land area in Africa is 1.16 billion hectares and constitutes 38% of total land area. Arable land area is 0.22 billion hectares and constitutes less than 20% of the agricultural land area and 7% of total land area, of which the latter number is less than India (53%) and China (12%).

In Africa, most people are engaged in farming; the percentage of agriculture within GDP is high; and, for many countries, agricultural products constitute a large share of exports. Dominant staple foods are cereals, starchy roots, and bananas. Most farms are small to medium-sized. Farm production is mainly subsistence but some regions produce cash crops such as cacao, coffee, cotton, tobacco, sugarcane, hemp, which have become important export goods.
2.2 The Important Role of Roots and Tubers among Foods in Africa

The Cereals Market

Worldwide, cereals can be considered the most important food crops. The production of cereal crops in Africa was 152 million tons in 2008. This production is rather small in relation to the size of the population and less than China (480 million tons), India (267 million tons), and the USA (404 million tons).

The top cereals produced in Africa are maize (55.8 million tons), sorghum (25.8 million tons), rice (23.6 million tons), millet (20 million tons) and wheat (19.8 tones).

Cereal production increased 52% in the last two decades; however, this rate of increase has fallen below the rate of population increase. During the same period, the area harvested for cereals increased 35% and yield increased 17%. The fact that in Africa the increase in harvested area is greater than the increase in yield is quite a different trend from in other countries.

Imports of cereals to Africa are increasing for several reasons including the relatively low increase in the rate of domestic cereal production compared to the increase in population, the increase of livestock feed demand caused by the growth of the livestock sector and an increase in demand for wheat caused by urbanization. In 2008, cereals imports to Africa constituted 17% of world trade.

Major import cereals are wheat (31.7 million tons), maize (11.6 million tons), and rice (68.3 million tons). Major importing countries are Egypt (10.5 tons), Algeria (72.8 million tons), Morocco (61.5 million tons), Nigeria (35.8 million tons), South Africa (33.8 million tons), Tunisia (31.2 million tons), Libya (23.6 million tons). These statistics illustrate how North African countries are especially large cereal importers. It is a relatively small number of Africa countries who import a large volume of cereals; many countries cannot afford to import much because of their shortage of foreign exchange. However, overall cereal imports to Africa have been increasing.
Production of Roots and Tubers

Africa produced 216 million tons of starchy roots and tubers in 2008, which is larger than the total supply of cereals (205 million tons) including both domestic production of 151 million tons and imports of 54 million tons. Africa's starchy root and tuber production constitutes 30% of world production and is critical in feeding the continent's increasing population.

Worldwide, potato has the largest share (43.1%) among root and tuber crops, but in Africa cassava accounts for 54.5% of total production, followed by yam (23.0%), potato (9.0%), sweet potato (6.5%), and taro (4.3%). Africa produces 50.7% of the world's cassava, 91.3% of its yam and 78.9% of its taro. The global share percentage of potato and sweet potato are small, but Africa still produces 19.50 million tons of potato and 14.01 million tons of sweet potato and both crops are staple food in some regions.

Root and tuber production increased 260% over the past four decades and 120% times over the past two decades. The rate of increase is higher than both that of cereal production increase and the rate of population increase. The rate of increase for cassava production has only been 90% however, which lower than those for other crops (yam: 220%, taro: 210%, sweet potato: 130%, potato: 170%)
In the past two decades, yield of starchy roots increased 19% times, while harvested area increased 86% times. Hence the increase in harvested area is much larger than the increase in yield.

Meanwhile, the volume of trade in starchy roots and tubers is small because, unlike cereals, they are quite bulky and deteriorate quickly in fresh form.

**Figure 5: Production of Root Crops in Africa**

![Production of Root Crops in Africa](image)

**Source FAOSTAT**

The Role of Starchy Roots and Tubers

Production volumes of roots and tubers cannot be directly compared with production volumes of cereals because the nutrient composition and water content are different. Starchy roots and tubers contain more water than cereals. Generally, 0.3 is used as a multiplier to calculate the root and tuber equivalent to cereal weight (Shinoura [1990]).

Deploying this multiplier factor, the \( \text{[starchy roots/(cereals + starchy roots)]} \) ratio in Africa is 0.24. This means roots and tubers are less important than cereals within the food supply. But in countries such as the Democratic Republic of Congo (0.71), Ghana (0.63), Nigeria (0.44), and Mozambique (0.43), the proportion of starchy roots in the diet is significant. In Tanzania, the ratio is 0.28. Even in countries where the main staple foods are cereals such as maize, there are some regions within the country where the staple food is a root or tuber. Therefore, starchy
roots and tubers can be considered important crops in Africa, especially in sub-Saharan Africa. Starchy roots and tubers are resistant to drought because they grow underground and are available for harvesting in the time of need. The yield of starchy roots is relatively high even when grown on infertile land, making roots and tubers very important crops for the purpose of maintaining food security in Africa.

### Table 1 Comparison of Root Crops and Cereal in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>Cereal production</th>
<th>Cereal import</th>
<th>Cereal supply (Total)</th>
<th>Root Crop production</th>
<th>Share of Root crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>84.5</td>
<td>22.8</td>
<td>9.3</td>
<td>32.1</td>
<td>4.0</td>
<td>0.04</td>
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<tr>
<td>Algeria</td>
<td>35.4</td>
<td>3.6</td>
<td>7.3</td>
<td>10.9</td>
<td>1.8</td>
<td>0.05</td>
</tr>
<tr>
<td>Sudan</td>
<td>43.2</td>
<td>5.3</td>
<td>1.4</td>
<td>6.6</td>
<td>0.4</td>
<td>0.02</td>
</tr>
<tr>
<td>Etiopia</td>
<td>85.0</td>
<td>13.0</td>
<td>0.7</td>
<td>13.7</td>
<td>6.1</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Tanzania</strong></td>
<td><strong>45.0</strong></td>
<td><strong>6.2</strong></td>
<td><strong>0.6</strong></td>
<td><strong>6.8</strong></td>
<td><strong>8.6</strong></td>
<td><strong>0.28</strong></td>
</tr>
<tr>
<td><strong>Mozambique</strong></td>
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<td><strong>1.6</strong></td>
<td><strong>7.9</strong></td>
<td><strong>2.4</strong></td>
<td><strong>6.0</strong></td>
<td><strong>0.43</strong></td>
</tr>
<tr>
<td>Kenya</td>
<td>40.9</td>
<td>2.9</td>
<td>1.0</td>
<td>3.8</td>
<td>2.5</td>
<td>0.16</td>
</tr>
<tr>
<td>Uganda</td>
<td>33.8</td>
<td>2.7</td>
<td>0.4</td>
<td>3.1</td>
<td>8.5</td>
<td>0.45</td>
</tr>
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<td><strong>Nigeria</strong></td>
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<td><strong>30.2</strong></td>
<td><strong>3.6</strong></td>
<td><strong>33.8</strong></td>
<td><strong>89.4</strong></td>
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<tr>
<td>Cote d’Ivoire</td>
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<td>2.7</td>
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<tr>
<td>Ghana</td>
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<td>0.8</td>
<td>2.7</td>
<td>15.0</td>
<td><strong>0.63</strong></td>
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<td>Congo</td>
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<td><strong>0.71</strong></td>
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<tr>
<td>Angola</td>
<td>19.0</td>
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<td>0.6</td>
<td>1.4</td>
<td>10.2</td>
<td><strong>0.69</strong></td>
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<tr>
<td>South Africa</td>
<td>50.5</td>
<td>14.5</td>
<td>3.4</td>
<td>17.9</td>
<td>2.2</td>
<td>0.03</td>
</tr>
<tr>
<td>Total (Africa)</td>
<td>1033.0</td>
<td>151.4</td>
<td>50.7</td>
<td>202.0</td>
<td>216.4</td>
<td>0.24</td>
</tr>
</tbody>
</table>

Note: Share of Root Crops = Root Crop×0.3/(Cereal+Root Crop×0.3)

Source: FAOSTAT

### 2.3 Cassava Production and Trade in Africa

Cassava is native to South America and was brought to Africa by the Portuguese in the 16th century. During this period large numbers of Africans were sent to South America as slaves, but some later managed to return and brought with them additional knowledge to Africa regarding cultivating and cooking cassava. In addition, African governments began promoting the
production of cassava as a measure against famine, which contributed to the further spread of cassava in Africa.

Today, cassava production in Africa constitutes 50% of world production and it has become the principal root and tuber crop in Africa.

*Figure 6 Cassava Production Area in Africa*

African cassava production was 118.05 million tons in 2008, which constitutes 50.7% of global cassava production and 54.5% of the roots and tuber production in Africa. Cassava production increased 87% over the past two decades. During the same period, harvested area increased 47% and yield increased 27%, suggesting that increase in harvested area contributed more to the production increase than did the increase in yield.

Cassava yield in Africa is 9.8 tons per hectare, which is lower than Asia (19.2 ton/ha) and South America (13.5 ton/ha). Some of the reasons for this low yield are the prevalence of slash-and-burn farming, low fertilizer input, mixed farming, slow development of new cassava varieties, and cassava diseases.

Nigeria is the largest producer of cassava with 44.58 million tons, which constitutes 37.8% of Africa’s total production, followed by the Democratic Republic of Congo (15.02 mil. tons), Ghana (9.65 mil. tons), Angola (8.84 mil. tons), Tanzania (6.60 mil. tons), Uganda (5.07 mil. tons).
tons), and Mozambique (5.04 mil. tons). Together, these top 7 countries produce 70% of the cassava in Africa. All of these countries are in Sub-Saharan Africa.

70% to 80% of the cassava produced is utilized for food, though the proportion varies among countries. The percentage used for livestock feed and non-food processing material is small.

**Figure 7 Production of Cassava in Africa**

![Graph showing production, yield, harvested area, and harvested area over time.]

*Source: FAOSTAT*

### 2.3.1 African Cassava Trade

There is very little international trade in fresh cassava because its shelf life is extremely short. A small amount of processed cassava is traded.

African cassava exports peaked at 466 tons (fresh equivalent) in 1968 and decreased to only 51 tons in 2008. The cassava product with the largest export volume is dried cassava at 9,593 tons in 2008. The other export items are cassava flour (3,802 tons) and cassava starch (1,448 tons). Both have increased in the last decade. The largest exporter is Uganda (29,000 tons). The top 3 countries (Uganda, Nigeria, and Benin) account for 94% of exports.
On the other hand, Africa imports 170 thousand tons of cassava (fresh equivalent), which far surpasses export. Most is imported as cassava starch. In 2008, 29000 tons of cassava starch was imported and volumes have been increasing recent years. The largest starch importing country in Africa is South Africa, which constitutes 80% of African cassava starch imports. The import volume of dried cassava is only two thousand tons, less than export volumes. Hence Africa is a net exporter of dried cassava.

**Figure 8 Cassava Trade in Africa**

![Cassava Trade in Africa](source: FAOSTAT)

**Figure 9 Exports of Cassava Products from Africa**

![Exports of Cassava Products from Africa](source: FAOSTAT)
2.4 Global Cassava Production and Trade

Production

Source: FAOSTAT
Total global cassava production is 232.95 million tons. Africa, Asia, and South America constitute 50.7%, 32.9%, and 14.2% of global production respectively.

Major producing countries are Nigeria (44.58 mil. tons), Brazil (26.70 mil. tons), Thailand (25.16 mil. tons), Indonesia (21.59 mil. tons), and Congo (15.02 mil. tons). These top 5 countries produce 57% of world production. Production in Nigeria, which was lower than that of Thailand, Brazil, and Indonesia 20 years ago, has increased 189% over the past two decades. As a result, Nigeria has become a dominant production country.

Globally, cassava production has increased by 60% in the last two decades. Over this period, increases in harvested area (27%) and yield (26%) were almost equal.

Global Cassava Trade

Global cassava exports are 17.57 million tons (fresh equivalent) and equal to 7.6% of production. The volume peaked in 1987 at 32.55 million tons, decreased afterward, and has then increased recent years. The largest export country is Thailand, whose 13.64 million tons constitutes 78% of world exports. Other Southeast Asian countries such as Vietnam (1.88 mil. tons) and Indonesia (0.53 mil. tons) also export large volumes.

Globally the major cassava products for export are dried cassava and cassava starch. While dried cassava used to account for most of the exports, the volume has decreased since around 1990 and starch export has increased recent years.

**Figure 12 Global Cassava Exports**

Source: FAOSTAT
On the import side, Europe was the largest importer until around 1990, but imports to China have been increasing in recent years. Currently, China imports 8.57 million tons which constitutes 47% of global imports. The other major importing countries are South Korea (2.35 million tons), Japan (0.86 million tons), Indonesia (0.79 million tons), Spain (0.68 million tons), Malaysia (0.62 million tons), and Belgium (0.61 million tons).

**Cassava End-uses**

Cassava is used differently in different countries and regions. Shown below are characteristics of major producer countries in Africa (Nigeria and Tanzania) and the major regions in Southeast Asia.
Asia (mainly Thailand and Indonesia) and South America (mainly Brazil).

In Nigeria, estimates on cassava usage vary. Some estimates report that 90% of cassava is used for food and 5-10% is for livestock feed, while FAOSTAT reports that 50% is for livestock feed. This difference may come from different ways of calculating cassava volume; for example water content is loss when processing, which may lead to lower volumes recorded as feed. In addition, after preparing cassava for food, peels and scraps remain that may be fed to livestock but be underreported in data on cassava for feed. In Tanzania, cassava is used mostly for food but use for livestock feed is increasing recently. Neither Nigeria nor Tanzania exports a significant amount.

In Southeast Asia, 40% of production is exported. Thailand in particular exports a large percentage, which is a significant contrast to other major production regions including Africa. Thailand used to export cassava pellets to the EC, but the volumes dropped when the EC increased its self-sufficiency in livestock feed. After that, Thailand increased its export of cassava starch to Japan and, more recently, cassava chips to China.

In South America, 40% of cassava is used for food and another 40% is for livestock feed. The percentage that is used for starch is also comparatively high.

**Figure 15 Cassava End-Uses**

![Cassava End-Uses Diagram](Image)

*Source: FAOSTAT*
Figure 16 Utilization of Cassava in Main Countries and Areas
[FAOSTAT, Unit: thousand tons]
3. Production, Processing, and Consumption of cassava

3.1 Characteristics of Cassava

Herbaceous shrub
Cassava is a type of herbaceous shrub, and its tubers grow under the ground. Tubers have a length of 15-100cm, and diameter of 5-15cm. Each cassava plant produces 5-15 tubers, and these tubers radiate out from under the plants.

Cassava field (Mozambique)  Cassava Tubers

Tolerant to extreme environments
Cassava is tolerant to extreme environments, and can adapt to poor soil or irregular rainfall. Even in the dry savanna areas of Africa where rainfall is not stable, cassava can grow well. Cassava tubers are also fairly resistant to damage from insects or animals.

Cassava can be harvested at any time in the year
Cassava tubers remain fresh as long as they are under the ground, allowing them to be harvested at any time of the year. Cassava tubers can be harvested anywhere from 6 months to 3-4 years after planting. However, after harvesting, the quality of cassava quickly deteriorates, and must be eaten or processed within 2 days.

Fresh cassava is heavy and highly perishable
As cassava contains 70% of water, it is heavy and difficult to transport. Since roads are not good in many parts of Africa and most cassava farmers do not have access to tractors or trucks, transport and distribution of fresh cassava is limited.

Because the quality of fresh cassava deteriorates so quickly, fresh cassava cannot be stored for very long. Theoretically, cassava can be stored in refrigerators, but there are not many...
refrigerators available to African cassava farmers.

However, dried cassava can be stored for a long time and it is easy to transport, so farmers often dry cassava in order to store before eating or selling it.

There are 2 main varieties of cassava, sweet and bitter
The so-called “bitter” cassava contains poison (cyanogenic glucosides) that must be removed before eating. The poison can be removed by soaking the cassava in water and then usually boiling or cooking. Sweet cassava can be consumed directly, often boiled, grilled or deep-fried. According to the Collaborative Study of Cassava in Africa (COSCA) research, 69% of cassava in Africa is sweet, and 31% is bitter.

Cassava is weak in nutrients and protein
While cassava provides an important source of carbohydrates, it does not contain much protein or other essential nutrients. Cassava does contain some vitamin C and calcium but much is lost through processing. On the other hand, cassava leaves are a good source of protein and vitamins, and can balance a diet heavy in cassava root.

Cassava for food security
Cassava is extremely important for food security for several reasons: 1) It is tolerant to drought 2) it can be harvested at any time of the year 3) It produces many tubers even without application of fertilizer or pesticide. However because of issues such as the rapid deterioration of cassava after harvesting and the difficulty in transporting the heavy tubers, in Africa, cassava remains a subsistence crop and has not been seriously considered as a commercial or cash crop.

3.2 Cassava Cultivation

Planting
Cassava plants do have flowers and bear fruit, but new cassava tress through vegetative propagation. In other words, they use cuttings from existing trees to plant new trees. To do this, cassava branches of about 20-30 cm in length are cut from healthy trees. About 10 cuttings can be taken from one tree. These cassava cuttings are planted 1 per m², although the density is different depending on the farmer or region. Once planted, these cuttings will take root and grow into a new cassava tree.
Slash and burn

Land for cassava cultivation is often prepared by through slash and burn agriculture. If cassava is continuously planted in the same soil for many years, the soil degrades. Therefore farmers clear new land through slash and burn and let the old land lay fallow for several years.

Intercropping

According to COSCA data, 60% of cassava in Africa is intercropped. The prevalence of intercropping and the type of crops intercropped with cassava varies by region. Maize is the most common crop intercropped with cassava, with banana, rice, yam or sweet potato is also common.

The main reasons for intercropping are:

① Farmers tend to grow many crops in one field because of their lack of land.
② Intercropping reduces risk from production decline or price fluctuations of one crop
③ Intercropping reduces disease
④ Harvest seasons can be spread throughout the year, which helps solve the problem of labor shortage.
⑤ Intercropping produces a variety of foods and contributes to a nutritionally balanced diet for the farmer and family.

Planting season

Cassava is mainly planted at the beginning of the rainy season. The time of planting depends on the other crops with which cassava is intercropped. The reason cassava is planted during the rainy season is that ① Cassava needs large amounts of water in the initial stage of growing, ②This allows cassava to be ready for harvest in the dry season, when it is possible
Harvest season
Farmers can harvest cassava at any time of the year, whenever they want to eat, process or sell the cassava. However, as mentioned above, cassava is mostly harvested in the dry season when it can be dried in the sunshine.

It can be harvested anytime between 6 months and 4 years after planting. According to COSCA research, the average in Africa is 12 months after planting. The later harvesting comes, the harder and more fibrous the tubers become.

Inputs and machinery
Although cassava is grown extensively in Africa, most farmers do not use fertilizer and pesticide. However, to increase the yield, fertilizer and/or pesticide is necessary. In addition, most farmers do not use a tractor and rely instead on simple hand hoes for planting and harvesting.

For transporting cassava to market, few farmers have access to trucks or tractors and often use bicycles to transport cassava from villages to towns. However, in some cases cassava collectors will come to the villages with trucks and collect cassava to take to the town markets.

Labor
According to COSCA research in Tanzania, 1 hectare of cassava production requires 182 hours of labor, which includes 54 hours for cultivation, 27 hours for preparing cuttings, 27 hours for planting, 28 hours for weeding and 46 hours for harvesting. In Mozambique and Tanzania, this labor is household labor. In Nigeria, however, 80% of the labor is hired labor.

Disease
Cassava has long been considered to be tolerant to disease. However disease damage has
become an increasing problem. This phenomenon is due in large part to the fact that cassava is grown more intensively than before in response to population increases.

Common diseases include cassava mosaic disease (CDM), cassava brown streak disease (CBSD), and cassava bacterial blight (CBB). Pests include potato tuber moth (PTM), scale insect, whitefly, mites, locusts and others.

\[\text{Cassava leaves infected with diseases}\]

### 3.3 Consumption of Cassava

80-90% of Africa’s cassava is consumed as food, with the remaining small percentage used for feed or industrial materials. 40% of people who live in Africa eat cassava as a staple food, meaning cassava is a very important source of calories for a large number of people.

Below are illustrations of some common ways to eat cassava in Mozambique and Tanzania.

**Raw**

Sweet cassava can be eaten raw and tastes slightly sweet.

**Boiled**

Boiled cassava is common, often cooked or served with a bit of salt. Japanese would recognize
the taste a similar to “satoimo”, a type of tuber grown in Japan.

**Deep-Fried**
Fried cassava is a popular snack. It comes in different sizes – when finely sliced cassava is fried, it is similar to potato chips. Cassava chips are sold in supermarkets on the same shelf as potato chips.

**Baked/Grilled**
Baked cassava tastes similar to a baked sweet potato and is often sold along the street.
Baked or grilled cassava is sold in the street

Ugali
The most popular cassava product in East Africa is “Ugali”. Ugali is made from boiled cassava, which is then ground into paste. People eat ugali with vegetables, meat, fish, palm oil or spices.

Ugali can also be made from maize or banana, and cassava-maize mixed ugali is also seen. Consistency, taste, and color are important elements for ugali. Because it is eaten with the hand and mixed with other foods and sauces, the ugali needs to have the proper consistency – stiff enough to be picked up and keep its shape, but soft enough to absorb sauces.

Cassava leaves
Unlike the tubers, cassava leaves contain vitamin A, vitamin C, calcium, and protein, and as such, cassava leaves are eaten as a vegetable. There are many cooking styles, including boiling the leaves and then crushing to a paste, similar in consistency to creamed spinach. Cassava leaves can also be cooked with oil, peanuts, or fish. Dried cassava leaves can be stored easily and dried cassava leaf powder is also sold in shops.
An advantage of cassava leaves is that they can be harvested at any time, even during the dry season in savannah areas, when few other vegetables are available. Picking cassava leaves does not have much effect on the growth of the cassava tuber.

3.4 Methods of processing cassava

Most cassava undergoes processing because it begins to degrade immediately after harvest and cannot be stored very long. In addition, although sweet cassava can be directly consumed, bitter cassava contains toxins which must be removed before consuming. Soaking in water or fermentation removes bitter cassava of its toxins, and is therefore often the first stage of cassava processing.

Both sweet and bitter cassava root is 70% water, which makes it heavy and not easily transportable. However, drying cassava inhibits degradation and permits longer preservation as well as reducing the water content weight, which allows a decrease in required transportation cost.

Major processing methods of cassava are described below.

Peeling
Cassava roots are covered by dark brown outer skin which must be removed before being used as food or as raw material for high-quality starch production.

In Africa, the peeling is usually done manually with a knife, because cassava roots vary greatly in shape and any parts infested by diseases or pests must be detected visually and removed.

It is a laborious work, because cassava roots must be peeled one by one. For daily consumption at home, the work may not take so much time, but for selling to traders and consumers, large quantities of cassava must be peeled which requires a large workforce. Peeling is mechanized in some regions but hand peeling is still commonplace.

![Men Peeling Cassava with Knives](image)
Drying

Peeled cassava roots are dried in order to allow them to be stored for a longer period and to reduce weight. Long roots are cut into smaller pieces for better drying. Dried cassava roots look like hardened white lime and can be preserved for at least a year.

Cassava roots can be either sun-dried or dried over a fire. In the savannah regions, sun-drying during the dry season is common; in the tropical rainforest climate, drying over a fire is also employed because of the rain and the abundance of wood.

Product quality considerations also need to be made. Many farmers dry their cassava roots over the kitchen fire, but at times the smoke can discolor the cassava. Meanwhile, sun-dried cassava roots are susceptible to flies and dust. If it rains during sun drying, the product must be dried again on another day.

Dried cassava is packed in bags and kept in a storage room or sent to cities for sale. In homes in Tanzanian villages, for example, the amount needed is then taken out of the bag, ground into flour and used to make *ugali* or other dishes.

Grinding

Fresh cassava can also be dried after grinding. The grinding has traditionally been done by hand with mortar and pestle. Peeled cassava roots are put into a mortar and ground with a pestle. These are not freshly harvested cassava roots, but roots that have been soaked in water for days and allowed to ferment. The ground cassava is then pressed under a stone to remove water and dried.

Instead of grinding the cassava with a pestle, it is also possible to grate cassava manually using a wooden board fitted with small blades. However, this method is not really more efficient than mortar-and-pestle grinding, and has the disadvantage of possible injury to fingers.

In recent years, some communities have introduced motor-driven grinders, but manual grinding
is more common in rural areas where it is not necessary to handle so many roots at a time.

Pressing
Cassava is 70% water and must be dried to allow it to be preserved longer. As mentioned earlier, after grinding, the next step is pressing the cassava to remove water and then finally sun-drying.

Traditionally, ground cassava is placed into a basket or a bag, and pressed under a stone or something similar for three to five days to remove moisture. At the same time, the cassava can properly ferment.

Another way is to sandwich the ground cassava between two boards and pinch them closed with a vise or jack. This method is not always preferred because, though effective for removing moisture, it does not allow the cassava to ferment the way the traditional method does.

Fermentation
Many people prefer fermented cassava because it is richer in nutrients, more savory with a slight acidity. The fermentation method varies from one region to another.

One way is to peel the outer skin, cut the roots into small pieces, soak in water and dry for a day. Then, after leaving the pieces in a pile for about one week, the cassava is fermented and ready to eat.

An alternative method is to soak raw freshly harvested roots in water for three to five days (during which they ferment), then peel the skins and dry them.

Fermented cassava is used to make popular dishes in many countries, all with regional variations; for example, the popular Brazilian cheese bread, Pão de queijo, is made from fermented cassava and in Mozambique, shredded, dried cassava is fermented and then shredded even more finely to create rale (rali) flakes, which can be eaten, for example, mixed with water like a breakfast cereal. In Nigeria, fermented cassava is ground into flour called gari and then fried in oil, added to other dishes, or mixed with hot water to become doughy eba.

Milling
In rural homes in Tanzania or Mozambique, the milling is done manually, pounding fried cassava with a mortar and pestle. In recent years, some regions have introduced flour mills that can produce cassava flour in no time. The machine is also used to process maize and other cereals, yams and beans.

Often, an entrepreneur in a village sets up a milling machine, and processes cassava on a contract basis for a fee. Typically, village women are seen bringing in their cassava to the flour mill at supper time.

**Cassava starch production**

Cassava starch is made from cassava by removing fibers and other impurities. Cassava starch is produced by grinding peeled fresh cassava, soaking it in water and letting it settle. The fibers and other substances are removed by filtering. While Thailand produces cassava starch (tapioca) on an industrial scale, Africa’s commercial starch industry is dominated by small factories with few large players. However, demand for starch is increasing gradually in Africa, and it is hoped that cassava starch production will increase in the same pace, creating an opportunity for value-added cassava processing.
To prepare cassava ugali at home, the root must be ground to a fine flour and stirred with water. Ready-made cassava flour will require only adding water (hot water). With the advance of urbanization, city dwellers these days tend to prefer ready-to-eat foods. This is also true of cassava, adding to the importance of developing cassava processing industries in Tanzania and Mozambique.
4. Adding Value to Cassava

4.1 Cassava Transformation

In Africa, cassava has long been a subsistence crop that small-scale farming households produce for home consumption. Only the surplus (raw or dried) tends to be sold to neighboring towns.

However, in recent years Africa has been undergoing a process of urbanization and city residents are increasingly looking for easy-to-cook ingredients and ready-to-eat foods. Cassava-based foods are no exception to this trend. This has resulted in various structural changes taking place along the cassava value chain in cassava production, processing, distribution and consumption. These changes are termed the “cassava transformation.” (The Cassava Transformation (2002))

Michael Porter, a well-known US business management professor, introduced the concept of the value chain in his book Competitive Advantage (1985). The concept is now widely used in developing strategies for food industries. It has become increasingly common to look at cassava as the raw material for a value-adding processing industry consisting of cassava production, processing and distribution, and to formulate development strategies which take into consideration the technological development, capacity development and infrastructure improvements that support cassava as an industry.

The FAO together with the International Fund for Agricultural Development (IFAD) announced a cassava development strategy in 2000 based on the concept of a value chain titled “The Global Cassava Development Strategy and Implementation Plan”, which was followed by a number of cassava value-chain study reports in African countries.

In addition, to further promote changes and developments in cassava industries, the Natural Resources Institute (NRI) at the University of Greenwich in the UK is engaged in a project called Cassava: Adding Value for Africa (C:AVA) which focuses on value-added cassava industries.

4.2 Stages of the transformation

The Cassava Transformation (2002) divides cassava's development into four stages: (i) famine-reserve crop, (ii) rural food staple, (iii) urban food staple, and (iv) livestock feed and industrial raw material (See 7.2). Each stage has its own characteristics as described below.
Stage 1: Famine-reserve crop
Cassava can be an important crop during a time of food shortage, because it has the excellent characteristics of being both drought-resistant and able to be harvested year-round. In many parts of Africa, cassava is grown as a famine-reserve crop even if the staple crop may be maize. Governments encourage cassava cultivation when famine is feared or is taking place.

In cassava industries that are at this stage of development, cassava is still rarely grown for sale; within African countries Tanzania is a country that can be considered to still be at this stage, although the industry is undergoing change.

Countries at this stage lack coherent cassava research activities or technical extension programs. Organized efforts for variety improvement are virtually non-existent. Extension of new varieties depends on voluntary exchange of varieties among farmers, and they tend to prefer varieties that can be preserved in the ground for a long time.

Stage 2: Rural staple food
Countries and regions that are at the stage of cassava as a rural staple food depend on cassava for much of their caloric intake. Farmers grow cassava primarily for household consumption and sale to outside buyers is minimal. Production, harvesting and processing activities are not mechanized and depend mainly on household labor. Congo, Côte d’Ivoire and Uganda are considered to be at this stage of development.

Harvested cassava is dried and stored. As needed, the required amount is ground and dissolved into water as food. Cassava leaves are also eaten in order to supplement the nutrients missing in the root.

Each region grows its own traditional variety and the yield is low. Planting and harvesting periods are not consistent as they are affected by the peak times of other activities being undertaken for a living.

Stage 3: Urban staple food
Cassava is generally considered to be a rural subsistence crop. However, rural people who are used to eating cassava as their staple food tend to continue to eat cassava even after they have moved to cities. Thus, demand for cassava products has increased with the advance of urbanization, and cassava has begun to be produced for sale to the urban populations.

When this stage is reached, processing industries can thrive because there is demand for cassava to be dried and/or milled for transport to cities. Improvements to roads and other infrastructure are made to support the transportation needs of the processing industry. Nigeria
and Ghana are said to be at this development stage.

When commercial sale becomes the major purpose for cultivation, introduction of high-yield varieties advances, and varieties that can be harvested in relatively short periods after planting come to be preferred. To respond to the needs of the urban population, efforts are made to develop easy-to-cook cassava foodstuffs and ready-to-eat cassava food products. The private sector plays an important role in research and development, processing, marketing and sales. Governments also often support such activities.

**Stage 4: Livestock feed and industrial raw material**

Besides human consumption, cassava can be utilized as livestock feed and as an industrial raw material. For example, Thailand converts most of its cassava production into starch and livestock feed. No African countries have yet reached this level.

When this stage is reached, cassava is cultivated not just for domestic market but also for export. Production and processing are carried out more efficiently, and even the drying process is mechanized to a large extent. Cassava varieties that are better suited for mechanized operations are introduced.

The government and private sector are engaged in collaborative research and development, and private firms play key roles in the supply of machinery.

Africa in general is moving through stages (i) → (ii) → (iii). Field research for this study conducted in Mozambique and Tanzania found numerous signs that indicated the advent of stage (iii). It was confirmed that in these two countries, the cassava situation was rapidly changing.

### 4.3 Typical cassava products

Typical value-added cassava products include: dried cassava, cassava flour, paste, fried chips, starch and livestock feed. Cassava leaves are also processed and sold.

Each product type is explained in detail below.

**Dried cassava**

Raw cassava is easily available in rural areas and peddlers come to cities to sell fresh cassava. However, harvesting cassava is a time-consuming effort and farmers do not harvest cassava every day because they have other tasks to do on other days. Usually, therefore, cassava is
stored as dried cassava and the necessary portion for a meal is ground and stirred with water to make *ugali*. Such cassava is prepared mostly by women. In cities, some people buy dried cassava and make *ugali* at home; some others buy already-ground cassava flour.

**Cassava flour**

Cassava flour is made by drying and pulverizing cassava root; it is ready-to-eat, only needing to be mixed with water (hot water) and stirred. Methods of producing cassava flour vary slightly from one region to another; a typical method is to grate peeled cassava and then dewater and dry it to obtain the flour. This process allows the cassava to ferment and acquire an acidic taste. It also detoxifies the bitter variety of cassava.

Another method is to, instead of grating first, sun-dry the peeled root and then pulverize. However, no fermentation occurs by this method so the flavor of the flour will be different.

In Mozambique and Tanzania, cassava flour was seen sold in plastic bags in town shops and also measured out by the cup in markets. Some of the cassava products for sale include soybean, maize or other flours which are added to provide supplementary nutrients.
**Paste**
Cassava paste is made by soaking peeled cassava in water to make it soft and then crushing it into a pasty dough. In Nigeria, it is called *fufu*. Fermentation takes place during the soaking.

In some cases, cassava paste is made by boiling peeled cassava and crushing it. No fermentation occurs when this method is used.

Cassava paste is a semi-processed food and has a product life of about a week. In Nigerian cities, cooked cassava is sold in bags, but sale of cassava paste was not observed in Mozambique or Tanzania.

**Fried chips**
Fried cassava chips are simple “potato” chips made of cassava or thin deep-fried of cassava. Salted cassava chips are available in plastic bags in supermarkets on the same shelf as potato chips. The price is about the same and the shape is very much alike. Cassava chips are somewhat chewier and appear to be heavier in weight than potato chips.

**Starch**
Cassava starch is produced by grating peeled cassava, running the watery grated mass through a filter to remove fibers and then settling the liquid. The bottom sediment is dewatered, dried and packed in bags as starch for shipment.

In Brazil, the starchy liquid is allowed to ferment for 60 to 90 days and then dried. The resulting fermented flour is used to make various foods. The most popular product is *pão de queijo*, a bread made of fermented cassava starch mixed with cheese and egg.
Starch can be produced from maize, wheat, potato, sweet potato and other crops, but the properties differ slightly depending on the raw material. Cassava starch is high in purity and viscosity. These and other good properties of cassava starch make it an excellent raw material for a wide variety of foodstuffs including isomerized sugar, beer and alcohol. In addition, cassava starch can be used in glues, paper milling, textiles and other industries.

Pão de queijo made from fermented cassava starch

Livestock feed
Like maize, cassava can be used as livestock feed; in Brazil a large portion of cassava production is directed for this use. However, in Africa today, only a small portion of the cassava production is used as livestock feed. Nevertheless, consumption of meat, eggs and cow’s milk is increasing and it is hoped that more cassava can be used as livestock feed to keep the import of feed grains to a minimum.

Sweet cassava can be fed to farm animals raw, but chips and pellets are the more common forms because of the ease of preservation and transportation. Cassava chips are produced by slicing cassava root by machine and then sun-drying the resulting chips for a few days. Cassava chips can be fed to farm animals as is, but cassava is also widely sold in pellet form. Cassava pellets are made by pelletizing steamed and softened chips. Thailand, for example, used to export cassava pellets in large quantities to Europe.

Not only the roots but also the stem and leaves of cassava can be used for livestock feed. Cassava leaves are sometimes used as silage.
Leaf powder and paste

Cassava leaves are rich in vitamins and protein. In some regions, they are an important food. Unprocessed leaves degrade in quality over time, and so they are dried and processed to powder or paste for sale in bags. At home they are served as a side dish after being mixed in water (hot water) or are cooked to make various dishes.

4.4 The global cassava development strategy

As has been discussed up until this point, cassava is not only a staple food for many people globally, it is also a raw material for processed convenience foods for people who live in cities. There is great potential to produce even more varieties of cassava products for human consumption, animal feed and industrial use.

While the commercial cassava industry has already been developing in Thailand and Brazil, in most of Africa, cassava industry development has been a lower priority as governments focus on issues of population increase and food shortages. Nigeria is probably the exception, where
cassava products for urban consumption have been gradually increasing, and the government has supported the development of the cassava industry.

The COSCA research project (1989-1997) which was conducted mainly by the IITA, contributed to deepening knowledge on cassava in Africa among academics, researchers and development professionals. The COSCA project inspired further projects on cassava, aiming to develop the cassava industry in Africa. In 1997 when COSCA ended, the FAO and IFAD jointly began a project to support cassava development, which culminated in the release of “The global cassava development strategy” in 2000.
5. Mozambique’s Food, Agriculture and the Role of Cassava

5.1 Overview of Mozambique

Mozambique is located on the southeast coast of Africa, with a total area of 79,900 km² (roughly 2.1 times the size of Japan). It is bordered by the Indian Ocean to the east along its 2,515 km coast, the longest of all African countries. To the north, it is bordered by Tanzania, another target of cassava research for this study. Mozambique has 10 provinces which are divided into 128 districts. The national capital is Maputo. Portuguese is the official language, but each tribe also uses its own languages.

The population of Mozambique is 22,890,000 (a 2.3% increase from the previous year), 44% of which are under 15 years old. The country’s GDP was 10.2 billion USD in 2010 and the per capita GDP is about 445 USD. GDP per capita was the 13th lowest out of 175 countries in 2008, but the IMF forecasts that Mozambique’s growth will be solid in 2011, predicting 7.2% economic growth. The literacy rate is 54.0% for those 15 years old or older (among women it is 40.1%), the 10th lowest out of 134 countries (WDI, 2008).

The currency is the metical (plural: meticais), the abbreviation is MTN or MZN (currency code). The exchange rate is 1 USD = 35.8 MTN, 1 MTN = 2.88 JPY (XE.com, October 9th, 2010). In 2006, a new metical currency replaced old meticais at the rate of a thousand to one.

5.1.1 Post-Independence Economy

Mozambique became independent from Portugal on June 25th, 1975. Both the Soviet Union and China supported Mozambique’s independence movement and once independence was achieved, Mozambique’s economic policy began to move along a socialist path. Industries and
land estates became state-owned, and small-scale farmers were grouped to form collective farms. The economy suffered after the independence, as the ruling party, the Front for Liberation of Mozambique (FRELIMO), was violently resisted by the Rhodesian and South African-funded Mozambique Resistance Movement (RENAMO). Two years after independence, the country plunged into a bloody 15-year war that is also known as the Mozambican Civil War (1977-1992) which killed 900,000, through fighting and starvation.

After independence, Mozambique received significant amounts of foreign aid, but from 1983, Mozambique indicated a new policy of turning from a country that continuously needs foreign aid (much of it supplied by the Soviet bloc at that time) to one that actively seeks diplomatic relations with Western countries. In 1984, it joined the World Bank and 1987. Mozambique accepted the structural adjustments recommended by the International Monetary Fund (IMF) and the World Bank. By 1990, Mozambique had a new constitution which provided for a multi-party political system, market-based economy, and free elections.

The civil war ended on October 4th, 1992, under the Rome General Peace Accords and the economy has recovered smoothly since. Economic growth from 1996-2008 was 8% annually, and Mozambique has become the largest crude oil importing country in Africa (World Bank).

Since the 1980s, the real GDP has quadrupled, and GDP per capital has risen 160% from 140 USD in 1986 to 370 USD in 2009 (see graph below). Other areas of improvement include: reduction of the poverty rate from 69% of the population in 1997 to 54% in 2003; mortality rate of children under 5 decreased from 20.1% in 1997 to 13.8% in 2008; enrollment rate for primary school is now 95% in 2010 (World Bank). The literacy rate nearly doubled, from 27.1% in 1980 to 54.0% in 2008. During the same period, female literacy increased significantly, from 12.1% to 40.1% (World Bank WDI); this rapid pace of increase in female literacy is even higher than the increase in literacy for the overall population.
As a result of foreign direct investment, foreign aid and numerous investment projects, the Mozambican economy grew. Investment from South Africa and other countries helped the aluminum refining industry, the Maputo Corridor project, and Beira Corridor project. However, the projects did not help increase employment in the city, and problems with job creation and technology transfer remain issues to solve.\(^3\)

From 2008, Mozambique suffered from high, rising energy prices and the global financial crisis. At the end of 2008, due to the depreciation of the exchange rate, the price of agriculture products (mainly imported from South Africa) rose, and the inflation rate increased by double digits. This ignited food riots in September, 2010 (World Bank). This event will be discussed in more detail in a later section.

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\(^3\) World Bank [2010: p.16], JAICAF [2010: p.54].
The exchange rate became more stable from 2001 to 2008 than it had been during the 1980s through the beginning of 2000, a period in which the metical's value depreciated over 700% against the US dollar. However, between the end of 2008 and 2010, the value of the metical has dropped 40% against the U.S. dollar. The exchange rate affected the prices of imported agriculture products, with the prices increasing to a peak 60% more than usual. This is one of the main issues that sparked the food riots in the capital Maputo in September 2010.

5.1.2 Population Trends

The demand for food, especially in cities, has significantly increased with rapid population growth and urbanization. Between 1960 and 2009, the total population tripled. Over the same period, the urban population increased from an insignificant number to around 33%, and rural population decreased from 96% to 62.3% of the population.

The population growth rate has dropped compared to the high level immediately after the civil war, but it still has a 2% rate of increase; the growth rate of the urban population is much higher than the rural population as the graphs below will show.

![Figure 20 Population Trends in Rural and Urban Areas (1960-2009)](image)

(The right axis indicates the percentage of rural areas' population)
Source: Based on World Bank WDI's data
Looking at the demographics, the percentage of youth (14 years old or under) is high at 44.0%, and the economically active population (15 to 65 years old) is 52.8%. Both percentages have not changed dramatically since 1960. The population of seniors (65 years old or older) is at a low at 3.3%.

5.1.3 Industries

Mozambique’s GDP is comprised of services (47.1%), agriculture (28.6%), manufacturing (13.9%), and 10.4% for other industries (construction, electricity, gas, water supply, mining, etc.) The share of GDP for services and agriculture were 31.7% and 42.9% respectively in 1988, and in 2008 they were 47.2% and 30.8%. Their standings have reversed.

<table>
<thead>
<tr>
<th>Table 2 Share of GDP by Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
</tr>
<tr>
<td>Industry</td>
</tr>
<tr>
<td>Manufacturing</td>
</tr>
<tr>
<td>Services</td>
</tr>
<tr>
<td>Household final consumption expenditure</td>
</tr>
<tr>
<td>General gov’t final consumption expenditure</td>
</tr>
<tr>
<td>Imports of goods and services</td>
</tr>
</tbody>
</table>

5.1.4 Exports

The main export is aluminum, followed by electricity, tobacco, natural gas, and frozen shrimp. In the past the main export products were agriculture goods, but since 2001, mineral resources have become the main export products. The export value for agriculture products, however, is increasing. Mozambique’s largest trading partner is South Africa.
5.1.5 Agricultural Development of the Tropical Savannah in Mozambique

The project “Mozambique Tropical Savannah Agricultural Development Project under Japan-Brazil Tie-up” (commonly called “Pro-Savannah”) has been jointly carried out by Brazil, Mozambique, and Japan’s International Cooperation Agency (JICA). Africa’s savannah climate and soil is similar to the Brazilian savannah area called the cerrado. After the successful cooperation between Brazil and Japan on Brazil’s cerrado, the region was able to export soybeans internationally. The knowledge and experience acquired through the development of the Brazilian cerrado will contribute to developing the agricultural productivity of the African tropical savannah. The tropical savannah has 400 million hectares of arable land, which is twice the size of the cerrado. Mozambique is the first country chosen to conduct this project because it shared the same national language with Brazil (Portuguese), and also because the country has suffered a long period of civil war. In the future, the same project is expected to expand to other countries. JICA has plans to work on infrastructure projects for roads and export ports in Mozambique. Please refer to the details in JICA (2010).

5.1.6 Recent Issues

A 3-day food riot started on September 1st, 2010. It was triggered by an announcement from the government that water, electricity and bread prices were expected to rise, but the real motivation behind the riot was the inflation caused by the international financial crisis and the depreciation of the currency. In response, the president of Mozambique set out plans to subsidize fuel and imported wheat. On top of that, the government withdrew the original plan for price increases, and instead, provided subsidizing for bread, and decreased the amount of price increase to be
levied on water and electricity. The details of the policy are as follows:

- Provided subsidies for the bread-making industry through the Ministry of International Trade and Industry. For 50 kg flour (1,050 meticais selling price) the government would subsidize 200 meticais. The bread manufacturing industry will receive the subsidy from the Mozambique Bakery Association. The government also asked the bakery association to include cassava flour in the bread dough, rather than only wheat flour.
- Reduced import tariffs on foods (low quality rice, sugar, vegetables from South Africa)
- Permitted low volume users of water and electricity to forgo payments
- Froze wages of high-level government officials and public company managers, and prohibited payments with foreign currency

In other recent trade related news, according to the Mozambique News Agency, investors from Shanghai (which has a sister-city relationship with Maputo) plan to invest 13 billion USD over the next five years. They have already exchanged a memorandum with Mozambican government and their plan includes constructing an industrial complex, automobile assembly factory, and developing Chinatown. They will first invest 1 billion USD.

5.2 Food and Agriculture in Mozambique

5.2.1 Natural Resources

Mozambique is mountainous in the north, and has flat plains in the south. Approximately 44% of the country area is plains. Natural vegetation includes coastal forest, shrub lands in the south, grassy savanna and deciduous forest in the north and forest savanna. It is cool during the dry season (April to September), and temperatures than rise during the rainy season (October to March). The precipitation in the north is higher than in the south. In recent years, droughts and floods have become common. According to interviewees during field research for this study, in the past 30 years the rainy season has shortened and precipitation volumes are inconsistent.

FAO statistics report that out of Mozambique’s 78,630,000 hectares of land, farmland takes up 48,750,000 ha and forest takes up 39,440,000 ha. The total of farmland area plus forested area is greater than the total land area, which means there are some overlaps in the FAO calculations. Permanent grassland takes up 44,000,000 ha or 90% of the farmland. Arable fields take up 4,500,000 ha, and permanent crops cover 250,000 ha. Since 1961, arable land has nearly doubled.

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Farmland has increased 1,070,000 ha from 1990 to 2008, and over the same period, forest has decreased 9% (3,930,000 ha), or approximately 4 times that of farmlands’ gain. This decrease can be attributed to the expansion of the mining industry, growth of residential areas, transportation infrastructure, or other non-agricultural development.

Table 3 Land Usage in Mozambique Unit: 000 ha

<table>
<thead>
<tr>
<th></th>
<th>1961</th>
<th>1990</th>
<th>2008</th>
<th>2008 (Share)</th>
<th>61-08 (Change)</th>
<th>90-08 (Change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Land</td>
<td>78,638</td>
<td>78,638</td>
<td>78,638</td>
<td>100%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Farmland</td>
<td>46,649</td>
<td>47,680</td>
<td>48,750</td>
<td>62.0%</td>
<td>2,101</td>
<td>1,070</td>
</tr>
<tr>
<td>Arable Land</td>
<td>2,444</td>
<td>3,450</td>
<td>4,500</td>
<td>5.7%</td>
<td>2,056</td>
<td>1,050</td>
</tr>
<tr>
<td>Permanent Crops</td>
<td>205</td>
<td>230</td>
<td>250</td>
<td>0.3%</td>
<td>45</td>
<td>20</td>
</tr>
<tr>
<td>Permanent Grassland</td>
<td>44,000</td>
<td>44,000</td>
<td>44,000</td>
<td>56.0%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Forest</td>
<td>…</td>
<td>43,378</td>
<td>39,444</td>
<td>50.2%</td>
<td>…</td>
<td>-3,934</td>
</tr>
<tr>
<td>Irrigation</td>
<td>8</td>
<td>105</td>
<td>118</td>
<td>0.2%</td>
<td>110</td>
<td>13</td>
</tr>
</tbody>
</table>

*Source: FAOSTAT*

5.2.2 Statistical Reliability in Cassava Research

Statistical reliability is a significant constraint in for conducting cassava research. Cassava is unlike other grains: the cropping season is variable, the growing period depends greatly on the type of cassava, and the harvest timing differs. The fact it is sometimes intercropped with other crops makes cassava volumes difficult to track. Only a small percentage of cassava is sold commercially which is another reason statistics are incomplete. Often cassava is harvested little by little, over months or years, as needed for food and producers are not sure of the volumes they have consumed. Despite the fact that cassava is a main crop in Mozambique, there are years with missing data among publically released Mozambique government data. The World Bank has reported that when collecting data on cassava harvest, the samples are small and often roughly calculated.\(^5\)

Therefore we are assuming that not all cassava statistics within the Mozambique Agricultural Statistics are reliable, and we have observed errors in units and figures. To overcome this, we have used FAO statistics as an additional reference and have focused on the overall trend - the changes in mid to long-term, instead of changes in specific years.\(^6\) This report also uses

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\(^5\) [World Bank 2007: p.30]

\(^6\) For data before 1990, FAO statistics were the only source used.
information from TIA (Trabalho de Inquérito Agrícola, Agricultural Management Research) which Mozambican World Bank exports expressed is a more reliable source of data.

Nevertheless, according to interviews with the Inhambane Provincial government, statistics have become more reliable over the years (data since 2009 has shown significant improvement).

### 5.2.3 Agriculture Production in Mozambique

The richest soil is found in the northern and central regions. Agricultural production is concentrated in the northern region. This region has high precipitation, and farmers produce both consumption crops and cash crops. As a foodstuff, maize and cassava are especially important, followed by rice, sorghum, beans, and sweet potato. Cash crops are cotton, cashew nuts, and peanuts. In the central region, cassava, maize, sweet potatoes are the main staple foods, followed by beans, sorghum, millet, and rice. This region also produces horticultural crops and coconuts.

In contrast, the southern region is dry, the risk of drought is high, and the soil is sandy with lower fertility. The main crops are cassava, followed by small volumes of maize, rice, peanuts, sweet potato and cashew nuts. The southern region is good place to raise livestock such as cattle and other grazing ruminants. One important factor is that the southern region is not affected by the dangerous tsetse flies that inhabit 2/3 of Mozambique.\(^7\)

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\(^7\) (AICAF[1993]).
Figure 25 Agricultural Ecology of Mozambique

Table 4 Mozambique’s Agricultural Ecology

<table>
<thead>
<tr>
<th>Region</th>
<th>Main Foods</th>
<th>Other Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 Maputo inland and southern Gaza</td>
<td>Maize, Cassava, Cowpea, Peanuts, Cassava</td>
<td>Large grazing areas for cattle, goats</td>
</tr>
<tr>
<td>R2 Coastal region along the south of the Save River (Inhambane, Southern Gaza, Eastern Maputo)</td>
<td>Maize, Cowpea or Cassava, Peanuts</td>
<td>Rain in the cool seasons is suitable for cassava. The fallow period is decreasing due to the lack of land.</td>
</tr>
<tr>
<td>R3 Central and northern Gaza, western Inhambane</td>
<td>Sorghum, Millet</td>
<td>Cattle, Goats</td>
</tr>
<tr>
<td>R4 Central and North Central region of Mozambique</td>
<td>Maize, Sorghum, Cassava, Cowpea</td>
<td>In regions with abundant water, sweet potato and rice are grown</td>
</tr>
<tr>
<td>R5 Sofala and lowland region of Zambezia</td>
<td>In areas where the soil is heavy, rice is produced.</td>
<td></td>
</tr>
<tr>
<td>R6 Semiarid region in Southern Tete Province and Zambezi Valley Region</td>
<td>Sorghum, Millet</td>
<td></td>
</tr>
<tr>
<td>R7 Zambezia, Nampula, Tete, Niassa, Cabo Delgado's Mid-High Region</td>
<td>Maize or Sorghum</td>
<td></td>
</tr>
<tr>
<td>R8 Zambezi, Nampula, Cabo Delgado’s Coastal Region</td>
<td>Cassava, millet</td>
<td></td>
</tr>
<tr>
<td>R9 Cabo Delgado’s northern inland region (Mueda District)</td>
<td>Maize</td>
<td>Soil is sandy</td>
</tr>
<tr>
<td>R10 Zambezi, Niassa, Angónia, Manica’s highland region</td>
<td>Maize</td>
<td>Beans, Potatoes</td>
</tr>
</tbody>
</table>

Source: Based on World Bank data [2006: pp.100-102]
Land Area by Product

The agricultural product that takes up the most cultivation area is maize, followed by cassava, which uses about half as much land. Peanut cultivation area is half of cassava, which is followed by sorghum, cowpea, and rice. The total land area for maize and cassava is 2/3 of the total arable land (2008).

### Table 5 Land Area for Main Crops in Mozambique (2001-2008)  Unit: 000 ha

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>1,294</td>
<td>1,459</td>
<td>..</td>
<td>..</td>
<td>1,440</td>
<td>1,664</td>
<td>1,664</td>
<td>1,963</td>
</tr>
<tr>
<td>Rice</td>
<td>188</td>
<td>382</td>
<td>285</td>
<td>333</td>
<td>278</td>
<td>358</td>
<td>362</td>
<td>311</td>
</tr>
<tr>
<td>Millet</td>
<td>40</td>
<td>50</td>
<td>45</td>
<td>47</td>
<td>54</td>
<td>57</td>
<td>53</td>
<td>59</td>
</tr>
<tr>
<td>Sorghum</td>
<td>235</td>
<td>317</td>
<td>276</td>
<td>297</td>
<td>364</td>
<td>406</td>
<td>384</td>
<td>384</td>
</tr>
<tr>
<td>Cassava</td>
<td>642</td>
<td>718</td>
<td>680</td>
<td>699</td>
<td>1,106</td>
<td>858</td>
<td>994</td>
<td>954</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>47</td>
<td>97</td>
<td>72</td>
<td>84</td>
<td>64</td>
<td>80</td>
<td>87</td>
<td>64</td>
</tr>
<tr>
<td>Peanuts</td>
<td>326</td>
<td>333</td>
<td>329</td>
<td>331</td>
<td>433</td>
<td>323</td>
<td>397</td>
<td>458</td>
</tr>
<tr>
<td>Butter Beans</td>
<td>61</td>
<td>63</td>
<td>62</td>
<td>62</td>
<td>107</td>
<td>93</td>
<td>95</td>
<td>106</td>
</tr>
<tr>
<td>Cowpea</td>
<td>211</td>
<td>227</td>
<td>219</td>
<td>223</td>
<td>345</td>
<td>351</td>
<td>371</td>
<td>352</td>
</tr>
<tr>
<td>Bambara Groundnut</td>
<td>85</td>
<td>88</td>
<td>87</td>
<td>87</td>
<td>59</td>
<td>62</td>
<td>90</td>
<td>268</td>
</tr>
<tr>
<td>Boer Beans</td>
<td>73</td>
<td>64</td>
<td>69</td>
<td>66</td>
<td>149</td>
<td>170</td>
<td>199</td>
<td>268</td>
</tr>
</tbody>
</table>

Source: Áreas cultivadas com principais culturas alimentares básicas, Moçambique, 2001 - 2007, Evolução da Produção Agrícola e das Áreas Semeadas de Culturas Básicas, 2005 - 2009, Number of farms and cultivated area, with the main basic food crops and cash crops, CountrySTAT Mozambique (draft site), Área Colhida by Cultura and Ano

### Figure 26 Trends in Land Area for Main Food Crops (1961-2008)

Source: FAOSTAT

According to FAO statistics, cassava's planting land area was close to twice the land area of

---

8 This also includes areas that produce a mix of both maize and cassava.
maize in the 1960’s. However, the amount of land dedicated to maize has tripled since the 1970s, and in the latter half of 1980s, maize surpassed cassava as the top crop under cultivation. Now the land under maize cultivation is twice the size of cassava, a reverse of the 1960’s. Cassava was also increasing its land area until the mid-2000s, but then decreased in 2006-2008.

Different crops are known by different names, depending on the region or country. For example, for the names of some beans that originated in Africa (nhemba, jugo, boer), there are no standard English translations. The next chart summarizes some of these different words.

### (Reference) Names of Main Crops in Portuguese, English and Japanese

<table>
<thead>
<tr>
<th>Portuguese</th>
<th>English</th>
<th>Japanese</th>
<th>Scientific Name</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milho</td>
<td>Maize</td>
<td>トウモロコシ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arroz</td>
<td>Rice</td>
<td>米</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexoeira</td>
<td>Millet</td>
<td>ミレット</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mapira</td>
<td>Sorghum</td>
<td>ソルガム</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mandioca</td>
<td>Cassava</td>
<td>キャッサバ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Batata Doce</td>
<td>Sweet Potato</td>
<td>サツマイモ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amendoim</td>
<td>Peanut, Groundnut</td>
<td>落花生</td>
<td>Arachis hypogaea</td>
<td>South America</td>
</tr>
<tr>
<td>Feijão Manteiga</td>
<td>Butter Beans (Lima Bean, Sieva Bean)</td>
<td>バタービーンズ</td>
<td>Phaseolus lunatus</td>
<td>Central and South America</td>
</tr>
<tr>
<td>Feijão Nhemba</td>
<td>Cowpea (Black-eyed beans, Black-eyed peas, Nhemba Beans)</td>
<td>ササゲ</td>
<td>Vigna unguiculata</td>
<td>Africa</td>
</tr>
<tr>
<td>Feijão Jugo</td>
<td>Bambara Groundnut (African Groundnut, Ground-bean, Jugo Beans)</td>
<td>バンバラマメ (フタゴマメ)</td>
<td>Vigna subterranean</td>
<td>West Africa</td>
</tr>
<tr>
<td>Feijão Boer</td>
<td>Boer Beans*</td>
<td>ボーアビーンズ</td>
<td>Schotia atra (Karoo boer-bean)</td>
<td>Southern Africa</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Schotia brachypetala (Weeping boer-bean)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Schotia capitata (Dwarf boer-bean)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Schotia latifolia (Bush boer-bean)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Beans are mainly from Biodiversity Explorer (http://www.biodiversityexplorer.org)

(Note) There are four kinds of boer beans; all of them can grow into large trees.
Production by Products

While grains hold a high percentage of cultivated land area, from the perspective of food production, the potato family has the highest share. The reason is that crops in the potato family have extremely high yield and can produce more volume on a smaller plot of land than grain. Cassava, in particular, has extremely high yield, followed by maize, sweet potato, sorghum, rice, and peanuts.

Table 6 Mozambique Staple Food Production, 2001 - 2008

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>..</td>
<td>1,114.8</td>
<td>1,178.8</td>
<td>1,060.4</td>
<td>942.0</td>
<td>1,395.5</td>
<td>1,134.0</td>
<td>1,265.0</td>
</tr>
<tr>
<td>Sorghum</td>
<td>193.1</td>
<td>138.3</td>
<td>190.8</td>
<td>152.9</td>
<td>115.0</td>
<td>201.8</td>
<td>166.9</td>
<td>184.0</td>
</tr>
<tr>
<td>Rice</td>
<td>180.8</td>
<td>93.4</td>
<td>117.5</td>
<td>91.2</td>
<td>65.0</td>
<td>97.6</td>
<td>103.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Millet</td>
<td>31.7</td>
<td>12.2</td>
<td>21.6</td>
<td>18.3</td>
<td>15.0</td>
<td>22.4</td>
<td>24.8</td>
<td>24.0</td>
</tr>
<tr>
<td>Cassava</td>
<td>..</td>
<td>3,555.3</td>
<td>6,547.3</td>
<td>..</td>
<td>5,353.0</td>
<td>6,658.7</td>
<td>4,959.0</td>
<td>5,809.0</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>196.6</td>
<td>456.0</td>
<td>877.2</td>
<td>509.9</td>
<td>..</td>
<td>915.3</td>
<td>861.4</td>
<td>805.0</td>
</tr>
<tr>
<td>Peanuts</td>
<td>124.3</td>
<td>101.1</td>
<td>87.5</td>
<td>90.2</td>
<td>93.0</td>
<td>84.6</td>
<td>31.2</td>
<td>97.0</td>
</tr>
<tr>
<td>Butter Beans</td>
<td>..</td>
<td>35.7</td>
<td>40.9</td>
<td>44.9</td>
<td>49.0</td>
<td>49.6</td>
<td>54.5</td>
<td>46.0</td>
</tr>
<tr>
<td>Cowpea</td>
<td>92.4</td>
<td>53.7</td>
<td>53.7</td>
<td>50.9</td>
<td>48.0</td>
<td>71.2</td>
<td>62.2</td>
<td>61.0</td>
</tr>
<tr>
<td>Bambara Groundnut</td>
<td>20.0</td>
<td>22.0</td>
<td>18.0</td>
<td>12.5</td>
<td>7.0</td>
<td>11.6</td>
<td>20.3</td>
<td>..</td>
</tr>
<tr>
<td>Boer Beans</td>
<td>69.5</td>
<td>31.8</td>
<td>51.4</td>
<td>50.9</td>
<td>..</td>
<td>62.3</td>
<td>71.5</td>
<td>..</td>
</tr>
</tbody>
</table>

Source: Produção dos principais produtos alimentares básicos, Moçambique, 2001-2003
Evolução da Produção Agrícola e das Áreas Semeadas de Culturas Básicas, 2005-2009
Evolução da Produção Agrícola das Culturas Alimentares Básicas (2002-2006)
Table 7 Mozambique Staple Food Yields, 2001 -2008  

<table>
<thead>
<tr>
<th>Crop</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>..</td>
<td>0.76</td>
<td>..</td>
<td>0.65</td>
<td>0.84</td>
<td>0.68</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.82</td>
<td>0.44</td>
<td>0.69</td>
<td>0.52</td>
<td>0.32</td>
<td>0.50</td>
<td>0.43</td>
<td>0.48</td>
</tr>
<tr>
<td>Rice</td>
<td>0.96</td>
<td>0.24</td>
<td>0.41</td>
<td>0.27</td>
<td>0.23</td>
<td>0.27</td>
<td>0.28</td>
<td>0.32</td>
</tr>
<tr>
<td>Millet</td>
<td>0.79</td>
<td>0.24</td>
<td>0.48</td>
<td>0.39</td>
<td>0.28</td>
<td>0.39</td>
<td>0.47</td>
<td>0.41</td>
</tr>
<tr>
<td>Cassava</td>
<td>..</td>
<td>4.95</td>
<td>9.63</td>
<td>..</td>
<td>4.84</td>
<td>7.76</td>
<td>4.99</td>
<td>6.09</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>4.17</td>
<td>4.72</td>
<td>12.21</td>
<td>6.06</td>
<td>..</td>
<td>11.45</td>
<td>9.91</td>
<td>12.58</td>
</tr>
<tr>
<td>Peanuts</td>
<td>0.38</td>
<td>0.30</td>
<td>0.27</td>
<td>0.27</td>
<td>0.21</td>
<td>0.26</td>
<td>0.08</td>
<td>0.21</td>
</tr>
<tr>
<td>Butter Beans</td>
<td>..</td>
<td>0.57</td>
<td>0.66</td>
<td>0.72</td>
<td>0.46</td>
<td>0.54</td>
<td>0.57</td>
<td>0.43</td>
</tr>
<tr>
<td>Cowpea</td>
<td>0.44</td>
<td>0.24</td>
<td>0.25</td>
<td>0.23</td>
<td>0.14</td>
<td>0.20</td>
<td>0.17</td>
<td>0.17</td>
</tr>
<tr>
<td>Bambara Groundnut</td>
<td>0.24</td>
<td>0.25</td>
<td>0.21</td>
<td>0.14</td>
<td>0.12</td>
<td>0.19</td>
<td>0.22</td>
<td>..</td>
</tr>
<tr>
<td>Boer Beans</td>
<td>0.95</td>
<td>0.50</td>
<td>0.75</td>
<td>0.77</td>
<td>..</td>
<td>0.37</td>
<td>0.36</td>
<td>..</td>
</tr>
</tbody>
</table>


Crop yield in Mozambique is generally low. Except for products from the potato family, all other crops yield less than 1 m/t per ha. The potato yields are 10 times higher than grains. The top grain crops in 2008 were: maize 0.64, rice 0.32, and sorghum 0.48. In contrast, the yields for potato products were: cassava 6.09, sweet potato 12.58. Although the calorie density of potato products is low, the calories it provides to the population per land unit are higher than grains.

In addition to the food crops, cash crops are also grown. They are mainly cotton, tobacco, sunflower, copra9, cashew nuts, etc.

---

9 Dried coconut - The raw material used to extract coconut oil
Table 8 Cash Crops Production  Unit: 000 m/t

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cotton</td>
<td>71.0</td>
<td>103.1</td>
<td>75.1</td>
<td>83.1</td>
<td>114.3</td>
<td>128.2</td>
<td>92.7</td>
<td>72.0</td>
</tr>
<tr>
<td>Tobacco</td>
<td>11.2</td>
<td>42.6</td>
<td>51.1</td>
<td>34.9</td>
<td>80.8</td>
<td>93.1</td>
<td>33.6</td>
<td>40.0</td>
</tr>
<tr>
<td>Sunflower</td>
<td>6.5</td>
<td>3.5</td>
<td>3.9</td>
<td>4.6</td>
<td>1.1</td>
<td>4.1</td>
<td>6.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Copra</td>
<td>29.6</td>
<td>26.6</td>
<td>21.5</td>
<td>25.9</td>
<td>31.0</td>
<td>28.2</td>
<td>23.9</td>
<td>29.4</td>
</tr>
<tr>
<td>Cashew Nuts</td>
<td>53.6</td>
<td>61.0</td>
<td>43.7</td>
<td>52.8</td>
<td>59.8</td>
<td>50.5</td>
<td>56.8</td>
<td>70.1</td>
</tr>
</tbody>
</table>

Source: Produção dos principais produtos de rendimento, Moçambique, 2001-2008 (http://196.22.54.6/pxweb2007/Database/INE/03/31/31.asp)

Table 9 Number of Farms and Animals by Species  Unit: 000

<table>
<thead>
<tr>
<th></th>
<th>Farms</th>
<th>Number of Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2001</td>
<td>2002</td>
</tr>
<tr>
<td>Cattle</td>
<td>133</td>
<td>722</td>
</tr>
<tr>
<td>Goat</td>
<td>852</td>
<td>5,047</td>
</tr>
<tr>
<td>Sheep</td>
<td>35</td>
<td>174</td>
</tr>
<tr>
<td>Pig</td>
<td>602</td>
<td>2,397</td>
</tr>
<tr>
<td>Donkey</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Rabbit</td>
<td>88</td>
<td>540</td>
</tr>
<tr>
<td>Chicken</td>
<td>..</td>
<td>23,587</td>
</tr>
<tr>
<td>Duck</td>
<td>667</td>
<td>4,132</td>
</tr>
<tr>
<td>Wild Duck</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Turkey</td>
<td>23</td>
<td>131</td>
</tr>
<tr>
<td>Others</td>
<td>61</td>
<td>865</td>
</tr>
</tbody>
</table>

Source: Recent Evolution of Livestock Number, Small and Medium Farms
Evolução dos Efectivos Pecuários nas pequenas e médias explorações (2002 - 2006)
Number of farms and animals by species, Mozambique 2001-2002
Principais Espécies Pecuárias, 2005 - 2008

The number of livestock in 2008 were: cattle 1.18 million, pigs 1.26 million, goats 4.32 million, chickens 17.79 million. This is a big increase over 2001, when the large breeding livestock were goats (850,000), ducks (660,000), pigs (600,000), and cattle (130,000) (chicken figures were unavailable).

The increase in the number of goats is especially apparent. Goats started to increase in the latter 1980s and has increased 12 fold. However, data indicates the number of goats has decreased since 2000s. However, there are questions concerning the consistency of the data. Cattle
increased until mid-70s and decreased by half from 1980s to 1990. In the 21st century, the cattle breeding has rose back to the same level it was in the 1970s.

Figure 27 Trends in Number of Livestock 1961-2006

![Graph showing trends in number of livestock from 1961 to 2006.]

Source: Based on FAOSTAT data

Production Value and Sales Volumes

Table 10 Percentage of Main Staple Crops Sold at Markets (%), 2002-2007

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>26</td>
<td>23</td>
<td>22</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Rice</td>
<td>10</td>
<td>16</td>
<td>11</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Cassava</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sorghum</td>
<td>3</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Peanut</td>
<td>25</td>
<td>24</td>
<td>25</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>Cowpea</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>


Based on the data from JICA (2010), the amount of the main staple food products sold on the market, rather than used for home consumption, have not had large changes from 2002 to 2007.

Looking at the production values from FAO statistics below, we can see that in contrast to the diversity of crops produced in 2002, more weight was on cotton, tobacco, sweet potato, cashew

---

10 According to JAICAF[1993: 71 page] “Low breeding was due to guerrilla activity, drought, natural disaster, lack of technician, etc.”
nuts, sugar cane in 2008, and cassava’s value dropped.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value (000 USD)</td>
<td>Quantity (m/t)</td>
</tr>
<tr>
<td>Cassava</td>
<td>1</td>
<td>426,923</td>
</tr>
<tr>
<td>Pork</td>
<td>2</td>
<td>116,732</td>
</tr>
<tr>
<td>Maize</td>
<td>3</td>
<td>113,022</td>
</tr>
<tr>
<td>Cotton lint</td>
<td>4</td>
<td>60,121</td>
</tr>
<tr>
<td>Tobacco (raw)</td>
<td>5</td>
<td>46,694</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>6</td>
<td>45,818</td>
</tr>
<tr>
<td>Peanut (with shell)</td>
<td>7</td>
<td>37,533</td>
</tr>
<tr>
<td>Chevon</td>
<td>8</td>
<td>37,455</td>
</tr>
<tr>
<td>Cashew Nuts (with shells)</td>
<td>9</td>
<td>32,967</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>10</td>
<td>32,946</td>
</tr>
</tbody>
</table>

Source: FAOSTAT

5.2.4 Food Supply and Consumption

According to FAO food balance sheets in 2007, the calorie supply per capita in Mozambique is 2,067 Kcal per day. The major source of calories includes: cassava (628 Kcal per person each day), maize (404 Kcal), rice (198 Kcal) and wheat (188 cal); these top four products take up 68.6% of caloric intake. The caloric contribution of cassava in Mozambique per capita is the third highest in the world. (2003-2007 average FAOSTAT). It should be noted that there are regions of Mozambique where maize, not cassava is the staple.

Per kilogram, these four main products provide the following calories: milled equivalent rice (3,614 Kcal), maize (2,949 Kcal), wheat (2,745 Kcal), cassava (1,066 Kcal)\(^\text{11}\). There is a big calorie gap between cassava and other grain products. If we use a relative ratio to compare (cassava being one), maize would be 2.72, wheat would be 2.57, and rice (milled equivalent) would be 3.36. This should be kept in mind when comparing the production quantity and yield between cassava and grains.

---

\(^\text{11}\) The caloric values for all these products have been stable since 1970s

64
Food supply is mainly sourced from within the country, with a few notable exceptions - wheat (the third highest source for calorie), and rice, both of which are dependant on imports. Oil consumption is also dependent on imports. On the other hand, about half of the sugar production is for exporting. Most crop production is for human consumption. Only about 4% cassava and 10% of maize respectively are used as feed. The following chart summarized these consumption trends.

<table>
<thead>
<tr>
<th>Table 12 Food Balance Sheet (High calorie products per capita, 2007)</th>
<th>Unit: 000 m/t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Import</td>
</tr>
<tr>
<td>---------------</td>
<td>--------</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Cassava</td>
<td>5,039</td>
</tr>
<tr>
<td>Maize</td>
<td>1,152</td>
</tr>
<tr>
<td>Rice (Milled Equivalent)</td>
<td>70</td>
</tr>
<tr>
<td>Wheat</td>
<td>3</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>875</td>
</tr>
<tr>
<td>Sugar (raw)</td>
<td>244</td>
</tr>
<tr>
<td>Sorghum</td>
<td>170</td>
</tr>
<tr>
<td>Other beans</td>
<td>165</td>
</tr>
<tr>
<td>Pork</td>
<td>97</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>73</td>
</tr>
<tr>
<td>Coconut Oil</td>
<td>31</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>20</td>
</tr>
</tbody>
</table>

To understand changes in eating habits over the past 2 decades, we researched how many calories different food crops supplied to individuals.

Though the total calorie supply per capita was low during the civil war (1975-92), after the war was over it rose back to the same level as it was before the war. In the 1960s to 1970s, it was approximately 1,800 Kcal per day, but decreased from the middle half of 1970s to the first half of 1990s. During the 1980s, it was approximately 1,700 Kcal. It began rising from the latter half of 1990s, and by 2004, it rose to 2,000 Kcal, the highest level since the 1960s.

In the second half of the 1990's the calorie supply from cassava rose, only to decrease again.
However, this decrease was actually due to the increase in population or increase in use outside of food, because during this period the total productions of cassava actually increased, as we will discuss later.

From the 1980s to 1990s, the increase in maize supported the increase in total available calories. Since the beginning of the 2000s, maize has decreased but wheat, sweet potato, and rice have all increased, bringing more diversity of foods to the food supply.

**Figure 28 Caloric Supply by Product (1961-2007)**

![Figure 28 Caloric Supply by Product](image)

*Source: FAOSTAT*

In the past, cassava has played the central role, but as cassava’s share of caloric supply has decreased, other products such as maize have increased, indicating sign of increasing food diversity. Cassava’s share was more than 45% in 1960s, but by 2006, it has decreased to less than 30%. Cassava however, still remains one of the main food products. Maize had a high share of 25% in the early 2000s, but has decreased to 20% since then.

As mentioned earlier, a portion of Mozambique’s main staples is imported. These food imports are directly linked to last year's food riots in Maputo, which were started due to increases in the imported food prices increased. To understand how much the country relies on imported products, we calculated the self-sufficiency rate out of the total supplying calories using FAO’s food balance sheet data.
During the 1960s, the self-sufficiency rate was 100%, and during the civil war period it dropped to approximately 60%. After the war it increased to about 90%, but again decreased to 80% in 2000s.

During the civil war period, the yield of maize was low. Calories per person decreased along with the decrease in the self-sufficiency rate, and as a result maize, wheat, and rice had to be imported. These food products were imported to compensate for the lack of domestic food supply.

**Figure 29 Percentage Change in Calorie Source (1961-2007)**

Source: FAOSTAT

**Figure 30 Changes in Food Sufficiency Rate in Relation to Total Calories Provided (1961-2007)**

Source: FAOSTAT
After the civil war, the self-sufficiency rate increased because maize yields recovered, cassava yield increased, and maize imports decreased. The total calories available to each individual also increased. The increase in food supply helped elevate the quality of Mozambican’s diet.

In contrast, the self-sufficiency rate decreased in the 2000s – wheat, rice, and edible oil imports increased. However, during this period, the calories supplied per capita continued to rise. Food imports also helped increase available calories and enable a more diverse diet.

In the southern region, products imported through Maputo port and from South Africa compete intensely with domestic products (World Bank [2007: p.13]).

5.2.5 Farms and the Agriculture Structure

In Mozambique, 75.3% of the economically active population is engaged in agriculture.\(^{12}\)

In 2006, there were 3.35 million small to medium-sized farms. The country’s total arable land was 5.95 million ha, of which only 350,000 ha were put to use. Each farm owned approximately 1.78 ha of arable land.

Both the number of small to medium-sized farms and the amount of arable land area is increasing. The latter is increasing at a higher rate, which means the arable land per farm is increasing. Comparing the data from 2006 and 2002, the number of small to medium-sized farms had increased 7%, the arable land had increased 20%, and the average arable land per farm had increased 12%.

<table>
<thead>
<tr>
<th>年</th>
<th>原始值</th>
<th>农场数量</th>
<th>农场地面积</th>
<th>耕地 (1000ha)</th>
<th>休耕 (1000ha)</th>
<th>总面积 (1000ha)</th>
<th>平均每农场 (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>小到中等规模农场 (1000农民)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>总数</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original Value</td>
<td>2002</td>
<td>3,127</td>
<td>4,577</td>
<td>392</td>
<td>4,969</td>
<td>1.59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>3,210</td>
<td>4,838</td>
<td>311</td>
<td>5,149</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>3,271</td>
<td>5,376</td>
<td>336</td>
<td>5,712</td>
<td>1.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>3,332</td>
<td>5,913</td>
<td>360</td>
<td>6,273</td>
<td>1.88</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>3,350</td>
<td>5,603</td>
<td>355</td>
<td>5,958</td>
<td>1.78</td>
<td></td>
</tr>
</tbody>
</table>

\(^{12}\) National Bureau of Statistics of Mozambique. 2007
The vast majority of farms are small-scale. For example, data from 2000 found that the number of small farms was 3.06 million (average arable land was 1.2 ha), while the number of medium sized farms was 10,000 (average arable land is 6.7 ha), and the number of large farms was just 400 (average arable land was 282 ha). These large farms specialize in products for export. By 2003 there was a small increase in the number of small to medium sized farms, as the table below shows.

Table 14: Mozambique’s Agriculture Structure

<table>
<thead>
<tr>
<th></th>
<th>Small-scale farms (under 10 ha) in 2000</th>
<th>Medium-sized farms 10–50 ha in 2000</th>
<th>Large Farms Over 50 ha</th>
<th>Total</th>
<th>Small to medium-sized farms in 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of farmers (1000 farmers)</td>
<td>3,054.1</td>
<td>10.2</td>
<td>0.4</td>
<td>3,064.7</td>
<td>3,172.6</td>
</tr>
<tr>
<td>Area cultivated (1000 ha)</td>
<td>3,736.6</td>
<td>67.7</td>
<td>121.0</td>
<td>3,925.3</td>
<td>4,534.6</td>
</tr>
<tr>
<td>Average area cultivated (ha/farmer)</td>
<td>1.2</td>
<td>6.7</td>
<td>282.0</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>% of area cultivated for food crops</td>
<td>84.4</td>
<td>74.2</td>
<td>7.6</td>
<td>84.7</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: JAICAF[2010]

Below, looking at data about farms by product, we can see that most farms produce maize and cassava. The percentage of farms that produce cowpea is (55.9%) and sorghum, rice, and sweet potatoes are all approximately 30%. 
Table 15 Small to Medium-sized Farm Production and Land Area (2002)  

<table>
<thead>
<tr>
<th>Crop</th>
<th>Number of farms (a)</th>
<th>Arable Land (b)</th>
<th>Average Land (b/a)</th>
<th>% of Harvesting Farms</th>
<th>% of Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>2,521,887</td>
<td>1,459,254</td>
<td>0.58</td>
<td>80.6</td>
<td>31.9</td>
</tr>
<tr>
<td>Rice</td>
<td>1,076,989</td>
<td>381,574</td>
<td>0.35</td>
<td>34.4</td>
<td>8.3</td>
</tr>
<tr>
<td>Sorghum</td>
<td>1,139,982</td>
<td>317,350</td>
<td>0.28</td>
<td>36.5</td>
<td>6.9</td>
</tr>
<tr>
<td>Cotton</td>
<td>223,683</td>
<td>152,856</td>
<td>0.68</td>
<td>7.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Tobacco</td>
<td>118,620</td>
<td>41,310</td>
<td>0.35</td>
<td>3.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Peanut</td>
<td>1,762,468</td>
<td>332,542</td>
<td>0.19</td>
<td>19.7</td>
<td>7.3</td>
</tr>
<tr>
<td>Cassava</td>
<td>2,358,656</td>
<td>717,817</td>
<td>0.30</td>
<td>75.4</td>
<td>15.7</td>
</tr>
<tr>
<td>Millet</td>
<td>244,532</td>
<td>49,696</td>
<td>0.20</td>
<td>7.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Sunflower</td>
<td>76,969</td>
<td>9,025</td>
<td>0.12</td>
<td>2.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Cowpea</td>
<td>1,747,892</td>
<td>227,428</td>
<td>0.13</td>
<td>55.9</td>
<td>5.0</td>
</tr>
<tr>
<td>Butter Beans</td>
<td>366,342</td>
<td>62,949</td>
<td>0.17</td>
<td>11.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Bambara Groundnut</td>
<td>887,539</td>
<td>88,041</td>
<td>0.10</td>
<td>28.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Boer Beans</td>
<td>910,352</td>
<td>64,126</td>
<td>0.07</td>
<td>29.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>1,084,447</td>
<td>96,515</td>
<td>0.09</td>
<td>34.7</td>
<td>2.1</td>
</tr>
<tr>
<td>Total</td>
<td>3,127,493</td>
<td>4,577,045</td>
<td>1.46</td>
<td>99.9</td>
<td>96.1</td>
</tr>
</tbody>
</table>

Source: “Number of farms and cultivated area, with the main basic food crops and cash crops”  
http://www.ine.gov.mz/Ingles/sectorias_dir/Agricultura/agri1

Small to medium-sized farms are limited by their production methods. In the chart below, based on Mozambican government data. In 2003, over half of farmers used processing equipment (specific equipment is not noted in this data), about 10% used animals, and only a small percentage used agrochemicals and fertilizers. As we can see, there is room for land and labor productivity improvement.
Looking below at more organized data on fertilizer usage, from 2002 to 2007, usage generally increased. While there are differences by province and region, the increase in Maputo province is obvious.

| Table 17 Fertilizer Usage Rate in Farms (Medium to Small Farms, Province) |
|---|---|---|---|---|---|---|---|---|---|
| | Niassa | Carbo Delgado | Nampula | Zambezia | Tete | Manica | Sofala | Inhambane | Gaza | Maputo | Total |
| 2002 | 7.48 | 2.70 | 3.33 | 0.69 | 15.14 | 2.98 | 0.67 | 1.70 | 5.21 | 3.62 | 3.77 |
| 2003 | 11.69 | 0.00 | 0.31 | 0.70 | 12.06 | 2.82 | 1.49 | 1.83 | 2.16 | 3.35 | 2.57 |
| 2005 | 17.91 | 0.18 | 2.99 | 0.00 | 16.52 | 2.30 | 0.53 | 0.98 | 4.24 | 6.75 | 3.86 |
| 2006 | 15.06 | 4.80 | 2.95 | 1.65 | 17.83 | 0.78 | 1.66 | 2.41 | 2.14 | 7.00 | 4.72 |
| 2007 | 7.19 | 1.13 | 2.30 | 1.12 | 21.27 | 1.11 | 1.14 | 3.83 | 1.88 | 11.61 | 4.14 |

Source: Percentagem das explorações que utilizaram fertilizantes químicas, pequenas e médias explorações by Ano and Provincia (http://196.22.54.6/pxweb2007/Database/INE/03/31/31.asp)

5.2.6 Agriculture Trade

In Mozambique, due to the long distance between north and south and the under-developed road network, agriculture products are not widely distributed within the country, but instead, are supplied mostly to those living near the production area. In addition, because transportation costs are high, the capital city Maputo often receives goods imported through Maputo port and
from neighboring South Africa. The highly productive northern region exports agriculture products to neighboring countries informally.

In recent years, as road conditions improve, there has been more price standardization among regions and it is now possible to distribute to a wider region. However, there are still many roads that are unpaved, and during the raining season in many areas, none can be used except for the main roads.

Informal trade along the Malawi-Zambia-Zimbabwe border has also increased. Unofficial maize export in the inner region in the north (Tete, Niassa) is estimated to be about 100,000-200,000 m/t each year. Approximately 90% of the maize unofficially imported into Malawi is provided by Mozambique. Also, 70% of the maize in the unofficial maize market in the Southern African Development Community (SADC) is provided by Mozambique (World Bank [2006: p.18], JAICAF[2010: p.61]).

<table>
<thead>
<tr>
<th></th>
<th>Pavement (%)</th>
<th>Unpaved Roads (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good</td>
<td>Average</td>
</tr>
<tr>
<td>1995</td>
<td>11</td>
<td>20</td>
</tr>
<tr>
<td>2000</td>
<td>41</td>
<td>39</td>
</tr>
</tbody>
</table>

According to the official Mozambican trade statistics, in 2007 total imports were 616 million USD, and the total exports were 329 million USD; exports were twice the imports. The top imported products were all food products, including processed foods. In contrast, a large portion of the exported products were raw or low-processed cash crops, as well as non-food items.

The top three products imported in terms of value were rice (milled equivalent), wheat, and palm oil. For exporting products, the share of raw tobacco is exceptionally large, followed by raw sugar, ginned cotton, cashew nuts, and sesame seeds. The weight of the exports is highly concentrated on the top products (the top 4 products make up approximately 80% of all agriculture exports).

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13 In fact, during the food riot in the capital city Maputo, in which the price of breads made from wheat flour significantly increased in price, a large volume of imported rice (mostly from India) and vegetables (mostly from South Africa) were sold in retail. Wheat and rice are mainly dependent on imports.
### Table 19 Main Agricultural Exports (2007)

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Product</th>
<th>Weight (m/t)</th>
<th>Value (000 USD)</th>
<th>Unit Price (USD per m/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tobacco (raw)</td>
<td>44,452</td>
<td>139,955</td>
<td>3,148</td>
</tr>
<tr>
<td>2</td>
<td>Raw sugar</td>
<td>106,448</td>
<td>57,719</td>
<td>542</td>
</tr>
<tr>
<td>3</td>
<td>Cotton lint</td>
<td>31,694</td>
<td>36,696</td>
<td>1,158</td>
</tr>
<tr>
<td>4</td>
<td>Cashew Nuts (with shells)</td>
<td>32,671</td>
<td>27,413</td>
<td>839</td>
</tr>
<tr>
<td>5</td>
<td>Sesame</td>
<td>19,653</td>
<td>15,793</td>
<td>804</td>
</tr>
<tr>
<td>6</td>
<td>Cashew nuts (no shell)</td>
<td>3,167</td>
<td>12,081</td>
<td>3,815</td>
</tr>
<tr>
<td>7</td>
<td>Coconut oil</td>
<td>6,489</td>
<td>6,097</td>
<td>940</td>
</tr>
<tr>
<td>8</td>
<td>Maize</td>
<td>19,123</td>
<td>5,094</td>
<td>266</td>
</tr>
<tr>
<td>9</td>
<td>Other beans</td>
<td>11,269</td>
<td>4,400</td>
<td>390</td>
</tr>
<tr>
<td>10</td>
<td>Cotton Seed</td>
<td>29,177</td>
<td>3,777</td>
<td>129</td>
</tr>
</tbody>
</table>

### Table 20 Main Agricultural Imports (2007)

<table>
<thead>
<tr>
<th>Ranking</th>
<th>Product</th>
<th>Weight (m/t)</th>
<th>Value (000 USD)</th>
<th>Unit Price (USD per m/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rice (Milled Equivalent)</td>
<td>425,600</td>
<td>127,500</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
<td>347,650</td>
<td>93,000</td>
<td>268</td>
</tr>
<tr>
<td>3</td>
<td>Coconut Oil</td>
<td>55,200</td>
<td>44,000</td>
<td>797</td>
</tr>
<tr>
<td>4</td>
<td>Prepared Meal (Other)</td>
<td>8,937</td>
<td>20,749</td>
<td>2,322</td>
</tr>
<tr>
<td>5</td>
<td>Soybean Oil</td>
<td>19,945</td>
<td>15,334</td>
<td>769</td>
</tr>
<tr>
<td>6</td>
<td>Wine</td>
<td>89,603</td>
<td>11,397</td>
<td>127</td>
</tr>
<tr>
<td>7</td>
<td>Fat Acid</td>
<td>17,993</td>
<td>10,910</td>
<td>606</td>
</tr>
<tr>
<td>8</td>
<td>Chicken</td>
<td>8,461</td>
<td>10,463</td>
<td>1,237</td>
</tr>
<tr>
<td>9</td>
<td>Orange</td>
<td>51,643</td>
<td>10,176</td>
<td>197</td>
</tr>
<tr>
<td>10</td>
<td>Refined Sugar</td>
<td>12,255</td>
<td>9,972</td>
<td>814</td>
</tr>
</tbody>
</table>

Source: FAOSTAT

Looking at the trends in major imported products, rice, wheat and palm oil have increased significantly since 2000. In other words, the dependence on imports for these products has come
quite recently. This also indicates that the increase in imports underpinned the increase in the supply of calories per capita. In the southern region surrounding the capital Maputo in particular this trend has been apparent. Because Mozambique’s food sources are increasingly linked to imports, the depreciation of the currency can easily influence inflation of food import prices.

The maize import volumes have fluctuated quite severely from year to year and from the 1980s to early 1990s, the total maize imports increased. The increased maize supply has contributed significantly to the total caloric supply. However, since the late 1990s, the maize import volumes have generally been decreasing.

**Figure 31 Agricultural Import Trends for Main Products (1961-2007) Unit: 000 m/t**

![Agricultural Import Trends for Main Products](image)

*Source: FAOSTAT*

### 5.2.7 Economic Development Policies

In Mozambique, there have been several major national development programs including the Five-Year Plan, Poverty Reduction Strategy Paper (PRSP) and “Action Plan 2025 (Agenda 2025)” which set the agendas for long-term national development. Agriculture, rural development and poverty reduction are main issues in these programs.

Four Five-year Plans have been formulated so far (the newest version was formulated in 2010) and poverty reduction, agriculture and rural development and infrastructure development have always been the priority areas. In addition, the Mozambican government formulated the “Action Plan for the Reduction of Absolute Poverty: PARPA” in 2001 and then taking over from the PARPA I, PARPA II (2006-09) was formulated in 2006. Adhering fundamentally to PARPA I, PARPA II sets goals on a wide-ranging issues such as education, health, agriculture and rural development, basic infrastructure, governance etc. but it has shifted more toward rural
development-based reform (JBIC【2007:p.6-7】) and emphasizes the need to promote cooperation between different divisions to increase productivity in agriculture and related areas (World Bank【2010:p.16】).

As for cassava, the “Cassava Development Strategy for Mozambique (Sub-sector Strategic Study on Cassava)” was formulated in 2007, as will be discussed in detail in Chapter 7.

5.3 Production and Consumption of Cassava in Mozambique

5.3.1 Cassava Production and Consumption

Production and consumption of cassava in Mozambique varies greatly according to region. In the main cassava growing areas, cassava is the staple food, but in other regions, maize is the main food. Cassava is known to be a secure source of food during droughts and can complement an unstable harvest of maize and rice. The importance of cassava as a way to ensure food security during droughts is even more apparent as the climate changes.

Cassava is mostly produced on small scale farms, and was used almost entirely for household consumption in the past. Planting cassava is not difficult and the failure rate is low. Not only that, but it does not require fertilizer or agrochemicals, and takes less effort to weed than maize. Cassava can be left in the ground for a long period of time, and this was why it has been especially important during the civil war or other times of social unrest.

5.3.2 Factors in Increased Production

Except for a decline in the late 2000s and late 1990s, the production of cassava has been consistently increasing. The main reason has been due to higher yields.

Cassava production volumes increased from the late 1960s to early 1980s due mainly to both higher yields and larger planting area. In contrast, the increase in the mid to late 1990s is mainly due to higher yields. In the early 1990s, production temporarily decreased because of lower yields. Since then, disease-resistant, higher yield seeds have helped increase production. The increase in yield has been uniform across the country.14

14 (World Bank【2007:p30】).
Supporting the Population

Though cassava covers less planting area than maize, it provides more total calories. This is due to cassava’s higher yield per unit area. However, since the calorie per unit provided by cassava is small (only 36% that of maize, according to the FAO balance sheet), comparing calorie density is not as simple as comparing the unit weight of grain products. Therefore, we compare cassava
and maize by the amount of calories one hectare of each crop yields.

Since 1961, cassava’s calorie yield per hectare has always been higher than maize, and since the mid 1990s, it has usually been 2 to 3 times higher.

Cassava’s advantage was apparent during the civil war period. From the 1970s to 1992 (the year when the civil war ended) the calorie yield per hectare of cassava compared to maize rose from 1.2 times more than maize to 7 times more than maize. The yield of maize was clearly dropped during the turmoil of the civil war. During the same civil war period, cassava yield remained fairly constant, which indicated that cassava cultivation did not require the same hands on attention that maize cultivation requires. For these reasons, cassava is known as a food that can be used to insure food security during times of trouble.

**Figure 34 Calorie Yield per 1 hectare (1961-2008)**  
Unit: Kcal

In the 1990s, the yield of both cassava and maize rose. Cassava was able to reach its highest productivity level ever, while maize was only able to regain the level it enjoyed in the 1960s.

According to our field interviews, “early-harvest” maize seeds were introduced to respond to the shortened rainy season and the unstable precipitation that are a result of climate change and have had a negative influence on maize yields. For cassava, new varieties were introduced that were able to realize high yields without fertilizer. In areas where fertilizer use is low, cassava has an advantage.
5.3.3 Usage

Consumption trends can be observed by looking at the end-usage of cassava. After production recovered in the mid 1990s, cassava started to be used for feed\textsuperscript{15}. Recently, it has become, on average, about 15\% of production over the period 2003-2007. During the same period of time, the category known as "other usage," has also increased. In addition, the supply for human consumption at the end of 1990s recovered and exceeded the level it had been prior to the 1970s.

![Figure 35 Supply of Cassava by Usage (1961-2007)](image)

Source: Based on FAOSTAT

5.3.4 Comparison with Farm Population

The increase of cassava production parallels the population increase. Looking at trends from 1961 to 2008, at first glance, the increase in population seems higher than the increase in cassava production.

However, if we look at rural and urban populations separately, and take into account that cassava is mainly a staple for rural populations, a more complicated pattern emerges. The increase in cassava production maintains the same pace as the increase in rural population during the latter half of the 1980s\textsuperscript{16} (note). However, from the end of the 1990s, cassava production moved at a faster pace than the increase in the rural population due to increased

\textsuperscript{15} More detail on feed utilization of cassava in Sub-Saharan Africa in FAO&IFAD (2004)

\textsuperscript{16} Research from FAO also ascribes the increase in rural population to the increase in cassava production.
yield rates. From the late 1990s through 2006, the increase in the rate of cassava production trended close to the rate for population increase on the whole. This may be due to the increase in usages other than human consumption or the increase in consumption of cassava in the cities or in regions that were not consuming a large volume before. However, in 2007-2008, the level of increase in cassava production dropped back down to the same level as the increase in rate for rural population. The decrease in planting area could be a factor influencing this.

**Figure 36 The trend of Cassava Production and Population (1961-2007)**  
Unit: Index, 1961=1  
*Source: Calculated and formulated based on FAOSTAT*

### 5.3.5 Retail Price of Cassava, Maize and Rice

Before we look at the demand for cassava in urban areas, let's compare the actual retail prices of the main staples. Of cassava, maize, rice, rice is the highest priced. There have been times when maize prices rose to the same level as rice in Maputo, but only for very short periods on time. Looking at price data from the main cassava production area, Nampula, we see that cassava was usually less expensive than maize, although it has occasionally been the reverse. Since we know that cassava only provides 1/3 of the food calories per kilo compared to maize, the price data shows that as a calorie source, cassava is relatively more expensive than maize, but cheaper than rice.

The price of rice has continuously risen since 2005, more than doubling. The import price could be influenced by the rise in international prices in 2008, and the depreciation of the currency in 2005 and 2009-2010. Rice supply is heavily dependent on imports, and international prices and currency depreciation have a direct influence on the price of rice in Mozambique. While overall wheat price data is not available, we expect the price has risen since it is heavily dependent on
imports just like rice. In fact, our field research indicated that bread prices have been increasing. The price of maize doubled from 2007 to 2008, and since 2009, it has increased by more than 150%. This is similar to the international price, but unlike rice, we believe maize has not been influenced by the currency depreciation.

In comparison, the price of cassava price has not been influenced by either the international price or the exchange rate. Though the price rose in the latter half of 2008 to 2009, the price later decreased. At the end of 2010 it had returned to previous levels. According to FAO interviews, since cassava is mostly sold in producing regions and not as a global commodity, it is not influenced by the activities of investment funds.

5.3.6 Cassava and Maize Wholesale Price Contrast

To examine the profitability of suppliers, we can compare the prices of maize and cassava in Nampula. Looking at the price ratio in the graph below, maize is slightly less than double the price of cassava. Considering that cassava has 7-9 times higher yield rate than maize, less work and expense required for harvesting, and that Nampula is the largest production region, the price of cassava is relatively high compared to maize based on this price ratio. This could be due to the distribution costs, and the low storage potential (or loss due to lack of storage).
5.3.7 Production and Consumption in Different Provinces

Generally speaking, cassava is produced mainly in the northern region, and it is the region’s staple food. Maize is the main staple food in the south. In addition, people living in coastal areas, including the southern coast, consume more cassava while populations in the inland regions consume more maize. It becomes slightly more complicated if we categorize cassava consumption by province.

If we look at the planting area by province, we can see that cassava production is concentrated along the coastal areas. In the north the main harvesting provinces are Nampula, Zambezia, Cabo Delgado, and in the south it is Inhambane. In particular, Nampula and Zambezia have a large amount of land under cassava cultivation.

The ratios between the production of cassava and grains are very different depending on different provinces. While the overall Mozambican percentage of cassava over grains is 35%, Nampula has extremely high percentage of 110%, and all the other main cassava growing regions are over 50%. On the other hand, Gaza and Maputo are around 20%, Niassa is 10%, and all provinces in the central region except for Zambezia are at 5%.
Table 21 Crop Production Area by Province, Small/Medium-Sized Farms, 2008

<table>
<thead>
<tr>
<th></th>
<th>Northern Region</th>
<th>Central Region</th>
<th>Southern Region</th>
<th>Whole Country</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Niassa</td>
<td>Cabo Delgado</td>
<td>Nampula</td>
<td>Manica</td>
</tr>
<tr>
<td>Grains (a)</td>
<td>242</td>
<td>226</td>
<td>315</td>
<td>515</td>
</tr>
<tr>
<td>Maize</td>
<td>196</td>
<td>135</td>
<td>209</td>
<td>327</td>
</tr>
<tr>
<td>Rice</td>
<td>16</td>
<td>31</td>
<td>42</td>
<td>135</td>
</tr>
<tr>
<td>Sorghum</td>
<td>28</td>
<td>51</td>
<td>63</td>
<td>53</td>
</tr>
<tr>
<td>Millet</td>
<td>2</td>
<td>9</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cassava (b)</td>
<td>38</td>
<td>114</td>
<td>345</td>
<td>289</td>
</tr>
<tr>
<td>(b/a)</td>
<td>16%</td>
<td>50%</td>
<td>110%</td>
<td>56%</td>
</tr>
<tr>
<td>Beans</td>
<td>82</td>
<td>90</td>
<td>287</td>
<td>265</td>
</tr>
<tr>
<td>Peanut</td>
<td>14</td>
<td>35</td>
<td>168</td>
<td>69</td>
</tr>
<tr>
<td>Butter Bean</td>
<td>30</td>
<td>0</td>
<td>18</td>
<td>43</td>
</tr>
<tr>
<td>Cow Pea</td>
<td>17</td>
<td>36</td>
<td>64</td>
<td>40</td>
</tr>
<tr>
<td>Barbera Bean</td>
<td>4</td>
<td>6</td>
<td>32</td>
<td>8</td>
</tr>
<tr>
<td>Boer Bean</td>
<td>17</td>
<td>13</td>
<td>22</td>
<td>130</td>
</tr>
<tr>
<td>Cotton</td>
<td>2</td>
<td>42</td>
<td>23</td>
<td>10</td>
</tr>
<tr>
<td>Tobacco</td>
<td>26</td>
<td>.</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>Sesame</td>
<td>6</td>
<td>25</td>
<td>39</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>406</td>
<td>497</td>
<td>1,010</td>
<td>1,099</td>
</tr>
</tbody>
</table>

Source: Área cultivada com as principais culturas, pequenas e médias explorações by Culturas, Ano and Provincia (http://196.22.54.6/pxweb2007/Database/INE/03/31/31.asp)

Looking at the breakdown of crop production area by province we can see that the ratio between cassava and grain in 2008 follows the same trend as it did in 2006-2007. Most farms in the main cassava growing regions produce a fair amount of cassava, but outside of those regions, the number of farms producing cassava is quite limited. However, even in the provinces that produce only a small amount, 10-40% of farms are cultivating cassava.

Furthermore, if we compare the average from 2002-2003 to 2006-2007, the percentage of farms cultivating cassava has declined in all provinces. The high producing provinces had a small drop, but in many of the other provinces there was a significant decrease.
Because planning area and production volume still does not indicate the role of cassava as a foodstuff in Mozambican diet, we will compare the amount of calories supplied by the four main food crops harvested in each province. Because we know that food products are not distributed widely to other regions, we can assume that the products grown in each province are the main staples in that province. However it should be noted that rice and wheat movement is difficult to track because they are both heavily dependent on imports.

As seen in the figure below, out of Inhambane's top four food products, cassava takes up 80% in terms of the total supply of calories. It is about 75% in Nampula and Zambezia (note), followed by 50% in Maputo and Gaza. In Sofala, Niassa, and Manica, it is about 20%. In Cabo Delgado, it is just over 10%, and in Tete it is a mere 3%.

As it is indicated here, each province is dependent on different staple foods. While there are provinces that are dependent on cassava as their main food or main source of calories, there are also provinces that rely on maize and sorghum.
To understand the economic position of cassava, it is important to see it in relation to the value of major food crops across all provinces, as shown in the next figure. Only a very small portion of these food crops are sold; the majority is for household consumption. Cassava, maize, and sweet potato take up the majority of the value of production in all provinces, with cassava in particular taking up a big portion. In Nampula and Inhambane, cassava alone takes up 90% of the share. In provinces where there is less cassava production, maize and sweet potato have a higher share. In some provinces, rice, peanut, sorghum, and butter nut takes up only 5-10%.

Source: Calculation based on production volumes in “Triangular Cooperation for Agricultural Development of the Tropical Savanna Zones in Mozambique and Brazil” JICA(2010)

Calories of products, including polished rice, is based FAO Food Balance Sheet. Wheat (imported), imported rice, sweet potato, sugar data were not available, but they are also important staples.
5.4 Case Study Results in Mozambique

This section will discuss the two areas visited during the field work for this study, Inhambane on the southwestern coast and Nampula in the north. These visits detailed the dynamics of cassava production and processing as well as observing the current situation for processors and rural producers. Both areas are major cassava production regions, with cassava playing an important economic role and providing a high percentage of the daily caloric intake for the population.

5.4.1 Cassava Production in Inhambane

Growing demand for production and urbanization

Cassava production has benefited from the popular use of high yield seeds (distributed by the government) and the expansion of land for cultivation. Seeds with even higher yield, including those for the bitter cassava, are starting to be introduced as well. In Inhambane province, farmers have been delegated to distribute the new seeds and seedlings to other farmers, with good results. While the system for disseminating seeds still needs improvement, but it is becoming stronger. However, those charged with seed research and dissemination believe that the new higher yield seeds may weaken the soil, and in the future cassava production will require fertilizer.

The amount of land under cultivation is also increasing in size. To start planting on new land does not require any registration. Therefore, it is possible that cassava production in Inhambane could increase many times over. However, since producers hardly use farm animals or farm equipment...
to assist with labor, the increase in planting area is limited to the family's total labor force.

The lack of labor is a problem in the cassava producing regions. There is no advantage to selling in the local village market, so instead, many sell in the city. During the dry season when cassava is at its peak harvest, trucks from the city (e.g. Maputo) come to purchase cassava along the roads in Inhambane every day.

In Inhambane, the cassava demand from outside the region as well as government policy of distributing high yield seeds have driven the increase of cassava production. Traditionally cassava had been mostly for household consumption, but recently it has started to become a commodity. For families who have been able to benefit from this increased demand, through their larger scale farms (7 ha or more) or farmer associations, impacts have included children being able to go to school.

Also, due to climate change over the past 20-30 years, the rainy season has become shorter. The lower levels of precipitation mean that it is riskier to plant maize or sorghum, which are more easily affected by drought. The fact that cassava is easy to plant, and produces higher yields will become more significant. Cassava also holds the advantage over rice and wheat, which are both heavily dependent on import and easily influenced by the international price and the depreciation in currency.

As we will go into detail about later, the lack of supply has become a problem, especially to the processing industry. The distribution system in the consuming areas is not fully developed, and in addition, the quality and quantity to satisfy demand in insufficient and information on supply, demand and prices are inadequate. According to discussions with the Inhambane Provincial Government, there is a need for improvement related to sales and marketing personnel in the production region.

The demand for vegetables is increasing in Maputo. To satisfy this demand, the city imports large
quantities of vegetable and juice from South Africa. And benefited from the increase in income, the food diversity would likely to expand as well. In that case, there is a great potential for the cassava demand to increase. The difficulty in storage and the high cost in distribution would mean that in the city, cassava might not be considered to be an inexpensive food product.¹⁸

**Cassava Disease in Mozambique**

While cassava is as a main staple in rural areas, and has great potential to expand its production to meet the potential demand in urban areas, the spread of cassava diseases (especially Cassava brown Streak Disease - CBSD) is haunting eastern Africa.

Without effective disease control, the surplus in cassava supply may turn into shortage. There is an urgent need to select and popularize the use of disease tolerant seeds in order to protect cassava’s productivity. In recent years, FAO has switched its focus from promoting cassava throughout the value chain to fighting diseases, especially now that CBSD has became an extremely difficult problem to deal with. As CBSD expands from its origin on the coast of east Africa to the inland regions, there are concerns that it could spread to central Africa and west Africa.

(1) **Cassava Brown Streak Disease (CBSD)**

According to interviewees, 60% of Nampula, the largest cassava-producing province, has been hit with the disease. It has become the biggest problem facing cassava expansion. Disease resistant seeds are being distributed, but according to the IITA office in Tanzania, there is now another virus in addition to the one that has already been identified, and there are no seeds that are immune to both viruses. If Mozambique is in the same situation as Tanzania, they will need more time to develop and distribute new disease-resistant seeds.

The residents of Inhambane and in the southern region however, are not aware of CBSD at this time.

(2) **Cassava Mosaic Disease (CMD)**

While there is no damage in Inhambane from CMD, they have been using CMD-resistant seeds.

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¹⁸ In fact, the cassava price is higher than maize in Dar es Salaam, Tanzania.
5.4.2 Using and Marketing Cassava

Consumption

Based on our observation, residents living in the cassava harvesting regions (Inharrime, Zavala) along the Inhambane coast would include cassava in all their meals. Rural villagers eat cassava as part of their traditional diet, but urban people and wealthier farmers also eat rice, bread and pasta. Farmers reported eating cassava as fermented flakes (rale)\(^\text{19}\), cooking flour (pap)\(^\text{20}\), or boiling the raw cassava for other dishes. Cassava flour is made every day in the home, while rale is made once or twice a month. Cook with fresh cassava is favored, but the only way to preserve cassava is to make it into rale or some other processed form. The cassava leaves can also be consumed as vegetables.

When residents from the rural areas move to a city or to Maputo, they bring their cassava eating culture with them. However, cassava is still only sold in the informal markets in Maputo, and it is difficult to find restaurants that serve cassava.

People in urban areas (especially in the South) look down cassava as “poor man’s food,” something only villagers and farmers would eat. Some other reasons why cassava is not popular in the south include the fact that it is difficult to preserve, infrastructure for distribution is poor, high quality cassava is scarce, and the fact that traditionally the south has always consumed only a small amount of cassava. The transportation infrastructure however is improving and the policy environment is changing. Cassava is being recognized as in important crop for food security and a way to cut down on imports, thereby conserving foreign currency. For these reasons, the

\(^{19}\) Shredded cassava flakes that are pan-fried after drying and fermenting. They have a light, cheesy aroma.

\(^{20}\) It is like the stiff porridge shima or ugaï in Tanzania. It shares the same name (pap <pua>) as the stiff porridge made from maize that is consumed in South Africa. Southern Mozambique shares many culture similarities with its neighbor.
government is trying to raise awareness of cassava and elevate its image among the public.

Cassava leaves are rich in protein and vitamins; it is a suitable complement to the less nutrient-rich cassava tuber. However, it takes some work to process the cassava leaves, because they need to be pounded properly to release the toxins found in them. During the dry season, leaves become stiffer and are less tasty. The raw leaves are expensive because they lose their freshness within a day. In Inharrime district in Inhambane province, a cassava harvesting region, residents plant cassava for their own consumption - the leaves are not sold in market. The only exception would be selling leaves to government workers who do not own their own farmland.

**Processed Food Made From Cassava**

*Rali*: In Inharrime, small scale factories have been set up to produce *rali* for Maputo. Currently there are three processing factories. One model example which is run together with an agricultural cooperative is already generating good revenues. The high quality of the rali and attractive plastic packaging has resulted in high-value-added products. In the past, rali has been made at home by farmers and the end product often suffers from mold, a bitter taste, the smell of fuel, or sand mixed in with the flakes. However, a visit to this new factory during field research revealed a visually attractive *rali* product with a good flavor.
Processing Factory in Inharrime

Grater

Inside the Grater

Press to dehydrate the flake

Dehydrated flakes drying under the sun

Solar drying box for rainy days

Pan baking the fermented flakes
**Rale** in the warehouse

A small package of *rale*

Cassava flour

*Rale* can be put into tea or soup, or eaten as it is. It is a food that requires little preparation, a ‘semi-convenient’ instant food. People in urban areas tend to prefer this kind of food.

To produce *rale*, the cassava must first be dried, usually by sunlight. However during the rainy season, this could not be done. In the processing factory visited in Inharrime, workers were using an enclosed solar drier. In contrast, the farm union in Zavala simply does not produce *rale* during the rainy season, because they lack an enclosed drying facility.

Currently there are no large scale processors, and it is difficult for cassava producers and small scale processors to link with downstream food manufacturers.

**Processed leaves:** Cassava leaves are either dried and then made into flour or frozen before selling. Currently, only a few small entrepreneurs are involved in commercial cassava leaf processing, and supply is limited. However, demand is so great for processed leaves in the city, that processors would have trouble filling orders even if they were able to increase production capacity by a significant margin.
Other processed cassava products include cassava flour and bread made from cassava flour.

**Use as Feed**

Cassava is often used as pig feed, either in the form of boiled cassava, or mixed with maize and coconut. There are also reports that cassava waste, such as peels or rotten tubers, are used as feed. Currently, feed maker Higist is looking for suitable cassava farmers in order to make a feed product from cassava.

FAO statistics estimate 15% of cassava goes to feed, a number which many believe to be too high. However if both the waste and the leftovers from processing are added together, the result is similar to the FAO estimate. An actual example in a *rale* factory gave us 18.7% (75kg of waste out of 400 kg of cassava). Therefore it may be possible that 15% of cassava production, in the form of cassava waste mainly in the household, could go towards animal feed.

In Inharrime, there are currently plans to research the use of cassava for feed.

**Other uses**

Trucks from foreign countries, primarily Swaziland, have recently started coming directly to the villages to purchase cassava on behalf of starch processors. This began just about 1 month before our field research. The buyers purchase approximately 29-30 m/t every 2 to 3 days. This is in fact the first time there have been exports to Swaziland, according to the Inhambane Provincial Agriculture Authorities. Since there is no production of cassava in South Africa\(^{21}\), there is demand for it from outside the country. South Africa has already been importing cassava starch from Thailand. After rain, the toxic component of cassava increases and it becomes unsuitable for direct consumption such as boiling, baking. However for making cassava starch, cassava can be supplied throughout the year.

There are companies now considering the use of cassava as a brewing material for beer.

**5.4.3 Cassava Flour for Commercial Bread Making**

There have been efforts to mix cassava flour with wheat flour when making bread to increase bread volume, but trial production has been suspended. The government has requested the baking industry to produce bread using cassava flour mixed with wheat flour, but commercializing this bread faces many challenges, including an unstable supply of cassava.

\(^{21}\) There is no production of cassava in southern African countries, including South Africa, Swaziland, Lesotho, Botswana and Namibia.
flour.

The government, universities and the baking industry have cooperated in trials of bread production using cassava flour for two years. They were able to produce bread with an unexpectedly good flavor, which was well received by consumers. It is expected that it would sell well if it could be sold on a consistent basis at a reasonable price. However this is not possible under the current conditions of inconsistent cassava flour supply. There was also a backlash against the government’s request right after the 2010 autumn riot that cassava flour to be used in bread production; it was thought by some to simply be a politically motivated demand in order to reduce bread prices and thereby reduce pressure on the government.

The main bottleneck for producing bread using cassava flour is insufficient cassava flour supply. There is strong seasonality in cassava flour supply and it can be procured only during the dry season. In addition, there are other problems such as price, subsidies (including subsidies for wheat flour for bread), as well as marketing issues and consistency of availability of the bread on the market.

Because consumers are used to wheat bread, bread made of a wheat and cassava flour blend should be sold at lower price than wheat bread, at least initially, in order to encourage consumers to try it. To that end, cassava flour needs to be cheaper than wheat flour in order to be used by the baking industry.

It is unclear whether cassava flour could be sold at a lower price at this point. Some interviewee indicated it would be possible, but in an example of data gathered during field research, the cassava flour sold by an Inharrime farmers association was 25 MTN/kg, which is more expensive than the price of wheat flour (30 USD/50kg = 21MTN/kg) for the bread industry in Maputo.

It is difficult, however, to evaluate the general price level based only on this one case. Moreover, the production volume of cassava flour is still limited and if production increases, the price may go down through economies of scale and competition. The price of wheat flour will also change depending on international prices and exchange rates.

Under current conditions, when the national income level is low and economic instability is causing food security issues, food prices are critical. If cassava flour is currently not price competitive, in order for cassava flour to be used on a large scale, costs need to be reduced through increasing the scale of both production and processing or increasing the price of imported wheat flour. The flavor of bread made with blended wheat-cassava flour received very positive feedback from consumers, and it may be a way to add value to bakery products in the future.
As we pointed out earlier, cassava is already consumed in various ways in rural areas, but it is usually not processed into bread. Bread using cassava flour is mainly found in urban areas where other forms of cassava are not as consumed as much.

5.4.4 Case Study in Nampula

In this last section we will take a brief look the Nampula region, one of the main production areas and a destination of our field research. Nampula produces 3 million tons of cassava is produced annually and although there are people who consume maize (western region) and rice (eastern region) as their staple food, the majority of Nampula residents (75%) consume cassava.

The high season for planting cassava is in November and harvesting takes place during the end of dry season, which is from July and October. At present, the yield is 8-10 m/t per ha but 70% of production is affected by the recent proliferation of disease. Therefore, the development and dissemination of disease-resistant seeds has become a large issue. Five new varieties of seeds have already been developed and efforts are being made to disseminate them.

Case Studies of Three Cassava Processing Companies

Company A
Company A is one of Mozambique’s major agribusiness companies. It used to deal in industrial oil but broke into agri-business 4 years ago. At present, it owns 50,000 hectares of agricultural land (of which 8,000 hectares is currently used) and handles a wide range of agricultural products such as tea, macadamia nuts, potato, carrot, maize and canola oil. The company started a cassava project in 2007 and has been investing in the project over the past three years. Currently, cassava is produced on 100 hectares of land and negotiation is underway to provide cassava to a brewing company. The cassava industry is considered to have great potential, but the company is still discussing the best direction for future development.

Company B
Company B is a mid-sized processor located in Ribaue, 150km west of Nampula. It owns 1,000 hectares of land with 100 hectares allocated for cassava production. The company intends to expand their cassava processing business in the future, because demand for processed cassava products is growing rapidly and this demand is currently not being met. For example, there has already been a request from a South African company for 60 tons of cassava flour per week. In addition, due to the Mozambican government’s campaigns to promote processed goods of cassava, Mozambican citizens are becoming more aware of ways to consume cassava as a processed good and this is driving up demand.
Company B started full-fledged cassava production this year but an insufficient number of processing machines is their biggest problem. They are having trouble accumulating the funds necessary to invest in additional processing machines.

Company B’s farm is 30 minutes away from Ribaue, and is on the site of an estate owned by the Portuguese during the colonial period. After Mozambique’s independence, local farmers used the land sporadically, until Company B bought up these farms and is now operating them as a large-scale farm.

Company B produces cassava on 100 ha of their land and aims to expand it to 400 ha by 2015. Currently, it is negotiating with farmers to buy/rent more land to expand cassava production. On the same farm, 8 hectares of land are allocated as a nursery for seedling production and it provides seedlings of new cassava varieties to farmers in the area.

The soil of the farm is very fertile, and by planting cassava in straight lines, introducing new breeds and not intercropping, the company has been able to achieve a high yield of 18-25 m/t per hectare (average for the surrounding farms is 3 m/t per hectare). Plowing is conducted using leased tractors and agrochemicals are used to prevent disease and insect damage. Currently there are 8 workers on the farm and additional temporary workers are also employed from the region during the harvest season.

Company B’s cassava is processed into flour and starch in their factory. A plot of land near the Ribaue train station has been set aside for a processing factory and several small processing machines have been set up. However, the processing capacity is very limited and there are many challenges to overcome to become able to process all the cassava produced on the 100 ha farm.

The president of Company B has also organized a cooperative union to deepen their connection with the local community. The union is made up of 35 local farmers and Company B has set up
two machines for them to make powder from dried cassava and maize. Union members come to this processing center to make their own cassava and maize starch.

**Company C**

Company C is a small processing company that owns 100 ha of agricultural land near Nampula and produces various processed cassava products. The president showed us samples of products her company makes, including cassava flour, chips, cassava leaf powder, and frozen cassava leaves. The company uses small processing machines to make its cassava products, but the business has only just started and distribution routes have not yet been established. In Mozambique, there are a limited number of supermarkets and so small stores in the town are the only channel for selling cassava products. The president of Company C remarked that 2 or 3 years ago she never would have imagined that she would establish a cassava processing company and have a chance to meet visitors from Japan. But processed cassava products seem to be increasingly attracting attention and the market is changing rapidly. Company C is small but they are eager to expand their business by developing their distribution channels and increasing their sales. However, they still seem to lack knowledge about how to achieve these goals.
6. Cassava within Tanzanian Food and Agriculture

6.1 Overview of Tanzania

Tanzania covers 94.5 km² of land (2.5 times larger than Japan) and is along the Great Rift Valley facing the Indian Ocean. It neighbors the other target of our cassava research, Mozambique, to the south.

![Map of Tanzania](Image)

The population is nearly 44 million (2.9% increase over the previous year) and 45% of this population is under 15 years old.

The GDP is 21.62 billion USD (28.5 trillion Tsh), and GDP per capita is 509 USD, a 2.5% increase over the previous year. This GDP per capita positions Tanzania as 154th out of 175 countries in 2008, or 21st from the bottom.

The literacy rate of those 15 and above is 72.6% (female literacy is 66.3%) and this is 32nd from the bottom out of 134 countries (2008 WDI). Tanzania's official languages are Swahili (de facto) and English (official language of higher education and courts). There are around 130 tribes including the Sukuma, Makonde, Chagga and Haya.

Tanzania's currency is the shilling (Shillingi ya Tanzania in Swahili), which is abbreviated as Tsh or TZS (currency code) and which replaced the East African Shilling in 1966.
6.1.1 Post-Independence Tanzania

The United Republic of Tanzania was formed in 1964 by uniting two sovereign states: the Republic of Tanganyika which had gained independence in 1961 and the Republic of Zanzibar which gained independence in 1963. The first president Julius Nyerere introduced an original type of socialism, often called African socialism, that emphasized the connectedness of the traditional rural extended family - *Ujamaa* in Swahili. However despite Nyerere’s confidence in the power of the rural villages, agricultural production decreased. A long drought, war with Uganda’s Idi Amin and the effects of the global oil crisis in 1980s only exacerbated the economic problems. As a result, Tanzania adopted structural adjustment measures imposed by the IMF in 1986 with the idea of ushering in opportunities based on free market principles. In 1995, the country carried out the first presidential election and national election under multiparty system and stable social and political condition has followed.

Growth rate since 2000 has been 5-7 %, and there was single digit inflation until 2007. The economy has been fairly stable and is considered to be one of the healthier economies of Sub-Saharan Africa. The recent high rates of growth are credited to mining development as well as growing industries like construction, manufacturing and tourism.

The main bottlenecks are insufficient transportation infrastructure. Roads and energy infrastructure are gradually improving but ports, railroads and water systems are underperforming. In addition, partially because of contract enforcement and regulatory issues, Tanzania’s foreign investment environment was ranked 131st out of 181 countries in 2010, according to the World Bank’s 2010 Doing Business Report. This also acts as a barrier to economic growth.

Tanzania has had a big advantage in that it has had no civil war or coup d’etat since its independence. Interviewees encountered during field research credited this to having a common language (Swahili) as well as to first President Julius Nyerere’s strict assimilation polices which included ordering students to move to different regions of the country in order to cultivate friendships in new regions and encourage inter-tribal marriages.

6.1.2 Industries

Tanzania’s GDP (2007) is made up of services (43.3%), agriculture and forestry (including hunting) (25.8%), manufacturing (7.8%), construction (7.8%) and others (mining, electricity/gas, water supply) (5.6%). More than 40% of the agriculture and forestry is non-commercial.
6.1.3 Exports

The main exports are minerals such as gold, manufactured goods and agricultural products. In recent years, minerals and manufactured goods have expanded their share and as a result agricultural goods have reduced share from 44.1% in 2000 to 14.4% in 2007.

Table 22 Main Exports by Value (US$)

Source: MFEA [2008: p.57]

6.1.4 Tanzania and Mozambique Comparison

Although Tanzania’s economy appears to be more developed than Mozambique’s according to economic and development indicators, in recent years the gap between the two countries’ GDP per capita has shrunk. However Tanzania has much higher literacy rates and average life
expectancy. Mozambique's literacy rate in 2008 is still less than Tanzania's rate 20 years ago. However Mozambique's literacy rate has improved quickly since the end of the civil war (1.4 points/year) which is double the rate in Tanzania (0.7 points/year).

**Figure 44 Adult (Over 15 years old) Literacy Rates in Tanzania and Mozambique**

![Graph showing literacy rates in Tanzania and Mozambique from 1990 to 2010.]

*Source: WDI*

Average life expectancy is 47.9 years in Mozambique and 55.6 years in Tanzania (2008). Mozambique hit a peak in 2000 and has been stagnant since then but Tanzania's growth has been steady since the late 1990s (WDI).

**Figure 45 Life Expectancy at Birth (Year)**

![Graph showing life expectancy at birth in Tanzania and Mozambique from 1960 to 2010.]

*Source: WDI*
Both countries experienced a large currency depreciation against the U.S. dollar in the 1980s and 1990s. However, Mozambique’s currency depreciation was four times that of Tanzania (WDI).

GDP per capita has been growing in Mozambique since the late 1980s and since the late 1990s in Tanzania. Because Mozambique has higher a growth rate, the gap in GDP per capita between the two countries is getting smaller.
Both countries are highly dependent on exports and have had consistently had trade deficits. The value of Mozambique's exports had been rising steadily for decades but has dropped since 2008 while, at the same time, imports have remained high, which has increased the trade deficit. In Tanzania's case, export growth has been slow but import values dropped by half which has improved the trade balance.
6.2 Tanzania’s Food and Agriculture

6.2.1 Natural Environment and Land Resources

Most of Tanzania’s geography is plateaus at 1000m to 1400m altitude, which then rise gradually, with some up and down, towards the west. Coastal areas, mountainous areas (the highest area is 2000m high) and southern areas have heavy precipitation, as well as some inland areas. There are two rainy seasons, the minor one which is from November to December and the major one which is from March to May. The dry season is June and July. Natural vegetation is primarily trees along the coast, deciduous forests and forest-savanna in the southern and inland areas, and steppes in the northern areas. Soil is red (laterite) and most farms have acidic soil.

It is considerable room for agricultural development within the country and it is assumed that savanna development like Mozambique is undertaking is also possible.

<table>
<thead>
<tr>
<th>Table 23 Land Utilization in Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Total land</td>
</tr>
<tr>
<td>Arable land</td>
</tr>
<tr>
<td>Cultivated land</td>
</tr>
<tr>
<td>Area suitable for irrigation</td>
</tr>
<tr>
<td>Planted area under irrigation</td>
</tr>
<tr>
<td>Area of high development potential</td>
</tr>
<tr>
<td>Area of medium development potential</td>
</tr>
<tr>
<td>Land under medium and large-scale farming</td>
</tr>
<tr>
<td>Total land allocated to small holders</td>
</tr>
</tbody>
</table>

Source: Ministry of Agriculture Food Security and Cooperatives 2009 “Investment Potential and Opportunities in Agriculture (Crop Sub-sector)”

Tanzania Ministry of Agriculture data reports 9.5 million ha of cultivated land, which is just over 20% of the total 44 million hectares of farmable land. However, this farmable land can be assumed to include grasslands and pasture areas as well as forests, and therefore the “total farmable land” calculation may include areas that are actually marginal lands for cultivation. This is supported by FAO statistics (2008) which indicate that there is 34.95 million hectares of farmable land, including 9.6 million hectares of cultivated and 24 million hectares of permanent grasslands/pasturelands.
Only 1% of the land with irrigation potential has been irrigated\(^{22}\), despite the fact that Tanzania’s water resources are the second richest in Africa because it is surrounded by the Indian Ocean as well as lakes on three sides: Lake Victoria in the north, Lake Tanganyika in the west, and Lake Malawi in the south.

### Table 24 Land Use in Tanzania (thousand ha)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area</td>
<td>88,580</td>
<td>88,580</td>
<td>88,580</td>
<td>100%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Agricultural area</td>
<td>26,000</td>
<td>34,000</td>
<td>34,950</td>
<td>39.5%</td>
<td>8,950</td>
<td>950</td>
</tr>
<tr>
<td>Arable land</td>
<td>5,200</td>
<td>9,000</td>
<td>9,600</td>
<td>10.8%</td>
<td>4,400</td>
<td>600</td>
</tr>
<tr>
<td>Permanent crops</td>
<td>800</td>
<td>1000</td>
<td>1350</td>
<td>1.5%</td>
<td>550</td>
<td>350</td>
</tr>
<tr>
<td>Permanent meadows and pastures</td>
<td>20,000</td>
<td>24,000</td>
<td>24,000</td>
<td>27.1%</td>
<td>4,000</td>
<td>0</td>
</tr>
<tr>
<td>Forest area</td>
<td>N/A</td>
<td>41,495</td>
<td>34,234</td>
<td>38.6%</td>
<td>N/A</td>
<td>-7,261</td>
</tr>
<tr>
<td>Other land</td>
<td>N/A</td>
<td>13,085</td>
<td>19,395</td>
<td>21.9%</td>
<td>N/A</td>
<td>6,310</td>
</tr>
<tr>
<td>Total area equipped for irrigation</td>
<td>20</td>
<td>144</td>
<td>184</td>
<td>0.2%</td>
<td>164</td>
<td>40</td>
</tr>
</tbody>
</table>

*Source: FAOSTAT*

### 6.2.2 Agricultural Production

The highlands in the north and south have heavy precipitation, rich soil and irrigation is common. Coffee, banana, nuts and beans are produced here. The central plateau has little precipitation and frequent droughts with unproductive soil. It produces sorghum, millet and maize. The western lake region produces coffee, banana, cotton, tea, tobacco and cassava. The coastal region features production of copra, sisal hemp and cashew nuts in addition to rice, peanut, maize, cassava.

\(^{22}\) (JAICAF[2010])
Small scale farmers produce primarily subsistence crops and any sales are mostly to a local market. Mixed cropping and intercropping are common. Two thirds of the permanent crop area is mixed crops and 40% of the temporary crop area is mixed crops with an occasional combination of both mixed and intercropped.

Production volume of food crops shows maize with the highest volume followed by cassava, sweet potato, bean, millet, banana, rice, etc. In recent years, areas with high drought risk in particular have recognized the importance of cassava production for food security (World Bank [2009]). The chart below looks at some of the top crops from 2006-2007.

**Table 25 Main Food Crops by Volume 2006-2007, (MT)**

<table>
<thead>
<tr>
<th>Crops</th>
<th>2006</th>
<th>2007</th>
<th>Changes % 2006/07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>3,423</td>
<td>3,302</td>
<td>-3.53</td>
</tr>
<tr>
<td>Paddy</td>
<td>805.1</td>
<td>872.1</td>
<td>8.31</td>
</tr>
<tr>
<td>Wheat</td>
<td>109.5</td>
<td>83</td>
<td>-24.2</td>
</tr>
<tr>
<td>Millet</td>
<td>941.5</td>
<td>1165</td>
<td>23.73</td>
</tr>
<tr>
<td>Cassava</td>
<td>2,052.8</td>
<td>1733</td>
<td>-15.57</td>
</tr>
<tr>
<td>Beans</td>
<td>1,049.9</td>
<td>1156</td>
<td>10.11</td>
</tr>
<tr>
<td>Banana</td>
<td>1,169.2</td>
<td>1027</td>
<td>-12.16</td>
</tr>
<tr>
<td>Sweat Potato</td>
<td>1,396.4</td>
<td>1,322</td>
<td>-5.33</td>
</tr>
</tbody>
</table>

Source: MFEA[23] [2008: pp.115-116]

---

[23] Tanzanian agricultural statistics use dry weight for indicating cassava production and therefore government data can differ from sources (such as FAO) which use fresh weight. Dry weight is 1/3 of fresh weight.
The table below lists Tanzania’s top agricultural products in terms of value. The top five are beef, banana, cassava, maize and rice.
6.2.3 Agricultural Economy

Agriculture employs 74.6% of the workforce in Tanzania (2006, WDI) and this workforce is mostly comprised of the self-employed or family labor.

74.4% of households live in farming villages and 70.6% of these households engage in agriculture. 99.1% of farming families produce crops and 35.1% raise livestock. Most farming families who raise livestock also produce crops\textsuperscript{24}.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
Rank & Commodity & Value (Int $1000) & Quantity (Tonne) & Unit Value ($/tonne) \\
\hline
1 & Indigenous Cattle Meat & 511,520 & 247,316 & 2,068 \\
2 & Bananas & 498,785 & 3,500,000 & 143 \\
3 & Cassava & 439,566 & 6,600,000 & 67 \\
4 & Maize & 392,414 & 3,659,000 & 107 \\
5 & Rice, paddy & 272,215 & 1,341,846 & 203 \\
6 & Beans, dry & 246,583 & 850,000 & 290 \\
7 & Cow milk, whole, fresh & 226,049 & 850,000 & 266 \\
8 & Vegetables fresh nes & 179,205 & 955,000 & 188 \\
9 & Cotton lint & 146,963 & 99,000 & 1,484 \\
10 & Groundnuts, with shell & 135,947 & 300,000 & 453 \\
\hline
\end{tabular}
\caption{Top Agricultural Products by Value and Volume, Avg. of 2002 and 2008}
\end{table}

\textsuperscript{24} (MAFSC et al. [2006])
### Table 29 Number of Households by Household Type (2002/03 agricultural year)

<table>
<thead>
<tr>
<th>Household Type</th>
<th>Mainland Tanzania</th>
<th>National Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Households</td>
<td></td>
<td></td>
</tr>
<tr>
<td>involved in Agriculture</td>
<td>4,805,315</td>
<td>4,901,837</td>
</tr>
<tr>
<td>NOT involved in Agriculture</td>
<td>259,840</td>
<td>70.1%</td>
</tr>
<tr>
<td>Urban Households</td>
<td>1,745,933</td>
<td>70.1%</td>
</tr>
<tr>
<td>Households Total (from 2002 Pop. census)</td>
<td>6,811,087</td>
<td>6,996,036</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household Type</th>
<th>Mainland Tanzania</th>
<th>National Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops Only</td>
<td>3,095,983</td>
<td>3,156,060</td>
</tr>
<tr>
<td>Livestock Only</td>
<td>40,898</td>
<td>41,199</td>
</tr>
<tr>
<td>Pastoralist</td>
<td>1,828</td>
<td>1,828</td>
</tr>
<tr>
<td>Crops &amp; Livestock</td>
<td>1,666,606</td>
<td>1,702,750</td>
</tr>
<tr>
<td>Agriculture Households Total</td>
<td>4,805,315</td>
<td>4,901,837</td>
</tr>
<tr>
<td>Growing Crops Total</td>
<td>4,762,589</td>
<td>4,858,810</td>
</tr>
<tr>
<td>Rearing Livestock Total</td>
<td>1,709,331</td>
<td>1,745,776</td>
</tr>
</tbody>
</table>

**Source:** MAFSC et al. [2006]

85% of the workforce in farming families engages in agriculture. Occupations for farm family members other than agriculture include self-employment (4.7% of farming family workers), NGOs (3.0%), government (1.2%), and non-paid family work (non-agriculture)(1.2%). This indicates shows that employment opportunities are limited for the rural population.

---

25 (CountrySTAT, Tanzania)
About 10 million small farmer households own 85% of all farms and do 75% of all agricultural production. The size of each farm is between 1 to 3 hectares. Medium-size farms and large farms produce export crops. Foreign ownership of land or farms, when it occurs, is managed by the Tanzanian Investment Center (TIC).

Two-thirds of land use rights fall under customary law\textsuperscript{26}. In traditional shared ownership of land, land is entrusted to the leader of a community and individual community members have the right then to use, (not own) the land (AICAF[2002]).

Under the \textit{ujamaa} farming village development policy (1967 – 82) remote and scattered villages were gathered together. Now more than a half of farming families own a field within several hundred meters of their home and most farming families have two fields within 3 kilometers. The average distance to community-owned natural resources is 1.5 kilometers (in the dry season) or 0.8 kilometers (wet season) for water for human consumption, 1.2 kilometers (dry season) or 2.0 km (wet season) for water for livestock, for pasture lands (3.0 km in dry season/2.1 km in wet season) and for firewood (2.4 km in dry season/2.3 km in wet season).

\textsuperscript{26} as of 2002/2003 fiscal year, MAFSC et al. [2006]
Table 31 Land Area by Ownership Type (2002/2003 Agricultural Year)

<table>
<thead>
<tr>
<th>Land Ownership/Tenure - Area</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership Certificate</td>
<td>644,996</td>
</tr>
<tr>
<td>Customary Law</td>
<td>8,082,638</td>
</tr>
<tr>
<td>Bought</td>
<td>1,919,994</td>
</tr>
<tr>
<td>Rented</td>
<td>518,177</td>
</tr>
<tr>
<td>Borrowed</td>
<td>374,272</td>
</tr>
<tr>
<td>Share -cropped</td>
<td>73,673</td>
</tr>
<tr>
<td>Other Tenure</td>
<td>386,782</td>
</tr>
<tr>
<td>Total</td>
<td>12,000,532</td>
</tr>
</tbody>
</table>

*Source: MAFSC et al. [2006]*

Within farming families, tasks are generally assigned as follows:

- Planting, weeding, pest control, and harvesting are jobs for adult men and women or the whole family
- Processing crops, milking, water collection and transport, firewood gathering and beer brewing are jobs for adult women
- Selling goods, raising livestock, beekeeping, fishing, non-agricultural work, woodcutting and construction are jobs for adult men
- Taking livestock out to graze is frequently done by children, mostly boys

Agricultural loans from cooperatives, family, friends or relatives are common. Most loans are to cover input costs (fertilizer, agrochemicals, labor, seeds) and loans for investment (equipment, livestock, irrigation) are rare.27

### 6.2.4 Food Supply and Demand

There is relatively little trade in staple food products with the exception of wheat which is dependent on imports. In contrast to Mozambique, Tanzania produces its own rice domestically.

In addition, Tanzania uses 15 to 20% of its cassava, maize and bean production as livestock feed, a volume which is higher than Mozambique’s (5-20% of cassava and 10% of maize).

---

27 (FAFSC et al[2006]).
Table 32 Supply Source and End-Use of Major Food Crops Table
(Main sources of calories per capita, 2007, 1000 MT)

<table>
<thead>
<tr>
<th></th>
<th>Production</th>
<th>Import</th>
<th>Change in Inventory</th>
<th>Export</th>
<th>Domestic Supply</th>
<th>Feed</th>
<th>Seed</th>
<th>Processing</th>
<th>Other Application</th>
<th>Food Supply (kg/Person)</th>
<th>Calorie Supply (kcal/Person/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maize</td>
<td>3,659</td>
<td>19</td>
<td>135</td>
<td>88</td>
<td>3,725</td>
<td>800</td>
<td>62</td>
<td>18</td>
<td>435</td>
<td>2,411</td>
<td>58.4</td>
</tr>
<tr>
<td>Cassava</td>
<td>6,600</td>
<td>0</td>
<td>0</td>
<td>11</td>
<td>6,589</td>
<td>928</td>
<td>589</td>
<td>43</td>
<td>51</td>
<td>5,072</td>
<td>122.9</td>
</tr>
<tr>
<td>(Milled Equivalent)</td>
<td>895</td>
<td>47</td>
<td>-48</td>
<td>20</td>
<td>875</td>
<td>43</td>
<td>51</td>
<td>780</td>
<td>18.9</td>
<td>194</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>83</td>
<td>822</td>
<td>0</td>
<td>209</td>
<td>696</td>
<td>9</td>
<td>18</td>
<td>669</td>
<td>16.2</td>
<td>123</td>
<td></td>
</tr>
<tr>
<td>Sugar (raw)</td>
<td>267</td>
<td>195</td>
<td>0</td>
<td>66</td>
<td>396</td>
<td></td>
<td></td>
<td></td>
<td>396</td>
<td>9.6</td>
<td>94</td>
</tr>
<tr>
<td>Pulses</td>
<td>850</td>
<td>2</td>
<td>-100</td>
<td>4</td>
<td>749</td>
<td>230</td>
<td>60</td>
<td>405</td>
<td>9.8</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td>3,500</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3,500</td>
<td>350</td>
<td>875</td>
<td>2,275</td>
<td>55.1</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Sorghum</td>
<td>900</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>900</td>
<td>18</td>
<td>14</td>
<td>389</td>
<td>90</td>
<td>389</td>
<td>9.4</td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>1,322</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,322</td>
<td>66</td>
<td>1,256</td>
<td>30.4</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palm Oil</td>
<td>6</td>
<td>363</td>
<td>20</td>
<td>16</td>
<td>373</td>
<td></td>
<td></td>
<td>260</td>
<td>113</td>
<td>2.7</td>
<td>66</td>
</tr>
<tr>
<td>Fermented Drink</td>
<td>2,781</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2,779</td>
<td></td>
<td></td>
<td>41</td>
<td>2,738</td>
<td>66.3</td>
<td>60</td>
</tr>
<tr>
<td>Peanut without shell</td>
<td>210</td>
<td>7</td>
<td>11</td>
<td>16</td>
<td>211</td>
<td>4</td>
<td>12</td>
<td>102</td>
<td>93</td>
<td>2.2</td>
<td>34</td>
</tr>
</tbody>
</table>

Source: FAOSTAT

6.2.5 International Trades and Distribution of Agriculture Products

Specialized brokers supply agricultural products to cities, and the capital Dar es Salaam is the trade hub for the nation. Roads in rural areas are poorly maintained and distribution costs are high. Government regulations regarding distribution of agricultural products are strict. In addition, there are issues of lack of competition between crops produced by small farmers. Insufficient capital is also an issue. (JAICAF[2010]).

The main imported food items are wheat and palm oil followed by imported sugar. Green coffee beans, tobacco (raw leaves), flour, processed cotton and tea are main items for export.
Table 33 Tanzania’s Top Agricultural Imports by Import Value, 2007

<table>
<thead>
<tr>
<th>Rank</th>
<th>Commodity</th>
<th>Quantity (MT)</th>
<th>Value (1000 $)</th>
<th>Unit value ($/MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wheat</td>
<td>813,513</td>
<td>233,496</td>
<td>287</td>
</tr>
<tr>
<td>2</td>
<td>Palm oil</td>
<td>323,226</td>
<td>227,240</td>
<td>703</td>
</tr>
<tr>
<td>3</td>
<td>Sugar Refined</td>
<td>112,255</td>
<td>40,570</td>
<td>361</td>
</tr>
<tr>
<td>4</td>
<td>Fatty Acids</td>
<td>40,190</td>
<td>24,739</td>
<td>616</td>
</tr>
<tr>
<td>5</td>
<td>Sugar Raw Centrifugal</td>
<td>71,157</td>
<td>21,833</td>
<td>307</td>
</tr>
<tr>
<td>6</td>
<td>Food Prep Nes</td>
<td>5,302</td>
<td>20,413</td>
<td>3,850</td>
</tr>
<tr>
<td>7</td>
<td>Malt</td>
<td>33,995</td>
<td>19,071</td>
<td>561</td>
</tr>
<tr>
<td>8</td>
<td>Soybean oil</td>
<td>17,302</td>
<td>15,943</td>
<td>921</td>
</tr>
<tr>
<td>9</td>
<td>Bever. Dist. Alc</td>
<td>7,519</td>
<td>10,264</td>
<td>1,365</td>
</tr>
<tr>
<td>10</td>
<td>Beverage Non-Alc</td>
<td>6,261</td>
<td>7,734</td>
<td>1,235</td>
</tr>
</tbody>
</table>

Source: FAOSTAT

Table 34 Tanzania’s Top Agricultural Exports by Value, 2007

<table>
<thead>
<tr>
<th>Rank</th>
<th>Commodity</th>
<th>Quantity (MT)</th>
<th>Value (1000 $)</th>
<th>Unit value ($/MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coffee, green</td>
<td>51,909</td>
<td>113,064</td>
<td>2,178</td>
</tr>
<tr>
<td>2</td>
<td>Tobacco, unmanufactured</td>
<td>40,743</td>
<td>94,822</td>
<td>2,327</td>
</tr>
<tr>
<td>3</td>
<td>Flour of Wheat</td>
<td>89,691</td>
<td>41,088</td>
<td>458</td>
</tr>
<tr>
<td>4</td>
<td>Cotton lint</td>
<td>33,999</td>
<td>40,403</td>
<td>1,188</td>
</tr>
<tr>
<td>5</td>
<td>Tea</td>
<td>30,506</td>
<td>39,146</td>
<td>1,283</td>
</tr>
<tr>
<td>6</td>
<td>Peas, dry</td>
<td>88,169</td>
<td>32,991</td>
<td>374</td>
</tr>
<tr>
<td>7</td>
<td>Wheat</td>
<td>89,679</td>
<td>30,956</td>
<td>345</td>
</tr>
<tr>
<td>8</td>
<td>Cashew Nuts Shelled</td>
<td>5,981</td>
<td>22,241</td>
<td>3,719</td>
</tr>
<tr>
<td>9</td>
<td>Sugar Raw Centrifugal</td>
<td>61,757</td>
<td>20,408</td>
<td>330</td>
</tr>
<tr>
<td>10</td>
<td>Cotton Carded, Combed</td>
<td>19,438</td>
<td>18,290</td>
<td>941</td>
</tr>
</tbody>
</table>

Source: FAOSTAT

6.2.6 Food Consumption

In looking at the figure below that illustrates Tanzania’s calorie supply over the past decades, a dramatic increase in calorie can be seen in the early 1970’s which was due to a huge increase in the
production of maize. This high calorie supply was maintained throughout the 1980’s and into the mid-1990s, after which there was a decrease due to low production of cassava and maize. In the past decade total calorie per capita per day has gradually begun to increase again but has not yet reached the heights of the 1970’s and 1980’s.

![Figure 50 Breakdown of Food Calories Supply](image)

The recent rise in calorie supply has come from several factors, including an increase in imports of wheat, sugar and palm oil, an increase in production of rice, sweet potato and banana and the fact that cassava and maize production is no longer shrinking.

6.3 Cassava Production and Consumption in Tanzania

6.3.1 The Role of Cassava

Tanzania is the fifth largest cassava producer in Africa. Cassava production in Tanzania in 2008 was 6.6 million MT, or 5.4% of all African cassava production.28

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28 There are wide gaps in the cassava data provided by the Ministry of Agriculture and that given by the
Tanzania used to be the third largest African cassava producer, until it was overtaken by Ghana and Angola in the mid-1990s.

Cassava is tolerant against drought and can be left underground in the soil for a long period. As a result, almost all regions of Tanzania plant cassava as important part of their food security strategy. Looking at just the four main staple food, cassava has consistently been produced in higher volumes than the other crops.

**Figure 51 Production of Staple Food Crop in Tanzania**

Cassava has the largest production volume of any agricultural product in Tanzania. Cassava production is 6.6 million MT, which is 80% more than Tanzania’s second crop maize (3.65 million MT).

In addition to maize and tubers like cassava, cooking banana is also an important staple food in Tanzania. The total production volume of these staple foods was 18 million tons in 2008. Of this amount, cassava is 36.7%, maize is 20.4%, cooking banana is 19.5%, rice is 7.5%, sweet potato is 7.4%, potato is 3.6%, and sorghum is 5.0%. Tanzania is unusual in that wheat is not one of the staple foods.

Source: FAOSTAT  
Note: Weight of dried cassava is calculated as 1/4 that of fresh cassava

FAO. According to interviews with both FAO staff and Tanzanian Ministry of Agriculture officials, FAO data is likely to be more reliable. Therefore, unless stated, this section of the study uses FAO data.
In historical view, cassava production volume was 2.8 million tons in 1961, but increased from the middle of 1970s until it peaked at 8.2 million tons in 1985. It then dropped sharply due to disease and pests, spiraling down to 3.96 million tons, half the peak volume. It has grown again and returned to 80% of its peak.

In the meantime, maize production was only 0.59 million tons in 1961 but doubled to 1.37 million tons in 1975 and rose more than six-fold to 3.66 million tons. Thus, if we give the total of grains and tubers an index of 100, we can say cassava's share dropped from about 70% in 1970s to 45% in 2008 while the share of maize rose from 10% to 25% in 2008.

More than 80% of Tanzania's production of both cassava and maize are for human consumption. Fresh cassava consumption per capita is 337 grams (2007) which is more double that of maize (160 grams).

Figure 52 Daily Calories by Main Food Source in Tanzania

[Graph showing daily calories by main food source in Tanzania]

Source: FAOSTAT

However the number of calories in one kilo of cassava is only a little more than one fifth of the number of calories in one kilo of maize. Despite its high volume, the number of calories from cassava per capita is 235 calories or 11.6% of all calorie intake. That is less than half of the calories per capita gained from maize (522 calories) in 2007. Therefore, while cassava is the top food by volume, it is the second most important in terms of caloric contribution, behind maize.
The volumes of cassava discussed here refer to fresh cassava, which is 70% water by volume. In comparison, maize is usually 20% water at harvest and 15% in dried. 3 to 4 kg of fresh cassava can reportedly be processed into 1 kg of dried cassava. It should be repeated here that the Tanzanian Ministry of Agriculture's data on cassava production is based on dried cassava and their numbers are about one fourth of FAO's data on fresh cassava.

**Figure 53 Calorie Consumption of Main Staple Foods in Tanzania**

![Graph showing calorie consumption of staple foods in Tanzania](source)

Source: FAOSTAT

**6.3.2 Cassava Production Trends**

As of 2008, cassava had the fourth largest planting area, behind maize, sorghum and rice. Cassava’s planting area has remained virtually unchanged since the 1960’s when it was 570,000 hectares. 2008 statistics showed 670,000 hectares. On the other hand, the planting area for maize quadrupled from 790,000 hectares to 3.1 million hectares in 2008 and rice increased dramatically from 28,000 ha to 710,000 hectares. In 2008, the planting area for cassava was little more than one fifth of maize’s. Cassava's share of total harvesting area of crops and tuber had been reduced by one third over the past 50 years, from 30.5% in 1961 to 10.6% in 2008. On the other hand, maize's share rose slightly from 42.3% to 48.5% and rice increased from 4.4% to 11.1%. In 2008, both maize and rice exceeded cassava's share of total crop and tuber planting area.
Small Scale Cassava Farmers

According to the Tanzanian agricultural census (2002/2003), cassava is produced by 1.21 million farming households (mainland has 1.13 million and Zanzibar has 0.08 million), which is 25% of agricultural households of Tanzania. If we divide the total cassava planting area by the number of producing households, we can estimate that each household plants an average of 0.5 hectares of cassava.

In reality there is land available to expand farming, including cassava. According to data from the Ministry of Agriculture, Tanzania has 44 million hectares of cultivatable land, but currently only 22% or 9.5 million hectares is cultivated. This leaves more than 30 million hectares of uncultivated land. However, cassava has not increased its planting area in the last 50 years and the amount of land used for farming per farming household is as small as farms in China or India – countries that have large populations and little cultivatable land. This is because most Tanzanian farmers work primarily with hand tools, which limits the area that can be cultivated to that which an individual person can farm. It is difficult for Tanzania to increase cassava farming area without additional labor availability or the introduction of new technologies.

Figure 54 Cassava Yield in Main Producing Countries

The yield of fresh cassava in Tanzania in recent years has been between 6 to 10 tons per hectare. It was just under 10 tons in 2008 which is significantly lower than other cassava-producing countries. For example, it is just 40% of Thailand's yield, 70% of Brazil's and 80% of Nigeria's.
In addition, Tanzania’s cassava yield has fluctuated frequently over the last decades. For example, it went from 11-12 tons per hectare in the early 1980’s to a low of about 6 tons/ha in 2003. It has since recovered to about 10 tons per hectare.

### Loss due to disease and pests

One reason for the overall low yield and frequent fluctuation in cassava yields may be due to intercropping and the low use of chemical fertilizer, but since 1990s the biggest threat to Tanzania’s cassava production is disease and insect damage.

Cassava disease and insect damage include Cassava Mosaic Disease (CMD), Cassava Brown Streak Disease (CBSD), Cassava Bacterial Blight, Cassava Mealy Bug and Cassava Green Mites; CBSD and CMD have already spread widely. In particular, according to field interviews, the main reason for the drop in yield until 2003 was the spread CBSD.

CBSD had had a devastating impact on cassava’s production volume and quality. For example, according to research on disease in the Tanga region of Tanzania, CBSD has spread throughout this region and resulted in 74% of loss of cassava production volume, with 100% of the production volume loss in gravely damaged regions.

### Low Yield by Intercropping

Many Tanzanian farmers intercrop cassava between other products like maize, beans, cooking bananas or cashew nuts. According to the Tanzania Ministry of Agriculture, 40% of crop acreage, including permanent crops, is intercropped.

The most common reason for intercropping is to reduce the risk of a poor harvest, improve soil quality and control weeds. In addition, intercropping helps provide a variety of agricultural products and revenue sources to the farmer.

However, usually intercropping has low plant density and results in low yield. For example, some statistics show cassava’s average intercropped planting density is 6,400 plant/ha, which is much lower than the recommended monocrop density of 10,000 plants/ha. (Nweke et al, 1998).

However, it is interesting to note that in Tanzania, Zanzibar has the highest yield because many farmers in Zanzibar monocrop cassava in the recommended plant density of about 10,000 plants/ha.
6.3.3 Regional Trends in Cassava Production

Tanzania’s mainland is composed of seven zones and each zone is composed of several states. In addition to the mainland, there is the group of islands called Zanzibar. Mainland’s 7 zones are

① Lake Zone (Mara State, Mwanza State, Kagera State, Shinyanga State), ② South Zone (Mtwara State, Lindi State, Tunduru Prefecture of Ruvuma State), ③ Middle Zone (Dodoma State, Singida State), ④ West Zone (Tabora State, Kigoma State), ⑤ East Zone (Coast, Dar es Salaam, Tanga State, Morogoro State), ⑥ South Highland Zone (Ruvuma State, Mbeya State, Rukwa State, Iringa State) and ⑦ North Zone (Kilimanjaro State, Manyara State, Arusha State).

Figure 55 Regions of Tanzania

![Regions of Tanzania](image)

Tanzania produces cassava in all twenty-two states, but the Lake Zone, South Zone and East Zone have higher production and these three zones produce 70% of all Tanzanian production.

According to the Tanzania Ministry of Agriculture, in 2008 cassava planting covered 800,000 hectares and produced 1.72 million tons of cassava (dried), a yield of 2.1 tons per hectare. Looking at the three top producing zones, the South Zone produces the greatest volume (517,000 tons) or 30.7% of Tanzania’s all cassava production. The Lake Zone provides 27.5% of national production and the East Zone follows with 15.1%.

Cassava yield differs by region. It is highest in Zanzibar while Dodoma State has the lowest (1.2t/ha).
Figure 56 Share of Cassava Production by Zone (%, 2009)

Source: Ministry of Agriculture, Food Security and Cooperatives, and Sokoine University of Agriculture

6.3.4 Issues Related to Increasing Productivity

Development and Dissemination of Improved Varieties

The most critical factor in the recent drop in cassava production volume is disease and pest damage.

Countermeasures against disease and pests include ① prompt discovery of diseased cassava plants, collection and burning ② use of disease-free trees provided by seedling nurseries ③ using disease and pest resistant cassava plant varieties. This last countermeasure is ultimately the most effective and so development and dissemination of disease and pest resistant trees are essential.

Currently there are nine improved breeds under development: Naliendele, Kiroba, Kibaha, Mumba, Hombolo, Kizimbani, Kama, Mahonda and Machui.

Naliendele and Kiroba are for the Southern Zone, Kibaha and Kiroba are for the Eastern Zone, Mumba and Hombolo are for the Central Zone, and Kizimbani, Kama, Mahonda and Machui are for Zanzibar.

These new improved varieties face several challenges, including insufficient supply of seedlings,
insufficient information and awareness among farmers about the new varieties and a lack of capacity for disseminating. Because of these problems, most farmers in Tanzania still plant existing varieties which are not tolerant to CMD or CBSD and which have lower yield.

There are other reasons farmers do not use the improved varieties. First, there are few market opportunities to sell cassava even if the plants had higher yield, and therefore the incentive for adopting improved varieties is low. In addition, many farmers believe existing varieties have better characteristics than the improved varieties. For example, farmers believe that existing types are better able to be preserved underground without harvesting and more resistant to drought than the improved varieties, and therefore enhance household food security.29

A number of organizations are committed to the development, cultivation and promotion of disease and pest resistant varieties as well as high-yield varieties. These include DALDO (District Agricultural and Livestock Development Office), ASA (Agricultural Seed Association), Naliendele Agriculture Research Institute, Sokoine Agricultural University and TFNC (Tanzanian Food and Nutrition Center). These organizations receive support from a variety of sources including FAO, IITA (International Institute of Tropical Agriculture, based in Nigeria) and CIAT (International Center for Tropical Agriculture, based in Columbia). In addition, each region has commitments from aid organizations including NGOs such as SARRNET, ASARECA, AGRA and Catholic Relief Services (CRS).

One example of a project to promote improved cassava varieties is the UpoCA project, supported by USAID. It is undertaking promotion of improved cassava varieties to small farmers and training in production and processing technologies in seven African countries including Tanzania. Tanzania has insufficient supply of high-yield seedlings that are without disease and pest and thus UpoCA has taken the following actions:

1. Established a 10 hectare seedling multiplication farm in Chambezi-Bagamoyo
2. Established a 10 hectare multiplication farm in Kibaha
3. Reached agreement between four local associations to establish another multiplication farm
4. Established eight High Quality Cassava Flour (HQCF) processing centers and provided technical training on improved cassava varieties and on production and processing technologies.

29 (Kulenbeka et al., 1998, Nweke et al., 1998).
processing

5. Provided four TOT (Trainer of Trainers) courses with 87 participants

6. Trained 840 farming families in three regions in cassava production, processing, packaging as well as safety and quality control

7. With cooperation between FAO, Kisarawe and Mkuranga local associations, UPoCA established eight agricultural schools and trained a total of 200 farming households

Officials in the Ministry of Agriculture said the ties between those organizations and associations need to be further strengthened in order to speed promotion of improved varieties to farmers.

Introduction of Fertilizers

In addition to development of higher yield cassava varieties, increasing cassava production in Tanzania will require further introduction of chemical fertilizers. However, currently the cost of chemical fertilizers is high and they are not easily available and as a result Tanzanian cassava producers use little chemical fertilizer. Cassava is known to need large amounts nitrogen for fertilization (30-50kg N/ha) and (Adupa, 1994, Cock, 1985), Nweke et al., (1998) state that Tanzania consumes large amounts of nitrogen and it is the most limited nutrients in Tanzanian soil.

Planting Season

In addition, delaying the cassava planting season also lead to a decrease in yield. Although cassava is know for its drought resistance, if cassava face serious water shortage in the first five
months after planting, cassava loses about 60% of its yield. After the fifth month, water shortage does not lead to such heavy yield loss. If cassava is planted immediately after the first rainfall, the cassava will have higher yield\(^\text{30}\). However, in general, Tanzanian farming families tend to be late in their planting.

In addition, the small planting areas owned by farming families leads to a shortage of cassava supply. In other words, if demand for cassava materials supply consistently rises, farming families could benefit from increased production and enlarged planting area.

### 6.3.5 Growing Demand for Cassava in Urban Areas

In Tanzania, more than 80% of cassava production is for human consumption. However, cassava is still perceived as a poor man's food and until a few years ago, people with buying power in cities avoided eating cassava. During our field research, we discovered that finding cassava in restaurants in urban Dar es Salaam is difficult, except in special restaurants. In addition, few modern supermarkets sell cassava. Only the street markets to sell cassava. This indicates that cassava is not currently regarded as a marketable cash crop for urban consumers or for processed food material markets.

However, in recent years demand for cassava, especially for processed cassava products, is expanding in cities and cassava is gaining some attention as a potential cash crop, not only as a food for rural farmers.

There are several factors driving these trends.

First, the urban population is growing, just as national population is also expanding. Demand for foods has increasing, but maize and rice production volume have not expanded because of droughts, disease and pests. For example, in 2003, due to the spread of leaf rust disease, maize production dropped by more than 40%.

Secondly, grain imports, especially wheat, are rapidly expanding. In 2007, wheat imports

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\(^{30}\) Kulenbeka et al., (1998),
exceeded 810,000 tons with an import value of over 200 million dollars. Because international grain prices rose, the amount spent on imports rose, and some exporting countries put export embargos into effect; it became difficult to ensure sufficient volumes of imported grains. On the other hand, Tanzania’s two most important staple foods, cassava and maize have maintained consistently low prices. While world grain prices continue to be high, domestic foods like cassava and maize are strengthening their price competitiveness.

Finally, consumers are gaining awareness of the health benefits of cassava. For example, diabetes rates are rising in urban areas, and increasing numbers of urban Tanzanians believe that cassava is good for those with diabetes.

**Figure 57 Tanzanian Grain Imports**

![Graph showing Tanzanian Grain Imports](image)

*Source: FAOSTAT*

### 6.3.6 Cassava Processing Issues

Cassava can be processed for use in many industries, including livestock feed, alcohol brewing, bioethanol, textile industry, chemical, paper and lumber industries, in addition to food for human consumption. Cassava has a huge potential market. However, this market demand is for processed cassava products like dried chips, high quality flour and starch.

Currently a main food for urban Tanzanians is *ugali* made from maize flour. The *ugali* is made by mixing maize flour with water to produce a stiff porridge. *Ugali* can also be made with
high-quality cassava flour (HQCF).

As has been mentioned in this report previously, there are several reasons why it is difficult for cassava to be sold or distributed without first undergoing processing:

While fresh cassava can be kept for 2 years in the soil, once it has been dug up and exposed to the air, it will rot unless processed within two days. However Tanzania’s distribution infrastructure lacks a cold chain and thus there is no way to preserve cassava beyond the initial two days without processing. Processing is the only way to preserve cassava in Tanzania.

In addition, cassava has two varieties: sweet and bitter. Sweet cassava can be washed and is edible fresh. However bitter cassava contains the toxin cyanide and must be washed and fermented in order to remove the toxin and make it safe for human consumption.

Such processes take time and labor and urban Tanzanians are unlikely to consume more cassava unless the cassava is in the form of a convenient processed food easy for cooking, like maize flour or rice. From the farmers’ viewpoint as well, processing and then selling as a value-added cassava product is more profitable than selling fresh cassava.

In the world market, demand for cassava flour and cassava starch for feed and industrial use is increasing more quickly than the demand for cassava for human consumption. However in Tanzania, demand for cassava for human consumption is most pressing. The problem is that most cassava processing is done using traditional processing techniques. This requires a large amount of labor and time, and still results in low quality products with low food safety standards. Because of this, cassava does not penetrate into middle to high-income consumer markets in cities and thereby loses market opportunities. In other words, to increase demand for cassava in Tanzania, expansion of modern processing technologies and greater supply of high-quality cassava flour (HQCF) is needed.
Examples: Cassava Processing Failures

Since the 1980’s the Tanzanian government has attempted to add value to cassava by processing it into flour or starch but few cases have succeeded for various reasons. Some of the past failures include:

① In the late 1980s, the Tanzania government built a processing factory for cassava starch in Segerema Prefecture in the Lake Zone. However the supply of cassava could not keep up with the factory’s high processing capability. In addition maintenance costs were too high, and therefore it went out of business due to low productivity.\(^{31}\)

② The Lake Zone provides another example of a processing business failure. A few years ago, a farming family group in the Lake Zone received support to purchase cassava chipping equipment and a grater for cassava flour processing. This group was able to supply high quality cassava flour to a local supermarket, IMALASEKO. However, this farming family group was unable to maintain a consistent supply volume of HQCF and lost its ties with the supermarket. The main reason was the small size of the farming family group (10 members) and the fact that their cassava was damaged by CDM and other diseases, resulting in the lack of a continuous cassava supply for processing.

Other cassava processing businesses, such as one in Mkuranga\(^{32}\), have failed because of

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\(^{31}\) Match Maker Associates, 2007

\(^{32}\) Mnenwa, 2009
insufficient supply of cassava for processing, shortage of working capital, high fuel costs and lack of capacity and cooperation from farmers.

**Initiatives for New Processing Businesses**

Influenced by the past experiences of business failures mentioned above, in recent years, Tanzania has been promoting modern processing technologies like powered-chippers, grinder mills, and dehydrators for processing high-quality cassava flour. This study's field work observed pilot projects that have farmers form a group and directly engage in processing themselves, rather than simply selling their cassava to a processor. This allows small-scale farmers to cooperate as a group, undertake the processing work, and thus receive added value for their cassava. Although this initiative is still small scale, it is an interesting experimental initiative.

These projects are supported by the Tanzanian government, in cooperation with international organizations like FAO and the International Institute of Tropical Agriculture (IITA), research institutes like the UK's Natural Resource Institute (NRI) and various NGOs.

**Case Study: Value-Added Cassava Processing Project**

One interesting cassava processing project has been jointly undertaken by NRI and the Tanzanian Food and Nutrition Centre (TFNC).

NRI initiated this project on value-addition for African cassava, called the Cassava: Adding Value for Africa (C:AVA) Project. Its goal is improving livelihoods and income of 90,000 households including women and disadvantaged groups by constructing value chains for High Quality Cassava Flour (HQCF) in Nigeria, Ghana, Tanzania, Uganda and Malawi. The C:AVA project has been executed in Tanzania since 2009 with support from the Tanzanian Food and Nutrition Centre.

The project started as an experimental project for processing high quality cassava flour in southern Mtwara State. Mtwara State was chosen because it is the largest cassava producing region, with more than 20% of the national cassava production, and it is able to provide sufficient cassava material for processing. In addition, it is located only 500 to 600 km away from the biggest HQCF consumption region, Dar es Salaam, with year-round access by road which would enable shipment to Dar es Salaam all around the year.

There are 20,000 farming families in the target area and 1008 of those families participated in this project. The farming households are divided into 36 farming family groups with each farming family group comprised of more than 20 farming families. Most farming families have about 2 to 4 acres of farmland and usually cassava is intercropped with maize, beans, peanuts and other
crops. For processing there were 18 processing groups established and each processing group receives cassava from 2 farming family groups.

The C:AVA project supports the installation of processing equipment for each processing group. Processing started in July 2009 and 15 tons of high quality cassava chips were produced. This is far below 2010’s target of 180 tons mainly because the project could not secure buyers.

Currently, the project supplies products to Power Foods, a milling company and distributor whose headquarters is in Dar es Salaam. Power Foods buys at 700 to 750 TNS/kg, but the wholesale price of cassava flour re-processed, packed and branded by Power Foods is 1500 TNS/kg and at supermarkets, the product is sold for 1800TZS/1kg.

Power Foods is a private milling company founded in 1993 and mainly engaged in milling of finger millet, sorghum, cassava, soybean and maize. It is currently processing and distributing 1 ton of cassava flour per week. Distribution destinations for cassava flour include wholesalers, supermarkets and other retail stores, but main buyers are supermarkets and demand at supermarkets is increasing. Power Foods brand cassava flour is more expensive than wheat flour or maize flour due to its brand power, which signifies that it is safer than others.

For reference, as of November 2010, cassava flour price at retail was 1800TZS/kg, maize flour was 1500TZS and rice is 2400TZS/kg at a large supermarket at Dar es Salaam. High quality cassava flour may greatly increase its market share if it can drop to the same or lower price as maize flour. However, interviews with TFNC and in Mkarga Prefecture stated that a cassava chip selling price of 700 TZS/kg brings profit to farming families.
Prior to this C:AVA initiative, many regions had started experimental processing businesses based on farming family units during the period of 2003 to 2005. For example, in Bungu village in Rufiji region, 150 km away from Dar es Salaam, the Sururu Farmers Cooperative started an experimental cassava chip production factory. The cassava chips produced in this factory received high praise from wholesalers in the Dar es Salaam region.

However small factories face common challenges including ① seasonally inconsistent quality of the cassava raw materials brought in for processing ② water supply ③ insufficient market access ④ need for peeling machines, because peeling cassava is labor intensive using only hand and knife ⑤ sun-drying and processing are impossible in rainy seasons.

Mtimbuani village in Muheza region, 370 km south of Dar es Salaam, also constructed an experimental cassava starch production factory in 2004 under the IITA/CIAT Starch Project with support under it from the NRCTR Program TFNC and the Muheza Local Government under. Other cases are experimental cassava flour production factories in Zogoware village in Kibaha region and Chisegu village in Masasi region. These experimental plants had the advantage that they could be run on a small investment of several thousand dollars. On the other hand, they have faced the same challenges that Bungu village has. Each region is striving to solve these problems.

**Challenges in Promoting Cassava Processing**

There is great potential for processed cassava products like cassava flour. However, in order to supply high quality cassava flour at stable prices, Tanzania must overcome several issues.

First, it is necessary to expand and stabilize the supply of cassava raw materials. Processors are often faced with the problem of insufficient raw material supply. However to insure stable supply,
the main cause of low supply - damage by diseases and pests - must be dealt with.

Secondly, there needs to be clean water supply and an effective drying method to improve the quality of cassava products, as well as processing efficiency. The manager of a cassava chip processing factory in Mkuranga Prefecture, 40km away from Dar es Salaam, mentioned that the unstable supply of clean water was the main reason for the low quality of processed cassava products there. In drought years, this insufficient supply of high quality water hinders processing cassava even more. As far as processing efficiency, peeling cassava is generally done in a labor intensive manner by hand and knife; a peeling machine is required to improve efficiency in this aspect of processing.

Third, there is the issue of narrow sales channels. In our field research we visited two cassava flour processing facilities in Mkuranga Prefecture. One of the two could not find a distribution channel for their processed cassava flour, and the flour was piled up in a store room; they had stopped processing for now. In Mtwara, the volume of cassava flour produced was less than one tenth of the planned volume because, like Mkuranga, they could not find sales channels. To develop sales channels, there needs marketing improvement such as development of distributors and wholesalers as well as and as sales representatives.

Fourth, processing facilities need to expand their size so they can take advantage of economies of scale. In recent years, Tanzania has imported several hundred thousand tons of wheat and the imports are expected to continue to increase. In addition, the Tanzanian government is currently studying the possibility of adopting a policy of mixing approximately 10% cassava flour into wheat flour to cut demand for imported wheat. If this policy is adopted, the cassava flour market will greatly expand, although Tanzania is currently still facing a lack of a stable and continuous cassava flour supply.

Finally, the establishment of a domestic distribution infrastructure is essential. Currently, Tanzania has trouble even transporting cassava produced and processed in Mkuranga Prefecture (not far from Dar) to markets. Transport and distribution is also costly. As a result, big markets like Dar es Salaam in a coastal region find that importing products is less costly than purchasing domestic products. To compete with imported products, domestic products like cassava must establish solid domestic distribution infrastructure and reduce transportation costs.

6.4 Cassava Producing Area Case Studies: Lake Zone and East Zone

This section will introduce two cassava production and processing cases one in the Lake Zone and one in Mkuranga District in the East Zone where the research team did intensive interviews. Both zones are main cassava producing areas.
6.4.1 The Lake Zone

Tanzania has seven agricultural regions and each region has an Agricultural Research Center. Ukiliguru Agricultural Research Center is the center that oversees the Lake Zone around Lake Victoria and is located 40 minutes by car from Mwanza, the second largest city in Tanzania. The center has about 200 staff.

The Lake Zone’s cassava production is the largest in Tanzania, comprising 37% of total Tanzanian cassava production. The Lake Zone is followed by the southern region (28%) and the coastal region (20%). Cassava yield in the Lake Zone is 10 tons/ha, almost equal to Tanzania’s national average. With a few exceptions, farmers practice intercropping and also produce maize, sorghum, sweet potato, yam and banana. Some regions also produce rice. There is some slash and burn cultivation, but crop rotation is also practiced.

The Lake Zone’s cassava is composed of 65% bitter cassava and 35% sweet cassava. Bitter varieties are eaten in the form of flour and while sweet varieties are eaten uncooked. Cassava varieties along the coastal region are mostly sweet varieties.

Cassava Planting Cycle in the Lake Zone

The Lake Zone has a rainy season from November to early May, a dry season from the middle of May to November, and a short dry season in February. Rain is heaviest from March to May. Cassava is harvested all year round and the most productive season is around the end of the dry season. Therefore, planting is mostly done from November to January at the beginning of the rainy season. Cassava harvested in the dry season to be dried and stored.

Cassava Processing and Distribution

Cassava processing is not very commercialized yet. There are supermarkets in Mwanza and some handle cassava flour. Roads to the capital city Dar es Salaam have been upgraded recently but transporting cassava from Lake Zone to Dar es Salaam is still rare. There is no export of cassava across Lake Victoria, but maize was exported to Rwanda and Burundi when these neighbors suffered food shortage.

Profiles of Cassava Producing Households

These three families are examples of cassava farming households in the Lake Zone.

Farming Family #1
This farming family plants cassava along a road. There are 15 family members and the household's agricultural land is 2.5 ha. They produce cassava, maize and beans. The cassava yield is 5 to 6 tons/ha. They sell a quarter of their cassava production volume. The cassava for sale is that which was harvested in the dry season and then dried. Selling price to local collectors was 18,000 shilling/sack (70kg).

Farming Family #2

This 11-member family conducts relatively large scale farming on 8 ha of agricultural land. They had been planting cassava on 4 ha but suffered disease and the cassava yield dropped as low as 3.5 tons/ha. A quarter of their cassava production was sold and the selling price was 18,000 shilling/sack. They had a food storage hut on their premises and kept dried cassava and rice.

Farming Family #3

This 10-member family had a tiny 0.8 ha of agricultural land. Cassava cultivation covered 0.4ha. A quarter of their cassava production was sold, and they produced maize, beans, rice, peanuts in addition to cassava.
Milling Factory (in town)

A milling company is located on the way to a village. It had processing equipment and milled cassava (dry) or maize for a fee. Milling fee was 500 shillings/12kg for cassava and 400 shillings/12kg for maize. Cassava flour was sold there at 32,000 shillings/100kg.

6.4.2 Eastern Zone, Mkuranga District

Mkuranga District is 40 km away from Dar es Salaam, and has a population of 232,000. There are approximately 43,000 families, 40,000 of them are farmers (30% are youth). The scale of the farms is small, mostly between 0.5-5 hectares. There are 109 villages under the provincial administration.

Cassava is a traditional crop in Mkuranga District, and it is also one of the main staple foods. Within this region the main staples are cassava (30%), maize (30%) and rice (40%). During the drought in Tanzania in 1995, many regions asked the government for subsidies to purchase grain. However, thanks to cassava, the Mkuranga region did not lack food and did not ask the government for help.

Also, in recent years, cassava is not only staple food for farmers, but has also begun to become a cash crop. The traditional cash crops in the region are cashew nuts, coconuts and fruit. However, to provide more cassava for use as a cash crop, there are plans to increase the planting area from 340,000 ha to 51,000 ha; indicating there is still plenty of arable land available in the region.

From about 5 to 6 years ago, the high-yield and disease resistant “Kiroba” cassava variety has been used. The yield per hectare is 5 MT, which is a dramatic improvement over the past (1.5-2 MT per hectare). Planting is concentrated into two periods - during the short rainy season in November and December and during the longer rainy season in May and June. Harvesting can
be throughout the year, but the main harvesting period is between June and August.

**Mkuranga Cassava Processing Facility**

VECO, a NGO from Belgium, is conducting a project to promote cassava processing in Mkuranga District. They would help organize the farmers into groups of 25 member, and then instruct and support them in cassava processing techniques. There are a total of 39 farmer groups and 8 groups have already set up processing facilities. The processing facility is sponsored by Tanzanian government's District Agricultural Development Plan (DADP) funding. Since 2006, agriculture budgets have been transferred to the provincial level in line with decentralization regulations.

In these processing facilities, fresh cassava is dried and processed into chips. Each facility can only process 5 MT of cassava annually - a small quantity. Another problem is the lack of clean water, without which the cassava chips turn yellow easily.

This year, 24 MT of chips have processed among the 8 groups, and 14 MT have been sold. The remaining 10 MT has yet to find a buyer. The retail price for the chips (without packaging) is 600-800 TZA (1 TZA=18.0251 JPY as of October 11th, 2010) per kilogram, and 600-1000 TZA (for packaged chips). Farmers are able to profit from this price.

Fresh cassava is inexpensive in Mkuranga. In the local market, it cost about 500 TZA for 4 to 5 cassava tubers. It would cost 5000-6000 TZA for a 50 kg bag, and 50,000-70,000 TZA for 2 MT going through a middleman. During Ramadan, cassava is at its most expensive - 300,000 TZA for 2 MT.

To improve quality and sales, the farmer groups would need to conduct good marketing activities to find buyers, and to improve the quality of the chips by accessing cleaner water. There are about 100 staff working in the agriculture promotion center in Mkuranga District, and about 60-70% are actively working directly in the villages.
**Misasa Village, Mkuranga District**

Misasa is an example of a village within Mkuranga District. There are 468 households in Misasa village, 1768 residents (835 men, 933 women). The labor force consists of 706 people, of which 354 are men and 353 are women.

The average planting area for each household is 2 hectares, and about half of it used for cassava cultivation and the remaining is split equally between maize and rice. The cash crops are cashew nuts and pineapples, but in recent years, cassava has become a popular cash crop.

About half of their cassava production is used for household consumption and the remaining half is sold. Farmers do not sell fresh cassava in the town themselves; instead middlemen will come in trucks to Misasa to purchase cassava. During the harvest season in May and June, about 5 trucks will come every day. The trucks however, do not come in other periods of the year.

Misasa village is also participating in the VECO farmer group project mentioned in the previous section, and they have been waiting for the machine for processing chips to arrive. Currently, since they do not have a dedicated building for processing, they process directly in the field. When they have a buyer, they bring their tools out into the field and process the quantity based on the request of the buyer. Farmers' homes are used as temporary storage facilities.

They can process 250-300 kg of cassava chips at a time. In 2010, Misasa only processed three times, which produced 750 kg of cassava chips. During the dry season, 3 kg of cassava could be processed into 1 kg of chips. The retail price for cassava flour is 800 TZS per kilogram, and for cassava chips it is 600 TZS per kilogram.

### 7. Conclusions: Challenges for the Development of the Cassava Industry

#### 7.1 Conclusions on the Cassava Industry in Mozambique

When Mozambique's long civil war finally ended in 1992, its economy struggled to rebuild infrastructure and damaged roads and face the reality that agricultural technology remained at an extremely low level.

Nevertheless, after the war ended, planting and harvest of cassava, one of Mozambique's most important crops, increased due to improvements in yield. However despite cassava's importance, the government has not been so active in its promotion. Thus, cassava has remained a subsistence crop for Mozambican farmers, and accordingly, there has been little progress in merchandising and value-addition. Cassava products were generally unavailable or
out of stock in urban supermarkets and bakeries visited during our field research.

All in all, Mozambique’s cassava industry is relatively undeveloped.

In Mozambique, a report entitled “Cassava Development Strategy for Mozambique (Sub-sector Strategic Study on Cassava)” was written in 2007 in an attempt to make a comprehensive analysis of the cassava industry. The report did a comparative study on production, processing, distribution and governmental policy between Mozambique and Nigeria. Nigeria was used as an example as it has a far more developed commercial cassava processing industry. The evaluation of Mozambique’s cassava industry can be summarized as follows:

- **Production:** Cassava remains a subsistence food in farming villages. The low yield rate is attributable to poor agricultural techniques.

- **Processing:** Cassava is processed mainly by farmer manpower. Processing machines are still not prevalent. The processed cassava products are not high in quality.

- **Distribution:** 70% of cassava production is used for household consumption. A portion of the cassava is available for consumption in urban areas, but the market system is disorganized with unstable prices.

- **Governmental policy:** There is virtually no government policy toward the cassava industry and policies towards cassava research, government projects and private sector involvement are weak.

However, while the cassava industry in Mozambique is still at a weak stage, field research in late 2010 revealed that the cassava industry is changing rapidly and effort is being made for the development of the cassava industry.

For instance, in Nampula, the northern area of Mozambique with the highest cassava production, the governmental body, CEPAGRI (Centro de Promoção da Agricultura: Center for Promotion of Agriculture) promotes activities to grow the cassava industry. With this encouragement, a few business enterprises have started merchandising cassava products. With the “Cassava Development Strategy” report opened to the public, and with an effort for the development of the cassava processing industry taken up by the media, an awareness of cassava has been increasing.

However, this favorable movement has just begun. Processing machines are not yet in common use, distribution networks must be formed and capacity must be built all along the supply chain.
7.2 Conclusions on the Cassava Industry in Tanzania

Tanzania claimed its independence 10 years earlier than Mozambique and like Mozambique, Tanzania followed a socialist path after its independence. However, unlike Mozambique, the political situation in Tanzania was fairly stable. The economy did suffer in the 1980’s but since the mid 1990’s, the economy in Tanzania has been steadily growing and they have enjoyed political and social stability. Nevertheless, due to slow industrialization, 70 percent of Tanzanians are engaged in agriculture with poverty level incomes.

Cassava is the second staple food behind maize and is produced in large quantities, and yet it is still regarded as a subsistence crop for peasants, by many urban residents. This is one factor in its slow development of a commercialized cassava industry.

Tanzania is one of the six countries that were chosen as survey targets of the COSCA project. In “The Cassava Transformation (2002)” summarizing the outcomes of the project, cassava in Tanzania is ranked at the lowest stage of industrialization.

In the COSCA report, the status of the cassava industry in Tanzania as of the 1990’s was evaluated as follows:

- **Production**: Cassava was produced mainly for rural farmers’ household use. Farm-work like weeding and harvesting was done by manpower from within the family.

- **Processing**: Cassava was partly processed into powders and pastes. However the quantity was small, with the processing based on manpower.

- **Governmental policy**: The government encouraged cassava production for emergencies such as drought, and recommended cassava variety improvement as a way to combat pests

This 2002 evaluation was based on a survey conducted by the COSCA project between 1987-98. Since then, over 10 years have passed, and our survey found that the Tanzanian cassava industry has been changing considerably. In recent years, the economy of Tanzania has been growing fairly well and our survey saw improved road conditions and encountered farmers who were trying to position cassava as a cash crop and intended to increase production and to enlarge the processing industry.

The Tanzanian government too has increased its support. Two cassava focused reports have been released: “Cassava Value Chain Analysis” (2007, with Lake Zone as the target area) and “Cassava Chain in Tanzania” (2009, with Mkuranga as the target area). The government has
already started processing projects along the south coast area and in Mkuranga, as mentioned in the previous chapter.

However, like in Mozambique, these activities have just begun and will need much further support to be successful. The demand for cassava is not growing fast enough, distribution channels are not well enough established, and the production is not increasing as quickly as expected. Cassava diseases and pests are a big factor in this slow production expansion.

### 7.3 Challenges Facing the Tanzanian and Mozambican Industries

This section will outline the main issues facing the cassava industries in Tanzania and Mozambique which are impacting the slow development of the cassava industries. We will discuss four aspects: production, processing, distribution and governmental policy. The challenges are largely common to both Mozambique and Tanzania, and therefore, they will be discussed together.

**Production**

**Low Volume and Inconsistent Harvest**

Cassava yield is 4-7 MT/ha in Mozambique and 6-9 tons/ha in Tanzania. Yield is unstable and is lower than the 13 MT/ha world average and 12 tons/ha in Nigeria. The reason for the low yield is slow dissemination of high-yield varieties, spread of pests, little use of fertilizers and double or triple cropping.

Farmers cannot increase their supply of cassava to urban consumers or provide it consistently due to low volume and unstable harvests. This not only hampers the growth of the processing industry but also the establishment of stable and reliable distribution channels.

**Spread of Pests**

The length of time farmers let land lay fallow has been shortening due to an increase in the population and a need to use land more intensively. As a result, the spread of cassava pests is a big problem in both Mozambique and Tanzania. These pests affect the production volume, resulting in farmers unable to supply raw cassava in sufficient quantities to processors. Another problem is that pests worsen the quality of the cassava tubers themselves and accordingly, it becomes difficult to produce cassava products of high quality.
Low-tech Agricultural Practices

In both countries, planting, weeding and harvesting is done by hand, with the use of simple farming tools. As agricultural machines are far from prevalent, the productivity is very low. Limited use of fertilizers and agricultural pesticides also leads to low yield.

Processing

Shortage of Raw Cassava
The small and unstable harvest makes it difficult for the processors to procure cassava at a sufficient and constant quantity. In addition, demand for cassava for household consumption is on the increase on account of the increase in the population and as a result, farmers cannot always afford to sell their cassava to the processors.

Cassava can be harvested throughout the year, but it is best harvested during the dry season in order to let it dry by sunlight. Therefore, the harvest season is limited, and this makes it difficult for processors to consistently operate their processing factories. Under these risky circumstances, processors remain indecisive about making further investments in processing.

Shortage of Processing Machines
A commercial cassava processing industry can only be developed with the help of processing machines, moving away from inefficient family hand labor.

In both Tanzania and Mozambique, however, nearly all cassava is peeled and shredded by hand and dried by sunlight without use of machines. There are several reasons that processing machines are not in popular use; processors have no incentive to use them because of the small volume of cassava production; there are a few processing machinery manufacturers; processors are short of money; and bank financing for machinery investment is not adequate due to high interest rates.

Furthermore, there are vast areas of rural Tanzania and Mozambique not yet served by electricity, so electric powered machinery cannot be used without a generator.

Shortage of Clean Water
For processing cassava, water is required for washing and for extracting starch. In both Mozambique and Tanzania, however, one issue is that clean water cannot be secured in sufficient quantities because the water supply infrastructure is still basic or undeveloped. Consequently, water from wells and rivers as well as rainwater is used, but nonetheless, water is in short supply during the dry season. Without clean water, the quality of starch and cassava products will be low.

**Shortage of Business Resources**

Any new and growing industry needs business leaders and pioneering companies to pioneer business models. There are almost no such leaders in the cassava industries in either country because there are few who are knowledgeable about cassava products, and because there is no guarantee of high returns from cassava investment. There is no institutional system to support cassava business development.

**Distribution**

**Weak Infrastructure**

Except for highways, the poor road conditions in both countries make transport and distribution of crops very difficult. There are very few paved roads in rural villages, and vehicles occasionally cannot access the villages in the rainy season. In both countries, bicycles are commonly used for transportation of goods to towns and cities. Trains are not a convenient option due to a limited number of rail lines and very limited service.

**Under-developed Distribution Network**

While there are large-scale supermarkets in the metropolitan areas in both countries, in smaller cities there are very few supermarkets, and foods are available only at small stores or on the roadsides. There are very few stores that consistently stock cassava products (there are some stores which sell dried cassava). This poor distribution network makes it difficult to expand the processing industry and link supply with urban demand.

In connection with such disadvantageous distribution circumstances, product specifications remain unfixed and product quality remains unstable.
Low Prices

Because the cassava market is undeveloped, little information is available for rural farmers on the prices of cassava in towns and cities. As a result, rural farmers tend to sell their cassava at very low prices.

While use of cell phones is making price information easier to communicate to rural areas, most farmers are not organized well enough to negotiate with merchants or processors about prices. The fact that harvest and sales are confined in the dry season also means farmers have less bargaining power.

Governmental Policy

Few Policies Related to Cassava

As cassava has not been regarded as cash crop, the governments of Tanzania and Mozambique have not made cassava a priority. The spread of new cultivation techniques had been insufficient, and the development and dissemination of new varieties has been slow.

However, recent field research shows that this situation has been rapidly improving.

Incomplete Financing System

For the development of the cassava industry, financing is required for investing in processing machines and to develop new products. However, the image of cassava is still not so positive, making private banks very careful in financing cassava-related businesses. As a result there are not enough financing options for those in the cassava industry. In both countries, furthermore, the high interest rates on loans that are available severely impacts on the processors’ earnings.
8. **Recommendations**

The main recommendations for measures to address the issues outlined in the previous chapter can be summarized as follows:

(1) **Production Increase and Stabilization**
To enable the cassava industry to grow, cassava farmers need to produce cassava at a quantity beyond household consumption use, so that it can be supplied consistently and stably to the processing industry.

To do this, it is necessary to develop and disseminate high-yield varieties to increase production volume and to improve the productivity through improvement of production technology.

(2) **Intensification of Pest Control Measures**
The major factor in the insufficient supply of raw cassava is the spread of pests, and therefore, measures for controlling pests need to be intensified. To achieve this goal, the development and dissemination of pest-resistant cassava varieties should be a priority.

(3) **Development and Popularization of Processing Machines**
There are an insufficient number of processing machines in use in both countries, and therefore, cassava is processed mainly by hand. To make processing machines more commonplace, manufacturers engaged in machinery development need to be supported and education in the operation of processing machinery needs to be fostered. In addition, a financing system to facilitate the installation of machines and a maintenance service support system for trouble-shooting machinery malfunctions needs to be established.

(4) **Establishment of Distribution Routes**
In both countries, even where cassava products are manufactured, the production rate in the processing factories is low, because distribution routes are not yet established. Meanwhile, urban consumers who go to stores to buy cassava products sometimes cannot find them as they are out of stock.
To improve these unfavorable circumstances, distribution routes need to be established, and in parallel, product specifications need to be fixed in an attempt to begin to establish standards and brands.

(5) Fulfillment of Infrastructure
Poor infrastructure is impacting the development of a cassava processing industry. In both Mozambique and Tanzania, road conditions in rural areas are poor, though they have been gradually improving. As a result, the transport and distribution of commodities is still restricted to limited areas. Another problem is that the quality of cassava products is not stable because high-quality, clean water cannot always be secured.

To improve this situation, the governments should prioritize investment for the improvement of road and water systems. In addition, expanding the electricity grid to villages interested in establishing mechanized processing facilities and providing water for agricultural use will also support the development of processing facilities and adequate raw materials to supply the processors.

(6) Strengthening Cassava Research and New Variety Dissemination
Both Mozambique and Tanzania have institutions for agricultural research and agricultural extension, supported by international organizations and NGOs. However, for developing a cassava industry, these are not yet sufficient. These institutions need to be strengthened to undertake more intensive breeding research and extension work to educate producers on the use of new cassava cultivation techniques.

(7) Intensification of Support of Processors
In both countries, support for cassava processors has been improving over the last several years, and new business initiatives have started. Nevertheless, these initiatives are in their initial stages, and need to be grown to a larger scale. The industry needs leaders and business models to learn from. To attain this objective, it will be necessary to intensify technical support schemes for processors, which could include giving subsidies to cover start-up costs, providing new types of financing loans and capacity building for people throughout the processing supply chain.

(8) Organizing Farmer Cooperative Societies
As value-added cassava processing businesses develop, those that become leaders will those enterprises that already have the technology, know-how and sales channels. Smaller scale farmers with little experience can be left behind or not benefit from the growth of the industry.
Organizing cooperative societies for cassava farmers can help avoid such a problem. Support can be offered to the rural cooperative societies so that producers can buy processing equipment and the cooperatives can start their own processing businesses.

(9) Integrating Cassava into Japan’s ODA Strategy

Japan’s foreign aid to Africa related to agriculture has so far been centered primarily on rice cultivation and irrigation systems. Cassava has not had high priority within Japan’s foreign aid policy. In Japan, there are very few cassava researchers, and there is very little literature in Japanese language on African cassava. It is assumed that Japanese officials involved in ODA policy have no deep understanding of cassava.

As this study has revealed, cassava is such a critical crop in sub-Saharan Africa that Japan cannot afford to neglect it, whether looking from the aspect of economic development, poverty alleviation or food security.

Industrialization of cassava has already begun in many parts of Africa and Japan needs to correctly understand cassava’s positioning in African economies and societies in planning its assistance to Africa. With this in mind, Japan must become more knowledgeable about cassava, and to deepen its understanding of the food and agriculture dynamics in target African countries.

For example, in Mozambique, the “Mozambique Tropical Savannah Agricultural Development Project under Japan-Brazil Tie-up” (commonly called “Pro-Savannah”) has started in the northern part of Mozambique under joint collaboration between Brazil, Japan and the Mozambican government. This is Mozambique’s top cassava production area. Going forward with the Pro-Savannah project, it is important to focus attention on cassava and to have a program on cassava included within the project.

In Tanzania, Japan’s ODA programs could focus on the Lake Zone and the southern cassava production areas, which would have a direct relationship to poverty alleviation and increased food security.
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