

RWANDA

CASSAVA SUB-SECTOR ANALYSIS OUTLINE

DRAFT REPORT OF FIELD SURVEY FINDINGS

JAMES M. MBWIKA  
IITA CONSULTANT

MAYALA  
CASSAVA PROGRAMME OFFICER – ISAR

OCTOBER 2001

## LIST OF ACRONYMS

COSCA	Collaborative Study for Cassava in Africa
NARO	National Agriculture Research Organization
EARRNET	East Africa Root crops Research Network
IITA	International Institute of Tropical Agriculture
KARI	Kenya Agricultural Research Institute
FOFIFA	Foibe fikarohana ho fampandrosoana ny eny ambanivohitra (recherché scientifique): Centre National de le Recherche Appliquee au
FAO	Food Agriculture Organization of United Nations
I'NERA	Institut National pour l'Etude et la Recherche Agronomique
DRC	Democratic Republic of Congo
ISAR	Institut des Sciences Agronomiques de Rwanda
ISABU	Institut des Sciences Agronomiques de Burundi
NRI	Natural Resources Institute
CAP	Common Agricultural Policy
CGM	Cassava Green Mite
CMB	Cassava Mealy Bug
EU	European Union
MT	Metric Ton
Kg	Kilogram
Ha	Hectare
NGO	Non-Governmental Organization
UNDP	United Nations Development Programme
SOH	Seed of Hope

## TABLE OF CONTENTS

LIST OF ACRONYMS .....	2
Executive Summary .....	1
PART I SUB-SECTOR REVIEW .....	4
Introduction .....	4
Cassava Production in Africa.....	4
Cassava Production Trends in the East and Central Africa Region.....	5
Sub-sector Advances and Constraints in the Region .....	7
WHY SUB-SECTOR ANALYSIS .....	9
APPROACH .....	10
CASSAVA PRODUCTION IN RWANDA .....	11
Cassava Research.....	11
Cassava Production Trends.....	12
Food Production Situation in Rwanda 1990 –1999 .....	13
PROCESSING.....	16
MARKETING .....	16
UTILIZATION .....	18
Use of Cassava In Animal Feeds, Manufacturing Industry and Food Industry in Rwanda.....	20
POLICY AND TECHNOLOGY ENVIRONMENT.....	20
Stakeholder Analysis .....	21
PART II SURVEY RESULTS .....	22
Methodology.....	22
Field Data Collection .....	23
RESULTS AND DISCUSSIONS .....	24
PRODUCTION .....	24
Farming Systems.....	24
Main Constraints.....	26
Opportunities.....	26
PROCESSING.....	27
Consumer Preference for Processed Products .....	27
Constraints in The Cassava Processing.....	27
Opportunities.....	27
CASSAVA MARKETING .....	28
Gender Analysis of Clients .....	29
Cassava Marketing Constraints.....	29
UTILIZATION .....	30
Human Utilization.....	30
Utilization in Animal Feeds Industry.....	30
Industrial Utilization .....	31
CONCLUSION .....	32
RECOMMENDATIONS.....	33
References.....	35

## EXECUTIVE SUMMARY

This report presents information on the status of the cassava sub-sector in Rwanda. It is based on information gathered through literature review, key informant interviews with stakeholders and researchers within the network countries and field surveys covering farming households and cassava marketing agents. The purpose of the sub-sector review is to gain an understanding of what is the status of the cassava industry in the country in order to identify; constraints in the sub-sector, opportunities for immediate investment and research programming, and necessary technological and policy reforms to improve the performance of the sub-sector. The report also provides a stakeholder analysis and how the different stakeholders have collaborated in the development of the sub-sector. It proposes necessary structural and organizational restructuring that would improve the effectiveness of interventions in the sub-sector.

The study is part of a region wide cassava sub-sector analysis for all the EARRNET member countries (Kenya, Uganda, Madagascar, Rwanda, Burundi and DR-Congo). It is being undertaken in collaboration of National Cassava programmes.

The objectives of the study are;

- Review and update available information on the sub-sector in consultation with sub-sector stakeholders to provide valid, reliable and timely benchmark information on cassava production to consumption system for effective implementation of EARRNET activities,
- Study the various components of the Production to Consumption System (PCS), identify constraints, assess needs, determine areas of technological, institutional, organizational and policy opportunities and purpose interventions to enhance food security, income generation and socio-economic growth and development,
- Propose research development programmes, coordinate introductions, adaptation, development and dissemination of end-user preferred market oriented technologies for a more efficient and equitable sub-sector,
- Highlight access, equity, sustainability and gender issues for technical options, assess costs and returns of technologies (existing and new) and the potential for increased cassava trade through increased production, utilization and commercialization.

Cassava is the staple food for the most nationals of the EARRNET countries. It is the principle food crop in DRC and the second most important food crop in Uganda, and Madagascar. In Burundi and Rwanda it is the third most important food crop after banana and sweet potato. In Kenya it is the second important food crop among some communities in the Coastal and Western region of the country. In some countries both roots and the leaves from cassava form an important diet. Cassava has potential to contribute towards alleviation of food insecurity and in contributing to incomes in most EARRNET countries.

Cassava was first introduced in Rwanda in 1930 by Belgians (UNDP, FAO, Dec. 1992). In 1987 production was estimated at 498,653 tons from 53,745 hectares and a yield level of 9,278 kg/ha. It is the main source of calorie for an estimated 11% of the population (UNDP/FAO, Dec. 1992).

The level of cassava production in Rwanda in 1999 was estimated at 316,934 mt up from 188,182 recorded in 1998 (FAOTSTAT, Web2000). With yields ranging from 2.4 mt/ha to 3.3 mt/ha between 1990 and 1999, Rwanda has recorded the lowest cassava yields in the region. The yields are far much lower than those recorded in 1987.

Although cassava is primarily produced for food crop in the country the surplus forms an important source of income to the farming community and small-scale traders. It is mainly sold in form of chips or flour. Fresh cassava and leaves are also sold, especially in markets in Kigali.

Cassava is mainly grown as an intercrop. It is intercropped with beans, maize, bananas and in some areas with coffee. In some regions like Gitarama, the crop is grown as a mono-crop. Depending on the variety and the region the crop reaches maturity within 7 – 12 months.

Women play a significant role in the production, harvesting, processing and marketing of the crop and its products. Male youth are also active in processing and marketing of cassava chips and flour.

Processing technologies are largely traditional leading to limited range of finished products from cassava. The technologies are also labour and time consuming and result in low quality products. The technologies do not assure product quality consistency and economies of scale.

In the area of production, the Cassava Mosaic Disease (CMD) poses the greatest challenge to farmers, researchers and cassava development agencies in the country. Other problems include, cassava mealy bug, and cassava green-mite. Despite efforts to contain the devastating effect of the virus in the last decade, its effect continues to increase leading to decline in cassava production in most countries in the region. The effects of the mosaic disease have spared none of the countries in the region. In Rwanda the cassava programme in collaboration with EARRNET and IITA are introducing disease resistant varieties. However, the capacity to multiply and distribute sufficient planting material is limited.

Lack of planting material, land and low rainfall in some areas has also been indicated as factors contributing to low cassava production in the country. The narrow range of processed products and poor processing technologies affect the commercialization of the crop in the country. Cassava is also facing competition from other starch sources such as sweet potatoes and maize in the country as a food crop.

At the national level, stakeholder collaboration in addressing cassava problems is limited. Regionally Rwanda cassava programme collaborates with EARRNET and IITA in the areas of germplasm development and exchange, training, technical assistance and information exchange.

Based on literature review and stakeholder consultations, it appears cassava does have a development opportunity in the country, especially in addressing food security problems currently facing the country. The biggest challenge to the development of the sub-sector in the country at the moment is the cassava mosaic disease and lack of clean planting material.

Improved processing technologies are also lacking, although efforts by ISAR with support from IITA are currently in place to introduce improved processing technologies.

To achieve this potential, investigation need to be done to establish the extend of the cassava mosaic disease, level of adoption and impact of new disease resistant varieties. Investigations into sustainable and efficient methods for multiplication and distribution of clean planting material need also to be done. Efforts to transfer improved processing technologies should also be enhanced. This should be in addition to broadening the range of processed products. Potential new products include; baked products (bread, cakes and biscuits), commercial milling of cassava flour and baby weaning foods.

In terms of stakeholder collaboration, there has been no evidence of internal structures of the different actors in the sub-sector to work together in promoting the sub-sector. There are a number of NGOs involved in some way in promoting cassava in the country, but their efforts are not coordinated with those of other agencies.

There is need therefore for ISAR and other interested parties to initiate a cassava working group. Such a group can start with informal meetings, first to appraise itself with the status of the sub-sector, discuss what each of the agencies is doing, agree in what direction the sector should develop in the next en years and draw up a joint action plan to help achieve that goal. This will ensure that duplication of activities by different agencies are avoided, ensure efficient and focused allocation of resources, put in place a monitoring and reporting system and share as much information as possible on institutions experiences and lessons.

## PART I SUB-SECTOR REVIEW

### Introduction

Cassava (*manihot esculenta*) was introduced to West and Central Africa from South America by the Portuguese more than 400 years ago. It is now grown throughout sub-Saharan Africa and is considered second in importance to maize as a human staple, accounting for more than 200 calories per day per person. Estimates show that about 160 million people or 40 per cent of the population of sub-Saharan Africa consume cassava as a staple food (Nweke et al. 1988).

Whereas in South America and Thailand cassava is increasing being grown for industrial use, in Africa it is largely grown for human consumption.

### Cassava Production in Africa

Cassava is today one of the dominant starchy staples in the diet of people in Sub-Saharan Africa. Although it is grown in every country its cultivation is concentrated in humid tropics.

Africa's production of cassava is projected to grow at 2.9 per cent per year, which will raise production to 114 million tons by the year 2005. The bulk of the increase is expected to come from the Democratic Republic of Congo (DRC), Ghana, Madagascar, Mozambique, Nigeria, Tanzania and Uganda. Demand for direct consumption is expected to reach 85 million tons in the year 2005 with a growth rate of 2.8 per cent. In Table 1 below production estimates for Africa in the last decade are presented. The data shows a steady increase in production, from 79.35 million tons in 1991 to an estimated 92.12 million tons in 1999. The increase is attributable to increase in area under the crop and also improved yields per hectare.

Table 1 Production of Cassava in Africa 1991 – 1999 in MT of Fresh Tuber Equivalent

Year	Area (Ha)	Production (MT)	Yield (Kg/Ha)
1991	9,882,080	79,348,242	8,030
1992	10,163,363	81,868,845	8,055
1993	10,044,132	82,678,292	8,232
1994	10,323,385	83,816,343	8,119
1995	10,467,699	85,192,286	8,139
1996	10,225,193	84,587,126	8,272
1997	10,117,313	84,760,847	8,378
1998	10,797,101	90,013,262	8,337
1999*	10,823,616	92,119,233	8,511

Source: FAOSTAT Web2000.

Note:\* Estimate

The use of cassava for animal feeds in the continent is expected to grow at an annual rate of 1.3 per cent to the year 2005 largely due to expansion of processing facilities to meet any potential growth in domestic and export markets. Other uses of cassava (e.g. starch etc.) in Africa are expected to rise at even higher rates: 5 per cent in Benin, Ghana, Kenya, Zambia and Zimbabwe.

With increasing demand for cassava due to; population growth, changes in food preferences and increase in industrial needs in the continent, sub-sector operators will be confronted with the challenge of increasing production, improving access to good quality cassava products and expanding markets, which will contribute to local, national and regional food security and socio-economic growth.

Some of the limiting factors for increased cassava production in Africa are:

- Unreliability of supply;
- Uneven quality of products;
- Low producer prices;
- Lack of planting material
- Diseases and pests especially CMD, CGM and CMB
- Lack of appropriate storage technologies;
- Labour intensive processing techniques, and;
- Costly marketing structures.

### **Cassava Production Trends in the East and Central Africa Region**

Agriculture is the most important economic sector of the Eastern and Central Africa countries. It provides livelihood to about 80% of the population in the region; it is the main foreign exchange earner, provides the highest proportion of employment and is the main source of raw material for the largely agro-industrial sector in the region.

Cassava production in the region is estimated at about 24 million metric tones from a combined area of about 3.1 million hectares. Of this DRC produces about 16.5 million tones from an estimated area of 2.1 million hectares.

The production levels of cassava in five EARRNET countries are presented in figure 1 below. As it can be seen, Rwanda has recorded the lowest level of production in the last 10 years. Of all the countries shown, Uganda is the only country that has shown a significant increase in production after 1997. Production in Kenya has remained almost stagnant for most of the period but recent trends indicate some gradual increase in production.

Most of the decline in production within the EARRNET countries experienced from 1991 to 1996 has been attributed to cassava mosaic disease impact and civil strife experienced in most of the main producing countries.

The spread of cassava mosaic disease in the lake region was reported in ASARECA's AgriForum in the April 1998. The disease had first been recorded in Uganda in 1989. It spread into western Kenya in 1995, Southern Sudan in 1997 and in DRC in 1998 (ASARECA-Agriforum, April 1999). The mosaic virus has spared none of the countries in the region. Other contributing factors to the decline in production are lack of clean planting material caused by limited capacity to multiply and distribute improved planting cuttings.

In response to this pandemic, a number of programmes mainly donor funded have been initiated in the region to address the cassava mosaic problem and support multiplication and distribution of clean planting material. The East Africa Root crops Research Network (EARRNET) was started in 1993 and its mandate has been in the area of germplasm development, breeding and support for technology development and transfer in the region.

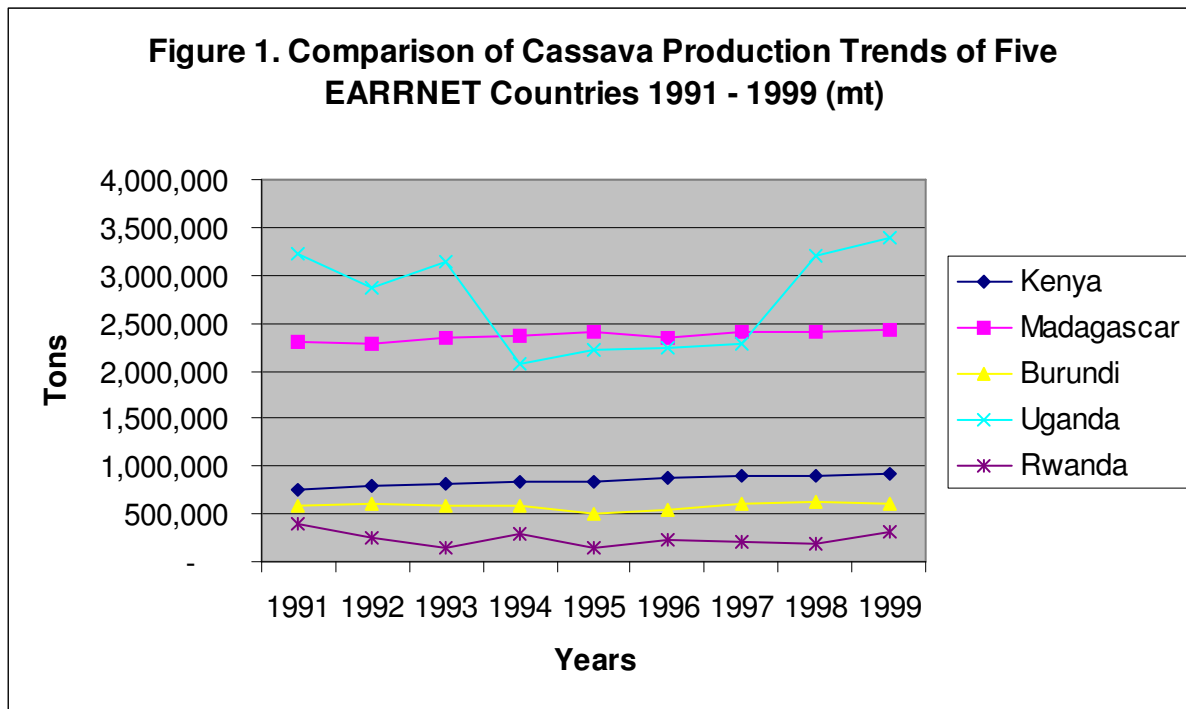
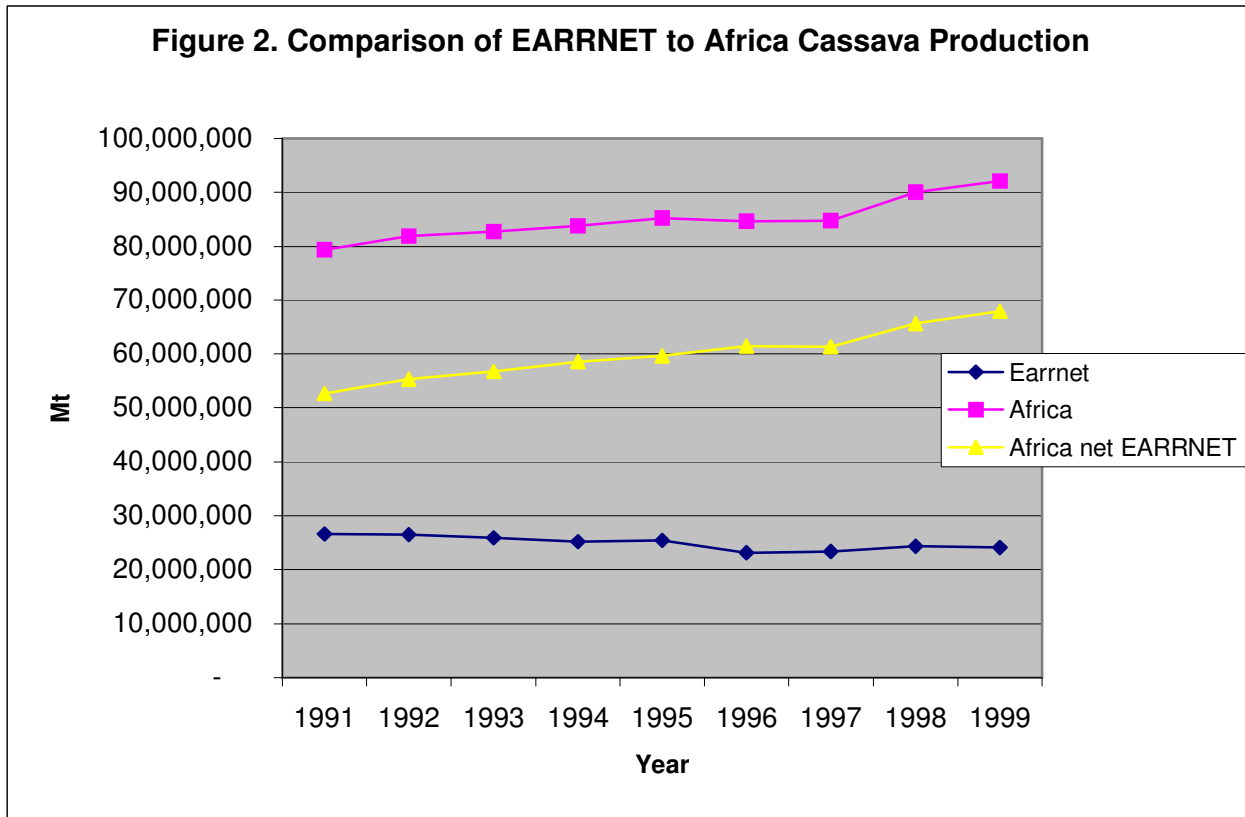


Figure 1 above demonstrates cassava's vulnerability to pandemics as it happened in Uganda during 1993 – 1997, when the cassava mosaic struck. As it can be seen, between 1993 and 1997 there was a major drop in production of cassava in Uganda associated mainly to cassava mosaic disease.

In figure 2 below a comparison of cassava production in the EARRNET region to that of the entire continent is presented. As it can be seen, the region is an important cassava producer in the continent. However, production levels in the region have declined marginally in the last decade largely due to cassava mosaic disease. The overall production in the continent has however increased within the same period from 80 million tons in 1991 to an estimated 92 million tons in 1998.



The increase in production in the continent can be attributed to advances in improved production techniques and varieties in Western Africa countries.

### Sub-sector Advances and Constraints in the Region

EARRNET is one of the networks of ASARECA and its mandate is to spearhead the development of the cassava sub-sector in the region in order to contribute to food self sufficiency and socio-economic development. To achieve this goal the network promotes production, utilization and commercialization of cassava through development of suitable and acceptable technologies for use by the different stakeholders. Its technology development and transfer mission falls under four categories; research, training, information exchange and institutional capacity building.

The network works through national research systems and in collaboration with other international research agencies from which it is able to tap current research breakthroughs, achievements and lessons from other parts of the world for the benefit of the regional cassava programmes. This places the network in a unique position to help in solving most of the problems affecting cassava production and utilization in individual member countries, including pandemics.

Since its inception, the network has worked towards identification of cassava production and utilization constraints and developed approaches to mitigate against them. The African cassava mosaic disease (ACMD), limitation of post-harvest technologies and marketing constraints have been some of the major daunting challenges facing the network. The ACMD has been tackled through development and transfer of mosaic resistant varieties. In this area a new challenge of multiplication and distribution of clean material has also emerged, as the national research institutions do not have the capacity for multiplication and distribution of planting material. The national programmes have tried to address this problem through collaboration with other development agencies within their respective countries.

In the area of post-harvest technologies, processing and storage technologies have posed the biggest challenge. In almost all the network countries cassava is mainly processed using traditional methods. These methods are costly in terms of time, labour and wastage. The quality control of the resulting products is also problematic. The low level of technology also implies that the number of products processed from cassava is also limited at the national level. Storage is a big problem because cassava is highly perishable. To increase cassava shelf life, it has to be processed such that its moisture content is minimized. The available technologies have serious limitations in this area.

Commercialization of cassava in the region is limited. In majority of the countries the share of sales out of the total production rarely exceeds 15%. This means the crop is largely grown for food security reasons. In rare occasions the crop is grown for commercial purposes, such as in the DRC where the leading flour miller has a nucleus estate of cassava from which it grows cassava for milling.

The potential for cassava to contribute to food security in the region is enormous as most of the countries continue to register food deficits and reliance on food relief from international agencies. Opportunities exist to expand production through increase in acreage and improvement in yields. Within the region cassava is primarily a food crop, being a main staple in DRC, second important food staple in Uganda and Madagascar and third important staple in Rwanda and Burundi. In Kenya the crop is an important staple food in the western and coastal areas of the country.

Cassava use in industrial processes is limited in the region but opportunities exist in countries with relatively established industrial base such as Kenya, Uganda and Madagascar. The main industrial potential use of cassava in the region is in livestock feeds, food manufacturing and in paper and textile industries.

Cross border trade in cassava has been reported but not documented between Kenya and Uganda, Rwanda, Uganda and Burundi and between Burundi, Rwanda and DRC. The main traded commodities are cassava chips, planting cuttings, fresh roots and to some extent cassava leaves.

At the policy level, there is no evidence that any of the network countries has an explicit and clear-cut policy for the development of the sub-sector. Only in countries where cassava is a principal food crop such as DRC and Uganda is cassava ranked highly in research. Most

countries neither have a food security policy, making it impossible to gauge where cassava ranks at the national policy level.

## **WHY SUB-SECTOR ANALYSIS**

The International Agricultural Research Centres (IARCs) and National Agriculture Research Systems (NARS) initiated Collaborative Study for Cassava in Africa (COSCA) in 1989 with the objective of improving the relevance and impact of agricultural research on cassava in order to realize the potential of the crop in raising food production and incomes. The study covered six countries: Cote D'Ivoire, Ghana, Nigeria, Tanzania, Uganda and the DRC. Later it was expanded to cover Benin, Burundi, Cameroon, Kenya, Malawi, Rwanda and Zambia. The study was done in three phases. The first phase broadly characterized the agro-environment (physical, social, and economic), production, processing, marketing, and consumption situation. The second phase dealt in more detail with yield, land area, crop utilization (sale or home use, processed or fresh use), and input/output relationships. The third phase involved detailed studies on post-harvest issues such as characterization of processing techniques, product quality assessment (nutrition, toxicity, and quality), marketing, consumption and demand.

While the COSCA study provided vital information for decision making, it does not provide comprehensive coverage on the cassava PCS continuum and linkages and how they affect the overall performance of the sub-sector. Key information on participants, processes, functions, and outcomes is also lacking in detail.

The study was also carried out in a period in which reforms in the agriculture sector, foreign exchange and overall macro-economic setups were being implemented in all the countries in the region. Hence the outcomes of the study do not represent a normal scenario, as it was done during a period of change and transition. Policy changes are likely to affect macro-and micro economic setups, and the cassava sub-sector is no exception.

Political instability in the region, which has threatened food production through displacement of farmers and disruption of economic activities, their effect on research work and the emergence and spread of the cassava mosaic disease in the region have also altered cassava production and utilization in the region. The impact of new technologies on production, processing and utilization of cassava, in the last decade may have altered its position as food and commercial crop.

Changes in weather which have seen an increase in the incidence of erratic rains, resulting into failure of grain crops may have stimulated farmers to give more attention to cassava which can withstand adverse weather conditions, in order to mitigate the effects of famine.

There has been no report produced on Rwanda based on the COSCA study and therefore very little information exists on the sub-sector in the country for effective planning.

There is therefore need to update information on all aspects of the cassava production-to-utilization system, including stakeholder analysis, major constraints and opportunities in the sub-

sector and more importantly carry further the COSCA work by identifying opportunities for increasing cassava contribution to food security and industrialization (commercialization) in the region.

## **APPROACH**

Two EARRNET steering committee review meetings held in Nairobi 23 – 24th June and July 3rd 2000, respectively endorsed the hiring of a consultant to handle the cassava sub-sector study in collaboration with the NARS and other stakeholders. NARS were asked to form cassava task forces comprising the national programme scientists, other cassava project representatives, NGOs, farmer associations, universities, donors, consumers and other interested parties to guide the sub-sector analysis at the national level. The committee agreed to use a production to consumption systems approach (PCSA) in the sub-sector analysis.

The PCSA is an important tool in sub-sector analysis. It focuses on the identification of the different commodity components and their interactions among themselves and with the environment. It is an important tool to focus and steer commodity research, policy and technological interventions intended to improve the overall performance of a commodity sector. Overall commodity performance is finally assessed in terms of its contribution to food security, employment, income and distributional impact within society at the macro level.

Correctly used PCS is directed to identify strategic points and forms of interventions in order to improve the performance of the commodity system. This objective requires the analysis of the current structure and the behaviour of the system and the understanding of the relations of these to its overall performance and environment. This implies a conceptual decomposition of the system into its micro level components, featuring the most influential interest groups, and the interactions of these components with each other and with the environment.

Because of its nature, PCS requires the work of interdisciplinary teams that approach and effectively incorporate the participation of intended final beneficiaries and other users of the expected research results.

Literature review and key stakeholder consultations were carried out in order to consolidate the existing information and complement it with current but unpublished information on the activities in the sub-sector.

A stakeholders' meeting was held to discuss the draft report of the literature review and to identify information gaps within the report and recommend other sources of information that could be used to improve the report. Following the stakeholders meeting, a survey focusing on cassava farm households, and traders was undertaken. The results from the survey have been consolidated with information from literature review to arrive at this report.

A five day regional workshop will be organized for reporting of the work done, exchange views and information, and propose strategies of improving the sub-sector performance.

## **CASSAVA PRODUCTION IN RWANDA**

### **Cassava Research**

The Institut des Sciences Agronomiques du Rwanda (ISAR) is responsible for agriculture research work in the country. In March 1999, ISAR called a stakeholders meeting to discuss the nature of shifting agricultural interventions from providing relief to inducing sustainable development, under the project “Agricultural Technology Development and Transfer Project for Increased Income and Sustainable Food Security in Rwanda”. The project objectives are to re-establish food security in food deficit areas and work towards a more vibrant market-oriented agriculture sector with regional trade perspectives.

The initial focus is on increasing production and marketing of five major food security crops; bananas, beans, cassava, potatoes and sweet potatoes. The long-term objective is to shift the research strategy towards a market-driven agenda and link the products of research with expanding markets through improvements in quality, processing and storage.

The objectives and goals of ISAR in this project are in line with EARRNET’s cassava sub-sector analysis objectives, which are to identify opportunities for greater contribution by cassava to food security and incomes among the cassava farming communities, traders and processors in member countries. The areas to be addressed within the project also form the core problem areas identified in literature and key stakeholder consultations in the region, namely poor quality processed cassava products, poor processing technologies and lack of appropriate storage techniques for cassava.

Rwanda has tried to re-establish its research work after the civil unrest of early to mid-1990s. A total of 280 clones have been retrieved after the civil unrest and are being evaluated. Some 26,000 seedlings were being evaluated in different locations in 1998 (EARRNET, July 1998). Under the Seed of Hope (SOH) varieties Rutamizi, Machunda, Eala07, Creolinha, and Maguruyinkware were multiplied and transferred to Rwanda for further multiplication and distribution under the SOH initiative.

Varieties hybrid TMS 30001/7/4 x UYT Bulk 85023/11/11 had a fresh storage root yield of 45.31 t/ha, followed by clones MIS-88-25, 90257 op/5, MIS-88-UYT Bulk 1977/11/39 and MIS-88-UYT Bulk 83022 op/7/5, with yields of 40.99, 43.37 and 40.00 t/ha, respectively.

Post harvest research is also being in conjunction with EARRNET and IITA for improved storage and processing technologies. Technologies that improve chipping / grating so as to improve drying efficiency are being tried at various pilot sites in the country. Other important post-harvest research activities are those for composite flour fortification and preparation of various

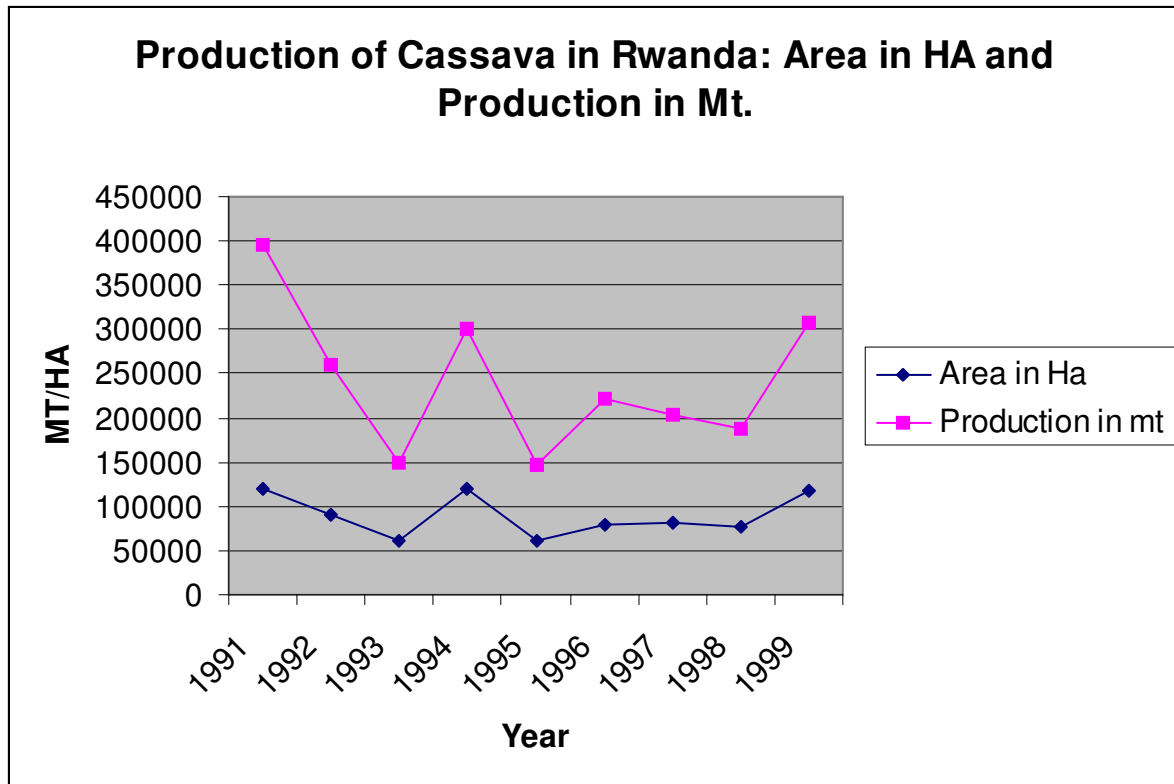
cassava based products. Transfer of these technologies is however, slow and hampered by inefficient extension services.

### Cassava Production Trends

The level of cassava production within the EARRNET countries has been fluctuating since 1992. In Rwanda a major drop in level of production occurred in the period leading to 1993. This was a result of a combination of reduction in area planted and drop in yields levels per hectare. Within the EARRNET group, Rwanda has recorded the lowest production and cassava yields per unit area in the 1990s.

Civil strife could most likely be blamed for the decline in area planted and also level of yields in the country. With current efforts to restore political stability in the country and donor efforts to address key constraints in the cassava production, the level of production and yields of cassava are expected to stabilize. As can be seen in figure 3 below, area under the crop and production has begun to show signs of improvement after 1998.

Figure 3: Area under Cassava and Cassava Production in Rwanda



In terms of importance of food crops in the country, bananas rank number one followed by root crops of which cassava and sweet potato are the most important. In table 2 below the relative importance of some of the four groups of food crops for the period 1966 to 1990 is presented.

Table 2 Relative Importance of 4 groups of Commodities in Three Periods in Rwanda

Category	1966-1970	1979-1983	1984-1990
Bananas	58.3%	49.9%	58.6%
Tubercules et raciness	27%	38.9%	30.1%
Legumus	7.4%	5.7%	5.5%
Cereals	7.1%	6.3%	5.8%

Source: Ndamage, G. et al. *Progress de la Recherche sur les Plantes a Racines et Tubercules au Rwanda, 1984-1991*, ISAR/IDRC 1992.

In this table it can be seen that bananas and root crops are the most important followed by cereals. Legumes have been overtaken in importance by cereals in the last 20 years. In the period 1984 – 1990, the importance of roots crops fell, while that of bananas increased.

### **Food Production Situation in Rwanda 1990 –1999**

Food production situation in Rwanda experienced a decline from 1990 to 1995. Thereafter a significant annual improvement on production has been recorded. In figure 4 below, the production situation of some of the main food crops excluding bananas, which is the main food crop, is presented. Banana production experienced an increase between 1990 and 1992 and thereafter a decline to 1995, before picking up again to 1999. The production statistics for the main food crops are shown in table 4 below.

Figure 4

**Les Productions Vivrieres du Rwanda Season A & B (1990-1999) MT**

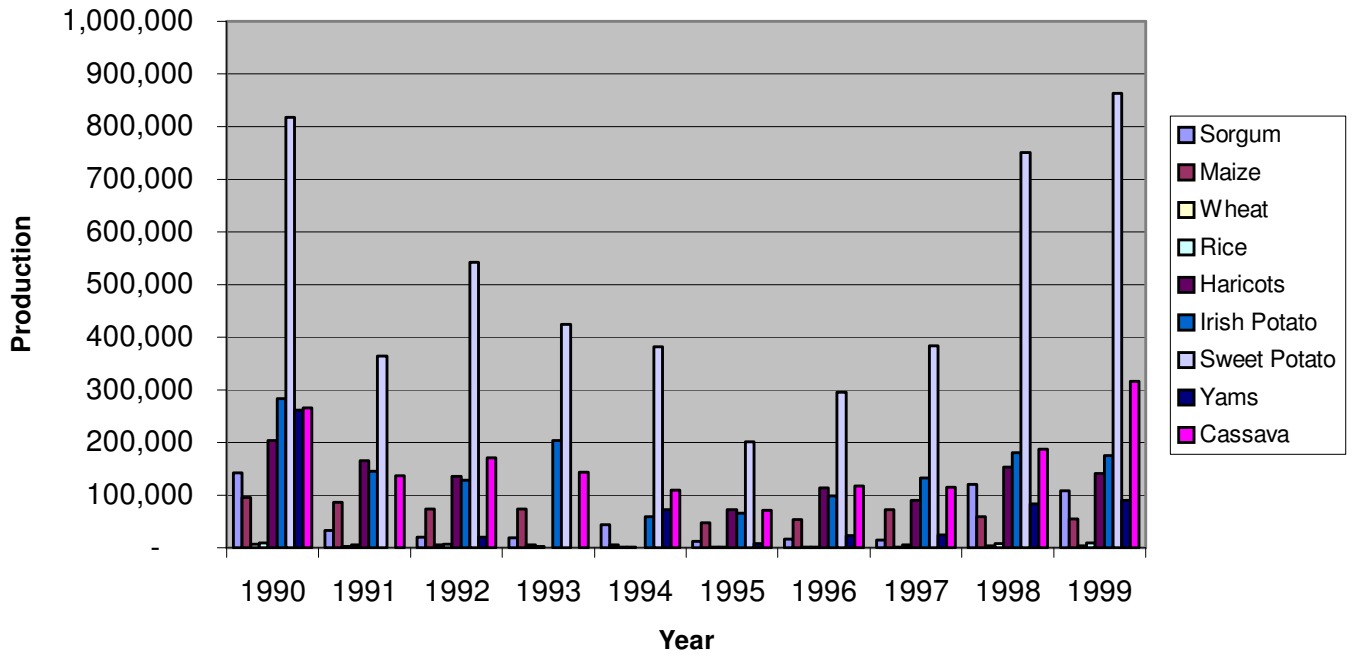


Table 4 Production of Different Crops in Rwanda for Seasons A & B (1990-1999) in TONNES

Crops	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
SORGHUM	142,603	32,300	21,000	19,500	44,100	13,000	16,900	15,100	120,533	107,566
MAIZE	95,685	86,100	73,400	74,200	5,700	47,300	54,100	72,100	58,618	54,912
WHEAT	6,976	3,000	5,000	6,000	1,300	1,100	1,200	1,100	4,140	3,607
RICE	9,433	5,000	6,500	3,000	1,800	900	1,100	5,500	7,935	8,919
BEANS	204,708	166,000	136,000	-	-	72,700	114,000	90,200	153,917	140,426
BANANA	2,776,764	3,092,900	4,632,000	3,073,200	1,489,000	957,600	1,056,000	1,077,600	2,625,485	2,897,433
IRSI										
POTATO	283,673	145,700	128,800	204,200	59,300	65,300	99,000	133,500	181,138	175,889
SWEET										
POTATO	817,738	364,500	542,600	424,000	381,600	202,000	296,000	384,100	751,141	862,568
YAMS	261,113	-	20,900	-	72,700	8,800	23,000	24,800	83,743	90,247
CASSAVA	265,190	136,800	171,000	144,100	109,400	71,100	118,000	114,700	188,182	316,934

## **PROCESSING**

Nearly all cassava in Africa is produced on small farms and is processed at the household level with the noticeable exception of large-scale production in a few densely populated areas such as Southwestern Nigeria (Fresco, L. O., 1993). Labour demands at the processing stage are much higher than labour requirements in production. There is therefore need for technology innovations to raise labour productivity.

Cassava processing in Rwanda like in most other EARRNET countries is based on traditional technologies. The main processed products are cassava chips and flour. The flour is then cooked into various dishes.

Processing is labour intensive and involves use of ordinary knives for peeling, and chipping the tubers. The peeled tubers are then sun-dried, before milling into flour. Flour milling is done using ordinary mills.

Under EARRNET the IITA manual chipper /grate has been modified incorporating new cutting plate for chipping, grating or slicing. This is expected to increase output from 40-50 kg to 80-100 kg per hour for chipping and reduce cost by 20% per unit.

Rwanda is part of the countries in which an hydraulic press which is cheaper and simpler to use compared to screw press has been developed and is being fabricated and tested at ISAR. Other countries include Uganda, Kenya, and Madagascar.

This improved technology is however yet to be disseminated and used in a wider scale in any of the countries were it is being tested. The technology is expected to reduce the labour demands in cassava processing and also improve the quality of the processed products.

## **MARKETING**

Cassava is mainly marketed in its processed form of chips and flour. Marketing of fresh tubers is also widely practiced in Rwanda. Women and youth play a significant role in the processing and marketing of cassava products.

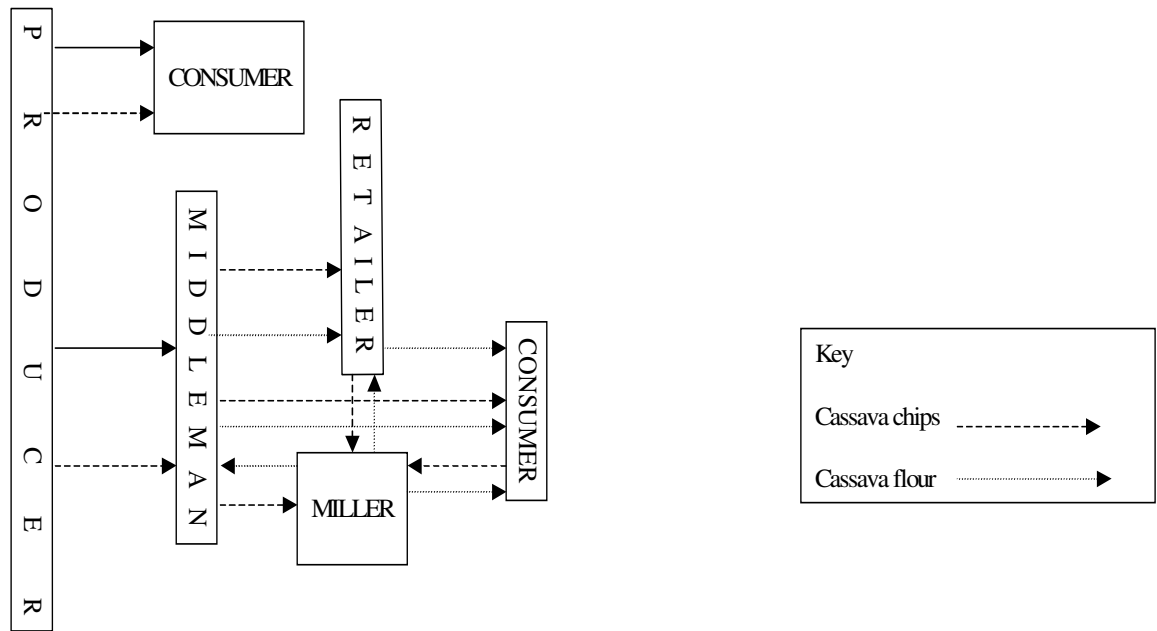
There has been no study on the cassava marketing in the country and hence the level, intensity and problems affecting cassava marketing is lacking. Informal interviews with retail traders in Gitarama area indicated that the most limiting factor to trade was lack of technologies for processing and drying cassava chips especially during the rain season. This leads to poor quality products and high losses to both traders and farmers.

Competition in marketing cassava chips and flour is also stiff and trade margins are therefore low.

The marketing chain for the cassava products in the country is not as complex as that of chips and flour in Uganda and DRC. In the figure below the marketing chain is presented

based on interviews with stakeholders and a number of chips and flour traders in Rwanda.

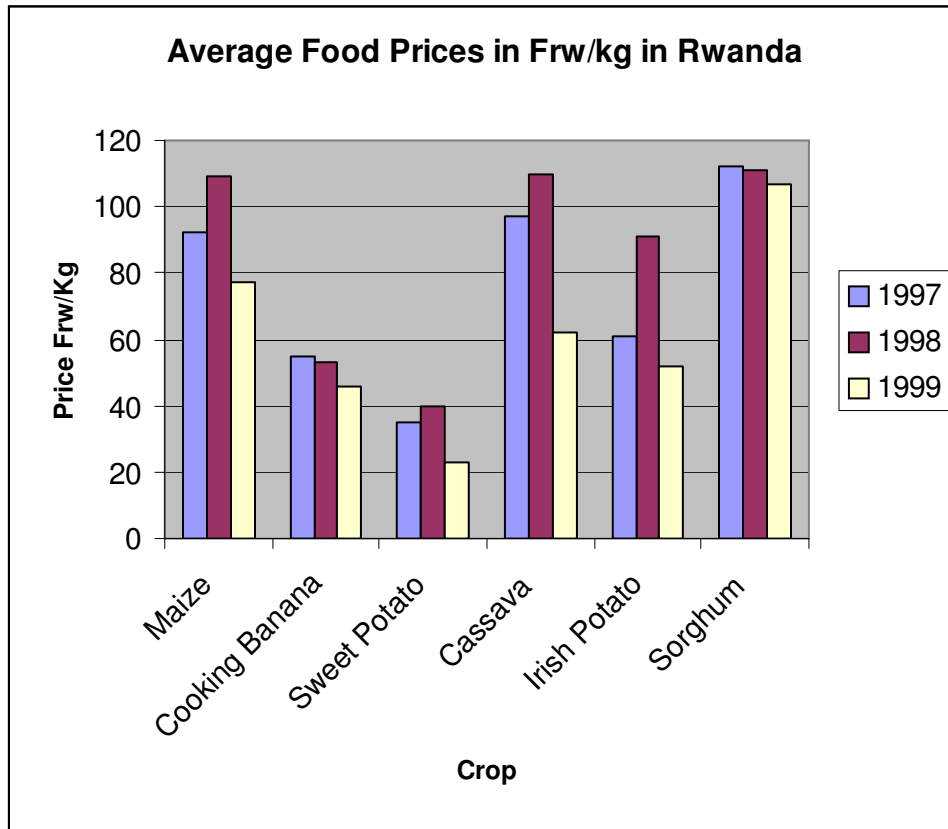
FIG. MARKETING OF CASSAVA CHIPS AND FLOUR IN RWANDA



### ***Price Changes for Various Food Crops Including Cassava In Rwanda***

The main food crops in Rwanda experienced an increase in prices between 1997 and 1998 but thereafter a decline in prices for all the crops was recorded. Cassava had the highest price decline between 1998 and 1999. This could be explained by the big increase in production within the period from 188,182 tons in 1998 to 316,934 tons recorded for 1999 as shown in table 4 above.

Figure 5



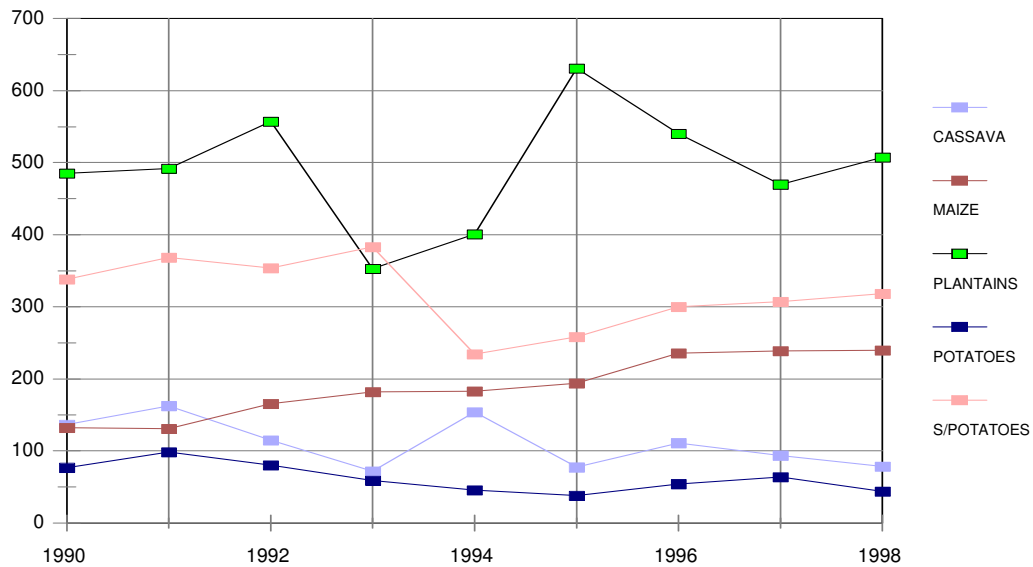
Cassava prices have remained high compared to other root crops and is only comparable to that of sorghum and maize. Sorghum has remained the most highly priced among the important food crops in the country as seen in figure 3 above.

## UTILIZATION

Cassava in Rwanda is mainly utilized in its processed form. Fresh roots are also boiled and eaten or just eaten raw as a snack.

Most of the cassava is however cooked in some form of paste (Ugali) and eaten with sauces, or stews of either meat/ beef or legumes and vegetables. The range of dishes in which cassava is eaten is however narrow in the country. In terms of calorific supply cassava is the fourth important source of calories after plantains, sweet potato and maize. The level of calorie supply from cassava has been declining in general in the last decade perhaps as a result of declining production. Although plantains are the main sources of calories, the supply in the decade has been very irregular with some noticeable falls in 1992 to 1993 and 1995 to 1997. Maize however, has shown steady increase as a source of calorie over the decade.

Figure 6: Per Capita, Per Day Calorie Sources in Rwanda 1990 - 1998



Source: FAOSTAT Web2000

In some communities across the EARRNET region, the level of knowledge of nutritional value of cassava products is largely unknown. Even among nutritional programmes in some countries cassava is said to be of low or no significant nutritional value. In tables 5 and 6 below information on nutritional value of cassava is presented.

The use of cassava leaves as a vegetable exists but is not as pronounced as in Burundi and DRC. Level of knowledge of the nutritional value of cassava based foods is lacking among most cassava consumers and policy makers in the country.

Studies elsewhere have shown that cassava leaves have high protein levels and can be used to supplement the low protein levels available in the cassava roots.

Table 5 Protein and energy contents of cassava products prepared traditionally.\*

	Raw peeled tuber	Tuber cooked in water	Peeled cooked and washed
Calories	395	394	395
Proteins	1.51	1.49	1.95

Note: \* Per 100g dry matter

Source: Favier, J.C et al. 1971 "La technologie traditionnelle du manioc au Cameroun: influence sur la valeur nutritive" in Wambugu and Mungai, 2000.

Table 6 Proximate composition of cassava leaves per 100g edible portion, fresh weight.

Component	Reference	Calories	Moisture %	Protein g	Fat g	Total carbohydrate g	Fibre G	Ash G
Cassava leaf, raw	A	91	71.7	7.0	1.0	18.3	4.0	2.0
	B	60	81.0	6.9	1.3	9.2	2.1	1.6

Source: a: *Food Composition Table for Use in Africa. FAO and US Dept. of Health Education and Welfare, 1968.*

b: *Food Composition Table for Use in Africa. FAO and US Dept. of Health Education and Welfare, 1972. in Wambugu and Mungai, 2000.*

In the area of product development the combined EARRNET countries have put emphasis on cassava flour fortified with beans, greengrams, eggs, and milk to prepare weaning foods and snacks (crisps, chips, hot balls etc.). Composite flours were tested in the preparation of uji, ugali and other products (cakes, biscuits etc.). Bread was found acceptable with a cassava: wheat ratio of 20:80, while others were prepared using 50:50 ratio. Genotype KME1 was identified as the most suitable for composite flour products.

### **Use of Cassava In Animal Feeds, Manufacturing Industry and Food Industry in Rwanda**

The level of utilization of cassava in animal feeds industry, manufacturing industries or food industry is not documented. The industrial sector in Rwanda is quite small and it is unlikely that cassava would have a significant role in the industrial sector in the country. The animal feeds industry is also limited and may not have a significant influence on cassava production even if the industry was to start using cassava as the source of energy.

Cassava may however, be promoted in the food industry, mainly in milling and baking. This is important if the crop is to play its role in the commercial food sector.

The country could however, develop a cassava based food manufacturing industry especially bread, and cakes. Some tests are already being done on manufacture of various foods using cassava flour through the Post-harvest Project in the country.

### **POLICY AND TECHNOLOGY ENVIRONMENT**

As in many countries in the region there does not appear to be any definite policy on cassava or the food security in the country. Rwanda is in the period of transition after a civil war that almost wrecked the agriculture sector. The main focus for the sector has been in supply of food relief other than sector development. The focus however, appears to be changing in the last three years towards sector development. Development agencies are now focusing on rehabilitation of the agriculture sector. In the area of cassava the strategy has been to tackle the cassava mosaic disease while at the same time developing the post-harvest area of the sub-sector.

In the area of technology development, the focus has been in the development of disease resistant varieties, improved agronomic practices, pests and diseases control. Improved processing technologies and diversification of the processed products has also been addressed through development and testing of new technologies.

## **STAKEHOLDER ANALYSIS**

The level of stakeholder collaboration in Rwanda in the development of the cassava sub-sector is limited. At the moment contacts are being made mainly in the planting material multiplication and distribution and in the transfer of improved processing technologies. The level of intensity and strategic focusing of this collaboration is however, not clear.

In DRC where the cassava mosaic has become so complex that yields and production levels are at their lowest, the main players have agreed to work together and they meet regularly on a monthly basis for consultations and strategizing. This is an important development as it will lead to better focusing of activities and efficient allocation of resources.

In Rwanda there does not appear to be any formal or informal group of the different stakeholders in the sub-sector that meets to have a joint plan of activities. This is an area that needs to be looked at and perhaps the ITDT project together with IASR and World Vision could take the lead in forming such a group. FAO and WFP could also be enjoined as members as they are also playing important roles in the sub-sector.

These institutions could start by forming an informal cassava working group and later expand it to include other stakeholders, such as Ministry of Agriculture, farmer representatives and some people from the milling industry. The group could then draw a calendar, agree on specific objectives, joint action plans and a monitoring and evaluation strategy for all interventions in the sub-sector. The group should review the current status of the sub-sector and try to prioritise areas for immediate interventions, agree on who does what and with what resources. It should act as an informal lobby group for policy and technological reforms, that would spur the growth of the sub-sector.

## **PART II SURVEY RESULTS**

### **Methodology**

The cassava sub-sector analysis study was initiated in 2000 in six EARRNET countries. Each of the countries formed a task force to coordinate the national data collection and stakeholders consultations.

In October 2000, detailed literature review was started for all the six countries. The review was complemented with information from stakeholders' consultations. The review was aimed at understanding the current status of the sub-sector in each country and to elicit debate on the potential areas for further investigations, research and investments targeting, institutional, policy and technological studies.

All the six EARRNET countries formed task forces comprising people working in the cassava sub-sector and of diverse disciplines.

The task forces were responsible for gathering as much literature as possible on cassava and related commodities in their country. This information was made available to the consultant for review and drafting of a status report. The draft status reports were debated national stakeholders workshops in which information gaps, areas with immediate opportunities and constraints were identified.

Field surveys were conducted in five of the six EARRNET countries to collect information for filling information gaps or updating the existing information.

Key stakeholders were consulted and their views considered in the draft country reports. The draft reports presented at stakeholders meetings for discussions and identification of information gaps.

Stakeholders' recommendations were considered in designing questionnaires for collection of primary data.

In Rwanda 148 cassava farmers were interviewed in the following regions, Gitaram 42, Butare 27, Mutara 18, Kigali rural 46 and Kibungo 13, two were not specified. The distribution of the farm households interviewed in each region was based on weighted scale of the level of production in the region compared to other regions.

Random sampling procedures using transect walks were applied in the smallest sampling units in each region, the village.

In the case of cassava traders, and processors, purposive sampling techniques were applied in which key informants were used to guide researchers to main traders, and processors of cassava commodities. In the case of small scale traders random sampling was applied in main trading centres.

## Field Data Collection

Field surveys have been completed in five countries. Only Uganda in which limited and focused studies were recommended is yet to complete their studies.

**Kenya** has collected data on production, marketing and processing. Specific papers have also been commissioned to look at the potential niches for the sub-sector. These include; animal feeds industry, cassava in the food systems, and potential commercialisation of cassava planting material. FoodNet has also funded a study on potential use of cassava starch in Kenya. This study will be completed by the end of the year.

**Rwanda:** Rwanda has completed survey on production and utilization/marketing. There has been no offer for researchers to undertake any of the proposed papers for commissioning. The relevant commissioned papers for Rwanda would be, study on the commercialization of multiplication and distribution of cassava planting material, study of cassava in the food systems and study on the necessary policies for cassava to contribute to food security and income generation.

**Burundi:** Burundi has undertaken survey on production, marketing, processing and transportation. No commissioned papers have been undertaken in the country.

**DRC:** In DRC where cassava is the most important food crop field work focused on tall areas of the crop; production, marketing, utilization, processing, transportation and middlemen who offer support services. A commissioned paper on marketing and utilization of cassava leaves is also being written.

**Madagascar:** In Madagascar thorough research work has been undertaken on all aspects of cassava; production, marketing and utilization, processing, CBOs working on cassava related projects. FoodNet is undertaking a detailed study on cassava marketing and industrial utilization.

**Uganda:** Uganda has had a number of studies on the cassava sub-sector including COSCA and some specific studies conducted by FoodNet. These studies have generated important information in understanding the sub-sector. After review of the available information and discussions at a stakeholders workshop in April areas that required further investigations were;

## **RESULTS AND DISCUSSIONS**

### **PRODUCTION**

Cassava is the fourth most important food crop in Rwanda after bananas, sweet potatoes and maize. It is grown under small-scale production systems and mainly intercropped with maize and bananas.

The survey results indicate that mean area cropped in the country is was 3.81 ha, while the mean area under cassava was 1.01 ha. This means on average 27% of the cropped area was under cassava. This indicates that cassava is indeed an important crop in the country.

#### **Farming Systems**

Most of the respondents reported that they grew cassava under mixed cropping although there was also a high percent of mono cropping. Only 15% of the respondents grew preferred cassava varieties under mono cropping, while 46.9% grew under mixed cropping, while 26.9% grew under a combination of mono-cropping and mixed cropping in different fields.

The main crop intercropped with cassava was maize. Cassava was also intercropped with beans, bananas, plantains, and occasionally with groundnuts or sweet potato.

The most important cassava varieties grown in the surveyed areas were; Gitamisi (74.4%), Imiribua (44.4%), and Gashashari (10.5%).

Farmers' reasons for preferring certain varieties were based on; yield, dry matter content, early maturing and taste.

In terms of sources of the planting material farmers identified the following as the main sources; own farms (30.4%), other farmers (15.5%), and a combination of own farm and other farmers for different varieties (9.5%). Some farmers also reported sourcing material from markets and a combination of other sources.

Table ...Main Cassava Varieties Grown Per Country

Country	Variety No.1	Variety No.2	Variety No. 3	Variety No. 4	Variety No.5
Burundi	Nakarasi	Bitamisi	Yongwe	Imiduga	Inagitembe
Rwanda	Gitamisi	Imiribua	Gashashari	Nairo	
Kenya	Kibandameno	Sudhe	Obarodak	B. Adhumani	Mucericeri
Madagascar	Mitay	Kelimanat ody	Madarasy	Pamba	Rantsanakoho
Uganda					
DRC	F100	Pululu	RAV	Madelene	Kinkongolo

Table ... Cropping System

Country	Cassava Grown with	% of mono-cropping of cassava
Burundi	Maize, beans, banana,	33%
Kenya	Maize, beans	24.7%
Rwanda	Maize, banana	48%
DRC	Maize, g/ nuts	19.8%
Madagascar	Maize, beans, g/nuts	56.2%
Uganda	Maize, beans	

Table ... Cropping System by Region in Rwanda

Region	Cassava Grown with	% of mono-cropping of cassava
Butare	Maize, Banana, Beans	10.3%
Gitarama	Maize, Banana, beans	16.7%
Kigali Rural	Maize, Maize	19.6%
Kibungo	Maize, Banana, Beans	15.4%
Mutara	Maize, Banana, Beans, g/nuts	16.7%

Table ... Main Sources of planting Material

Country	% From The Source			
	Own Farm	Other Farmers	Market	
Kenya	24	49.4	1.6	
Burundi	60.6	6.4	0.4	
Rwanda	30.4	15.5	(combination>9.5)	
DRC	47	36	2.5	
Madagascar	69.5	26.5	0.4	

Table ... Main Sources of planting Material By Region in Rwanda

Region	% From The Source			
	Own Farm	Other Farmers		
Butare	20.7	68.8		
Gitarama	31	23.8		
Mutara	27.8%	38.9		
Kigali Rural	34.8	45.7%	8.8%	
Kibungo	38.5	61.6		

### Main Cassava Production Constraints

The general constraints facing cassava production in the country as reported during the survey were; diseases (56.1%), lack of planting material (54.1%), pests (22.3%), lack of land (21.6%) and theft (13.5%).

The specific diseases and pests that were reported as severe during the survey were; CMD (65%), CGM (35.1) and CMB (13.5%).

Although diseases and pests were reported as main constraints to cassava production, the use of pest control methods was very limited. Only limited use of traditional methods of pest and disease control was reported.

### Opportunities

There is great potential to increase cassava production in the country. This can be achieved through increase in acreage as well as increase in yields. Since it has been shown that farmers consider yield as an important factor in selecting planting material, efforts should be made to develop high yielding varieties. The country still has potential

to increase yield as the current yield levels are still low (at 8-9/tons per hectare). An increase of yield levels by 25% would result in the country producing about ..... Tons of cassava per annum.

Increase in acreage can also be achieved by improving the multiplication and distribution of planting material. Other factors such as market efficiency and developing and promoting alternative uses also need to be put into consideration.

## **PROCESSING**

Cassava processing in Rwanda is mainly done at the household level. There are no urban based processors captured during this survey. However, there are a number of urban based millers who provide service milling for cassava flour. In addition to milling of cassava flour the millers also mill cereals.

Dried cassava chips (cosettes) and flour are the main cassava processed products in the country. The flour is then used in cooking mainly ugali. Some flour is also used in making fried and baked products such as Sambusa.

Fresh cassava tubers are also peeled chopped and boiled before being eaten.

### **Consumer Preference for Processed Products**

The general characteristics clients looked for in processed cassava were colour, and moisture level in cassava chips, and colour, texture and smell for cassava flour. For tubers consumers preferred them freshly harvested and of sweet taste.

### **Constraints in The Cassava Processing**

Constraints Facing Cassava Processors:

- Lack of raw material (primarily cassava chips)
- Poor quality of cassava chips especially during the wet season caused by inadequate drying.
- Lack of appropriate storage facilities for cassava chips and flour

Lack of cassava chips is especially severe during the wet season and processors have to stock sufficient quantities to meet monthly demands from consumers. Demand is usually very high at the end of the month. Traders' lacks appropriate storage facilities and therefore incur expenses through spoilage.

### **Opportunities**

The potential to increase the level of cassava processing into various products exists in Rwanda. The most promising processed products are cassava flour and chips. The dried chips can be stored and milled into flour whenever needed. This is one way of

addressing the perishability of cassava. The flour can then be used in food processing e.g. bread and cakes.

Organizing farmers into production units and making available appropriate cassava chips processing and drying technologies will be a good starting point. Ideally this should be done at the household or village assemble level. The dried chips can then be marked to selected and sensitized processing firms in the urban centers. A starting point would be the feed and flour millers since their quality requirements may not be very stringent. Formulation of cassava based feeds at micro-level can also be encouraged as a starting point for the product growth. This can be accomplished by formulating and disseminating appropriate feed rations.

## **CASSAVA MARKETING**

There were 24 traders interviewed during the survey. Majority of those interviewed were trading in cassava commodities as the sole business while others traded also in cereals and other tuber crops. Majority were selling dried cassava chips or cassava flour.

The surveys were carried out in Kigali, Kigali rural, Gitarama, Kibungo, Butale, Tambwe, and Bugeresa markets. The markets visited were a combination of wholesale and retail markets.

Majority of those interviewed were retailers although some of the traders were also trading in wholesale.

In terms of gender 41.7% of the interviewed traders were women, while the rest (58.3%) were men. Majority of the women traders were retailers (70%), while the rest (30%) were wholesalers. All the women traders were either married or widowed. Some of the male traders were single or married. Majority of the traders (77.5%) were aged between 18 and 35 years, while the rest were aged between 36 and 55 years.

In terms of level of education of the traders majority were of primary school level (70.8%), 16.7% had no formal education, while 8.2% had achieved secondary education.

Majority were operating their own business (70.8%) while the rest were either employed or were family members of the proprietors of the businesses. Only 33.3% had storage facilities within the trading areas. The rest stored surplus stock in their houses.

In terms of demand for the cassava products on sale, majority of the clients were either of both sexes or female. The main clients were direct consumers, retailers or in some cases processors agents. A few wholesalers were also mentioned as principle clients.

The main factors affecting demand were colour of the cassava chips of flour, taste and smell. Other factors were moisture content and prices. Coulor was however, the most important factor and white colour was the preferred choice.

The cassava varieties that produced the required attributes in cassava chips and flour were Gitamisi, and Imiribua.

The price for cossettes (dry cassava chips) ranged between FWR 120 – 165/kg in times of shortages to between FWR 50 – 130 /kg in times of bumper harvest in different regions surveyed. The price of cassava flour was ranging between FWR 140 – 200/kg in times of shortage in different markets and between FWR 50 – 130 / kg in same markets when their was glut in the market.

### **Gender Analysis of Clients**

In terms of main clients: it was found that both men and women were involved in purchasing various forms of cassava products. However 16.7% reported women as their sole clients while only one respondent reported men as his/ her sole clients. 79.2% reported that their clients were of both sexes. The clients were mainly direct consumers with a few number of respondents reporting that they sold to retailers.

In terms of age group majority of the clients were aged between 26 and 50 years. No respondent reported clients aged below 15 years.

### **Cassava Marketing Constraints**

The reported constraints by traders were; lack of appropriate drying technologies. This affects the quality of flour and cassava chips. In most cases, cassava chips and flour was considered of inferior quality due to high moisture content. This also caused another associated problem of poor taste and odour of the cassava flour.

Other problems affecting cassava traders were;

- High taxes,
- Insecurity on the highways,
- Fluctuation of prices,
- Lack of capital for building stocks,
- Shortages of cassava processed products especially during the wet season and
- Poor infrastructure.
- Means of transportation was also mentioned as a problem

The main clients are product retailers who purchase from the interior and transport the commodities to main urban centers for sale.

## **UTILIZATION**

### **Human Utilization**

In Rwanda both cassava leaves and tubers are used as human food, although the tubers are more important. Cassava tubers are consumed in two main forms in the country, peeled dried tubers are milled into flour which is then cooked into a thick paste known as Ugali, or fresh tubers are peeled, chopped and then boiled before being eaten.

Ugali is eaten with stews of various types such as, beans, vegetables or meat. The boiled tubers can be eaten with stew or taken with tea in the morning.

Cassava leaves are also an important human food in the country. From the survey results, out of the 148 households interviewed 44.6% said they used cassava leaves as vegetable. Here the opportunity lies in giving the relevant nutritional information on cassava leaves and promoting the use of both protein rich cassava leaves and carbohydrates rich tubers. Since a substantial number of cassava growers are already using the leaves and almost 100% of the cassava growers consume the tubers, promoting increased use of the two products will be easy.

In terms of cassava food qualities, the farmers said they liked cassava tubers for the following reasons; source of energy, taste, and also filling (satisfying). The cassava leaves characteristics were; taste, energy, good for the health of a child, source of vitamins, and filling.

Farmers said that most of the cassava they grew had all those characteristics, although Gitamisi, Imiribua and Gashashari were more frequently mentioned as the ones with the desired characteristics.

### **Utilization in Animal Feeds Industry**

The use of cassava as animal feed in the country was very limited compared to the other countries in the region as can be seen in the table below. Only 3.4% of the respondents said they fed cassava to their livestock. Since Rwanda still has a lot of natural pasture and its livestock sector is not well developed, these results are not surprising.

Table ... Use of Cassava as Animal Feed Among the Interviewed Households

Country	% of respondents Feeding Cassava to livestock	
Kenya	29.2	
Rwanda	3.4	
Burundi	8.5	
DRC	14.9	
Madagascar	44.4	
Uganda		

On the contrary in Madagascar and Kenya a high percentage of the interviewed farmers were using cassava as livestock feed. Most of the processors in Madagascar also mentioned animal feed (Provende) as a key product in their processing enterprises.

Table .. Use of Cassava Leaves as Vegetable Among the Interviewed Households

Country	% of Respondents using Cassava leaves for household consumption	% Sell cassava leaves
Kenya	43.9	
Rwanda	44.6	
Burundi	91	1.5
DRC	87	1.5
Madagascar	88.6	51
Uganda		

### Industrial Utilization

Throughout this study there was no evidence of potential use of cassava in the industrial sector. The industrial sector in the country is currently too small to make any impact on the demand for cassava. However, on a small scale basis a niche may be found in the bread and other food industries. The country can therefore start looking at the possibilities of encouraging the baking industries to make use of cassava flour in bread and cakes.

Within the neighbouring countries, Uganda, Burundi and DRC similar results have been obtained and since these countries are producing more cassava than Rwanda it is unlikely that they would form an import market for cassava products from Rwanda in the near future.

## CONCLUSION

Although cassava has played an important role in the food security in the country, its production level appears to have declined in the last decade mainly because of the civil war that has ravaged the country. Cassava is now the fourth important source of calories in the country after plantains, maize and sweet potatoes.

Production levels of the crop appear to be increasing in the last two years and unless the cassava mosaic disease that has ravaged production in the region takes its toll on the crop, it is likely that cassava will occupy the second most important position in food supply after plantains in the next three to five years.

Technology and policy environment need to be improved to respond to emerging needs of the crop and to ensure it plays important in food security and income generation. Technologies that improve the processing and storage of cassava so as to increase its shelf life need to be researched, tested and promoted among the cassava growing communities. There is also need to diversify the uses of cassava by coming up with more recipes and investigating potential industrial use of cassava as the country's industrial sector expands.

The level of knowledge of the cassava sub-sector is very low, especially the potential utilization in various areas such as food industry, animal feeds, starch production, and other industrial applications.

From the production side, the main constraints have been identified as pests and diseases, lack of planting material. These are constraints that can be addressed through research into new technologies, adoption and testing of genotypes from other countries that are disease and pest resistant. Multiplication and distribution of planting material can be addressed through networking with various stakeholders such NGOs, extension branch in the ministry of agriculture. However, more sustainable ways of ensuring planting material are readily available such as investigating potential commercialization of multiplication and distribution of planting material need to be investigated.

## **RECOMMENDATIONS**

### **Production Level**

Improve Multiplication and Distribution of Farmer Preferred Varieties

Improve Dissemination of Extension Messages

Improve Linkages With Other International Agencies Such IITA, EARRNET, World Vision International, the private sector and farmer organizations where they occur.

Improve Research Funding

### **Post-Harvest**

Improved Cassava chips making and drying technologies

Improve processing technologies for cassava flour to achieve desired attributes

Promote industrial use of cassava such as in large scale milling, confectionary etc.

### **Marketing**

Establish a market information service for main commodities including cassava

Need to have appropriate market infrastructure in main urban centres (Space, Storage, Sanitation etc).

Identify and promote cassava market agents through training in business skills

Promote village (community) level cassava processing and bulking centers which can then be linked with potential markets in the main urban centers

### **Utilization**

Need to diversify consumable cassava products

Improve the quality and standardization of existing products through improved technologies

Expand the uses of cassava in line with people's changing consumption habits

Develop cassava recipe extension manual for use for nutrition extensionists

## **Policy Level**

Promote cassava for food security, but not as a crop for the poor. Emphasis should be on the nutritional value of cassava.

Coordinate all cassava activities among various institutions in the country through establishment of a cassava working group

Make a deliberate attempt to promote improved processing technologies for cassava

Revise Punitive Taxes that Discourage Cassava Trade

Consider availing credit to cassava traders (Micro-Credit Scheme Can Be Established)

## References

Fresco, Louise. O. The Dynamics of Cassava in Africa: An Outline of Research Issues, COSCA working paper no. 9. IITA, 1993.

Leblanc, Luc, Bilan des Activities de Lutte Contre L'acarien Vert du Manioc (Mononychellus Tanajoa (BONDAR) au Rwanda, UNDP/FAO, Dec. 1992.

Ndamage, G. et al. Progress de la Recherche sur les Plantes a Racines et Tubercules au Rwanda, 1984-1991, ISAR/IDRC 1992

ASARECA, AgriForum Quarterly report, No. 7 April, 1999.

BALAGOPALAN, C. et al. Cassava in Food, Feed And Industry, CRC Press, Inc. Boca Raton, Florida, 1988.

Manyong, V. M. et al. Impact of IITA-improved Germplasm on Cassava Production in Sub-Saharan Africa, IITA, 2000.

Nweke et al, COSCA working paper no. 13, IITA 1996.

Nweke et al, COSCA working paper no. 22, IITA 2000.

Collins, C. et al, Cassava Marketing in Uganda: Constraints and Opportunities for Growth and Development, Draft Report, IITA, March 2000.

Wambugu, S. M. and Mungai, J. N. The potential of cassava as an industrial /commercial crop for improved food security, employment generation and poverty reduction in Kenya, KIRDI, May 2000.

FAOSTAT, Web2000