Full Annual Reports

Project 1

A Pilot Study for the Improvement of the Agricultural Market Information Service in Tanzania

Research Grant by FOODNET

A REVIEW OF AGRICULTURAL MARKET INFORMATION SERVICE IN TANZANIA:

The Changing Role of Market Information System

E.R. Mbiha, G.C. Ashimogo, A.A. Temu, D.Nyange[1]

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[1] Sokoine University of Agriculture, Morogoro, Tanzania

1. Introduction:

1.1 Background

This report reviews the current status of agricultural Market Information Service (MIS) in Tanzania as a part of a broader research on "A Pilot Study for the Improvement of the Agricultural Market Information Service in Tanzania." The study is funded by FOODNET, a regional agricultural research and development network focussing on market-oriented research and sales of value added agricultural products in Eastern and Central Africa.

Changes in many economic policies in recent years (1990s), particularly the adoption of market economy has rendered some of the functions of many institutions obsolete. MIS being not the exception had been affected by these policy changes. How has agricultural MIS functions and mode of operation adapted to these policy changes? This report reviews the status of agricultural MIS in Tanzania. The report is prepared as a benchmark for planning a more detailed survey of stakeholders in MIS particularly producers, traders, transporters and processors of agricultural commodities.

1.2 Objectives

Objective of this review is to understand the current agricultural market MIS in Tanzania so as to develop strategies to improve efficiency in data collection, processing, information dissemination and maintenance of databases.

Specifically the study has attempted to accomplish the following;

i) To review the organization of MIS in Tanzania and identify key stakeholders in MIS to be interviewed in a more comprehensive survey
ii) To evaluate sampling and procedures for data collection, processing, storage (database) and dissemination used by MIS
iii) To assess how MIS has adapted to changing economic policies, particularly market liberalization
iv) To make recommendations on how to enhance the efficiency of MIS in performing its functions and provide necessary information for planning a more comprehensive survey of stakeholders in MIS.

1.3 Methodology

- Literature review- MDB/MIS annual crop/commodity reviews, reports prepared for the media (radio and newspaper), evaluation reports, and proposals for reforming agricultural MIS.
- Review of data collection instruments, data processing, and dissemination procedures
- Evaluation of commodity price database
- Discussions with past and current MDB/MIS officials in the Ministry of Agriculture

2. Historical background of MIS in Tanzania

Prior to initiating reforms towards a market-oriented economy in 1984, Tanzania was a state-controlled economy. During that time, the government directly intervened in the market through price fixing, imposing restrictions on trade, monopolizing the commodity market using state owned companies and subsidizing the agricultural inputs and food commodities. Purchase of food crops from surplus areas, processing and then distribution in demand/deficit areas were mainly undertaken by the state owned the National Milling Corporation (NMC). Agricultural cooperatives operated in the rural areas as agencies for NMC. In addition to the NMC and cooperatives, the private sector also operated, mainly as a parallel market.

In 1986, Tanzania made a firm commitment to pursue a market economy and to undertake the Structural Adjustment Program (SAP). The new policy places a clear restriction on the actions that the government can adopt to achieve its objectives. Except in a very limited case such as restocking of the emergency grain reserve, the government is not supposed to intervene in the food markets; rather its role has been limited to facilitate and promote the participation of the private sector.

Specific policy reforms that target the agricultural sector include:

- Withdrawal of the government from fixing producer and consumer prices
- Reduction in export taxes
- Removal of agricultural subsidies in input such as fertiliser, seeds and chemicals
- Removal of quantitative restrictions in movement of agricultural commodities and inputs and
- Reducing and rationalisation of state marketing and credit institutions including liberalisation of markets and promotion of the private sector

MIS in Tanzania dates back into 1970 when the Marketing Development Bureau (MDB) was established under the Ministry of Agriculture. The project was funded by UNDP while FAO was the participating and executing agency. The project came into full operation in 1972. During its inception MDB had the following objectives;

- To provide advice to the government on marketing policy
- To organize marketing training for the staff that would be required by the Ministry, marketing authorities and cooperatives for their marketing activities, and
- To establish a regular market news service

Later on additional tasks were put to MDB and these include;

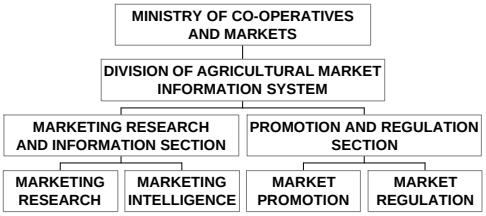
- To set consumer prices
- To carry out research on costs of crop production on behalf of the Cooperative Unions
- To recommend producer prices for staples and major cash crops (1973/74)

When it started information reported by MDB was official commodity prices and volumes. In early 80s even before market liberalization MDB had already extended its coverage to include unofficial parallel markets. However, such information became legitimate and acknowledged by the government after adoption of market-oriented economic policies in 1986. Since then MDB has been undergoing gradual transformation in terms of functions, organization structure and commodity coverage. As a reflection to such changes the department's name has been alternating from MDB to Agricultural Information Service (AIS) and Market Information Service (MIS).

3. **Current Market Information System**

Under recent changes MIS has been transferred from the Ministry of Agriculture into the Ministry of Cooperatives and Markets. Figure1 illustrates the current organization of MIS under the Ministry of Cooperatives and Markets.

AGRICULTURAL MARKET INFORMATION SYSTEM IN TANZANIA



3.1 Organization Structure and Functions

3.1.1 Marketing Research Unit

The functions of this unit are:

- To conduct customer needs assessment and provide information to farmers, livestock keepers, domestic traders, processors, importers and exporters
- To assess market potentials

- To analyse market shares, distribution channels, demand and supply, sales and market development

The mentioned functions are accomplished by conducting market surveys and participation in commissioned studies. In general, the activities of this unit involve data collection, analysis and dissemination of research findings.

3.1.2 Marketing Intelligence Unit

This is unit is involved in gathering of time series data from various markets by interviewing market participants e.g. wholesalers and retailers. Regional and district market monitors report what is happening in their markets to the central data processing unit in the Ministry. Other sources of its information are publications i.e. books, newspapers, trade periodicals; large-scale storage and processing facilities. Types of data collected include commodity prices, volumes of trade, marketing costs, commodity quality etc. In general activities of this unit involves gathering of time series, data analysis, projection and forecast, storage and dissemination of information to stakeholders.

3.1.3 Promotion Unit

Broadly, the functions of this unit include advertisement, promotion and publicity. To perform these functions the unit organizes trade fairs, exhibitions and provide support in building the capacity of private sector in promoting their products in domestic and international markets. Since individual companies market their own product, this unit is involved in coordinating and facilitating such activities. Also the unit is involved in generic promotion i.e. promotion of a commodity as an industry as opposed to brand promotion performed by individual companies.

3.1.4 Regulation Unit

This unit is involved in regulating crop/commodity marketing boards and traders by setting standards and grades of products (inputs and produce), formulating rules and regulations of operations, coordinating and monitoring, setting standard measures and weights.

3.2 Other Agencies Involved in MIS

Besides MDB there are other agencies involved in providing agricultural MIS. These are;

3.2.1 Food Security Unit (FSU): FSU was established in 1989 under the Ministry of Agriculture and Cooperatives. FSU has two sections, namely, Crop Monitoring and Early Warning System (CM&EW) and Strategic Grain Reserve (SGR). CM&EW is charged with the task of assessing (present and future) crop production and food supply in the country so that the government can take timely remedial measures on impending food deficit or surplus. This department has a countrywide system of assessing food production and supply through rapid field surveys, agro-meteorological data, crop procurements and stock data.

3.2.2 Kariakoo Market Cooperaion (KMC): KMC was established in 1981 as state company and is the largest produce market in Dar es Salaam. KMC is under the Ministry of Local Governments. KMC collects and keep records of price and volumes of crops delivered into the market.

3.2.3 Bank of Tanzania (BOT): BOT publishes quarterly and annual reports on agricultural production, export and import of commodities

3.2.4 Customs Department: This is department is under the Ministry of Finance and provides information on export and import of commodities including food and cash crops. Some of the information collected by this department are published by the Board of External Trade.

3.2.5 Private Sector

Since the adoption of liberalized market policies there has been an increasing participation of private firms and organizations in providing MIS. Some of identified MIS providers are Business Care, and Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA). Business Care publishes market information in its weekly the *Business Times*. In addition to reporting secondary information from other agencies, Business Care has its own network for gathering market information. *The Financial Times* also sponsors and publishes market information gathered from various agencies discussed earlier.

4. Factors Contributing the Changing Role of MIS

4.1 Policy changes

Abandonment of central planned socialist policies and adoption of market-oriented policies have prompted MIS to change its mode of operation from reporting of official (fixed) prices set by the state agencies to monitoring and reporting of market prices as they are determined by demand and supply.

4.2 Government MIS Organization Structure

During its inception MDB was under the Ministry of Agriculture. However, there have been frequent changes in the organization structure of the Ministry of Agriculture including split or merger of its departments, and transfer of its staff or functions to other Ministries such as Ministry of Regional Administration and Local Government, Ministry of Cooperatives and Markets, and Ministry of Water and Livestock Development. Such changes have affected the performance of MIS department in the Ministry especially in maintenance of database, coordination of market monitors in the regions and districts on one hand and data processing unit in the Ministry. Discontinuity of data series is one consequence for such frequent changes in the organization structure of the Ministries concerned.

4.3 Emergence of Private Agencies Offering MIS

Participation of private sector in agricultural commodity trade and as providers of MIS has changed the environment at which government MIS operates. Private agencies are complementing government's effort in providing MIS. Information collected by private agencies has a potential of serving as a verification mechanism for information collected by government agencies. However, there is a need to coordinate activities of various MIS providers to ensure consistence and avoid confusion to information users. Institutional networking in MIS

providers is vital to ensure a more broader geographical and commodity coverage while avoiding duplication of efforts.

4.4 Commodities Changes

During its inception MDB coverage was limited to few fruits and vegetables. Currently there are 27 food crops covered by the government MIS. Export crops such as coffee, tea, cotton, etc., have a more developed MIS than food crops. Since most of exports are of high value crops there is more involvement of private traders and crop cooperatives in providing various services including market information. MIS in export crops is more commodity-specialized.

However, since liberalization of markets some non-traditional exports such as food crops (e.g. rice) some fruits, vegetables and spices are gradually penetrating international markets. Also domestically, more commodities are finding their way into the market and there have been changes in commodities in the market in terms of volume, type and form. For instance some commodities that traditionally were grown for subsistence in the past have become more popular and are now produced commercially. Also more commodities are now being processed and packed before are sold to consumers as a way of adding value to them. Rapid emergence of maize and rice millers has been witnessed in recent years. This has led to decrease in commodity volume in some markets as part of the supply is re-channelled into millers instead of being delivered directly into the open market. Such trend has been reported in Tandale market, which is the largest wholesale grain market in Dar es Salaam. Packaging of milled products is also increasing leading to multiplicity of product brands in the market.

These changes have made it necessary for the MIS to change its mode of operation and revise its commodity basket.

4.5 Mass media for Dissemination of Market Information

When MDB started all the media ware under state monopoly. Currently there are many private media such as radio, TV and newspaper. Some of the media are nationwide while others are local. MIS has to deliver information in media that will reach the target group. Competition in media has an implication in the cost of dissemination market information.

4.6 Changes in Market Structure and Location

Currently government MIS covers 44 markets representing all major agro-ecological zones. Market information is collected mainly from producers (in rural markets), wholesalers and retailers. Since liberalization of markets there have been spatial changes in some commodity markets, possibly due to development of infrastructure (roads, railways and electricity), and increase in processing and large scale-storage. Processors and storage agencies are new intermediaries in the market structure. For example in the past Gairo was an important rural assembly market for maize and other staples along Dodoma-Dar es Salaam market channel. However, since electrification of the neighbouring Kibaigwa town, this market has shifted to the latter town.

5. Summary of Findings, Conclusions and Recommendations

From this review it is obvious that the government has done much effort to streamline the MIS in order to accommodate the recent policy changes. However, the below discussed observations suggest that the current government supported MIS still lags behind the rapid changing agricultural commodity markets hence recommendations are made on how to make MIS more efficient and timely in performing its functions.

5.1 Sampling (markets and commodity coverage)

Currently government MIS covers 27 commodities in 44 markets all over the country. Such sampling was designed to get a good representation of markets and commodities, and possibly to give statistical validity to market information collected. However, managing such a large sample of markets and commodities to ensure continuity of time series has proven difficult. There are many gaps in the price series available in the Ministry database. It would be advisable to reduce the sample size by selecting 'strategic markets' and most important commodities while maintaining good representation of agro-ecological zones, assembly and consumers markets. Reducing the sample size will ensure a closer monitoring of data collectors while increasing their motivation through salaries, capacity strengthening (training) and provision of working facilities e.g. motorcycle and mobile phones. With the current tight budget of the Ministries, a manageable sample is necessary to ensure sustainability of financial support.

5.2 Type of Information Collected

Though it is documented that volumes of commodities delivered to the market is collected, such information is scantly available in the database. Not much analysis can be done to price data without volumes. Monitoring of volume is quite complicated due to lack of transparency by

private traders (in attempt to evade tax) and emergence of new market intermediaries (processors and storage agencies). There is a need to strengthen data collection mechanism possibly by increasing public awareness of the importance of MIS through media and legal enforcement through local government by-laws. Increasing public awareness is an appropriate task for the newly formed promotion and monitoring section of MIS.

5.3 Data transmission to processing centre

Currently information from district and regional monitors is transmitted through radio-call network and postal mails. Due to increasing accessibility to internet, email and mobile phone network in regional and district towns, use of such technology where available could make reporting of information more timely and less costly. For example Vodacom Text Message cost US $ 0.06 per message regardless of the length. Sending an email in an internet café could cost TSh,. 300 –500 per 15 to 30 minutes.

5.4 Data processing

The current database needs to be updated and a more user-friendly software installed. FOODNET has already started to support MIS department by providing computers to facilitate installation of new software. However, the department needs continued support in capacity strengthening in terms of IT and analytical skills.

5.5 Information Dissemination

Most of market information is currently published in English newspapers. However, profile of traders in many market surveys indicate that majority of traders are primary school graduate. There is a need to have more market information publication on Swahili media. MIS stakeholders survey will reveal more information on popular mass media and programs.

5.6 Institutional networking

To avoid duplication of information reported by various MIS providers there is a need to establish a network of agencies providing the service. Such networking will also allow more geographical (markets) and commodity coverage while minimizing costs of MIS. Inconsistence in information reported will also be avoided.

5.7 Units of Measurements in Reported Prices and Volumes

Standardized measuring facilities are lacking in most markets and commodities. For example bags of maize and rice differ from market to market and seasons. When prices are converted into standardized weights such as Shilling per kilogram more precision is lost. The Regulation Section of government MIS need to undertake a study on how to cope with this and possibly regulate markets through legal enforcement. Use of standardized scales is gaining popularity in retail urban markets for some commodities. However, adoption of such practice needs more incentive and legal enforcement.

5.8 Promote Participation of Private Sector in MIS

There is an increasing participation of private sector in providing MIS. There is a need to promote more participation of private sector in providing MIS through public awareness campaign and contracting some of MIS task to private sector. However, due to high cost of providing MIS especially in geographically scattered market, the government should continue to provide this service and gradually withdraw where the private sector is taking over.

5.9 Changes in the Organization Structure of the Ministries

Frequent changes in the organization structure of the Ministry is affecting negatively the performance of MIS especially in maintenance of database, coordination of reporting system for markets in the districts and regions to the central processing unit. Discontinuity of many time series and loss of records is the evidence of the negative impact of frequent changes in the Ministries. To minimize such negative changes at least at the Ministry level, MIS department need to be moved as unit instead of splitting or merging it with other departments.

References:

Mdadila, J.M. (1996). A proposal to set up a comprehensive market information system for the agricultural sector. Marketing Development Bureau of the Ministry of Agriculture, Livestock and Cooperatives. Dar es Salaam, February 1996.

MDB (1992). Wholesale trade in grains and beans. Marketing Development Bureau of the Ministry of Agriculture and Livestock Development. Dar es Salaam, January 1992.

List of Current and Past MIS Officials Interviewed

1. Mr Banda, E.T.- Former Assistant Commissioner, Marketing Development Bureau, Ministry of Agriculture
2. Mr Mdadila, J.M Director, Market Information Service, Ministry of Markets and Cooperatives
3. Mr Ulaya, B. Market Information Service, Ministry of Agriculture
4. Mr Massawe, B.D. Project Manager, Tanzania Livestock Development Project, Ministry of Water and Livestock Development
5. Mrs Mlote,S . Coordinator of MIS, Tanzania Livestock Development Project, Ministry of Water and Livestock Development

Project 2

Technical report

Preamble:

The market information service is a new initiative aimed at empowering farmers by availing market information. The only prevailing market information service is through the Daily nation column provided by market information branch, Ministry of Agriculture. Our niche is the rural farmers in Kiambu and the larger Central Province/Nairobi. It was initiated by Immediate Communication after funding was received from FOODNET on 21-02-01. Our brochure is attached (annexe 1)

Hiring of staff

The post of market information compiler was advertised in College campuses and in both Nation and Standard on 7-03-01. A minimum of agriculture economics Bsc was requested. About 30 people responded and interviews were performed over a one week period. A scoring method was adopted and the person who scored most was hired. He has a Bsc(Agric. Econ.) computer training, work experience in marketing and managing a coffee estate. He commenced work on 12-3-2001

Preparatory work

The initial work of the data compiler was to familiarize himself with the markets, get a feel of the sellers, traders and farmers. He had to identify the main markets in Kiambu dealing with substantial volumes. He also travelled to other markets in Central province for comparative purposes. His other mandate was to ask these people he met through a simple questionnaire, the radio they listened to, the times which were most appropriate, their trade products and volumes. This work was conducted from 12-03-01 to 30-03-01.

Equipment acquisition.

A computer, printer, UPS and surge protector were purchased early on as indicated in the financial report. Considering that the target area has rugged terrain, it was important that a reliable and strong motorbike was obtained. All available models for that purpose were costly way above the ceiling set especially due to the taxes. After a long period of searching, a new Jialing motobike was obtained at the amount set by the budget (200,000) and the balance of forty thousand would be met by the company. This price includes helmet, one weeks training and taxes. The delay in purchase of the bike, meant that the data collector had to use public transport means of travel. His travelling expenses in the month of March and April were all in that category.

Radio programmes

From the first instance, Kameme FM had been approached to air the programmes but they were charging too much (20,000 per announcement). We then approached Coro FM who agreed to broadcast for 5 min 5380 sh/week information which was relayed to FOODNET. At that stage it was viable to air two programmes per week. We were later called by Kameme FM who had got wind of what was going on and who were still interested in airing the programme on commodity prices. They preferred daily commodity prices and covering Central Province which is their target audience. Our project covered only Kiambu (one of the districts of Central

province) and our budget was 5380 shs per week for air costs. After some discussions, a compromise was reached. They agreed to reduce charges to 1000 sh/ programme per day for five days. This came to 5000sh/week. The information would be as a chart which was flexible and could be adjusted and not tied to a time frame. This was actually below the budget set earlier in the project for two days. We devised a cost-effective way of collecting information from four markets representative of central province to meet their needs by recruiting ex-high school market traders as field agents. This was to cover distant markets in Karatina, Thika, Kutus, Kagio. They would be paid 100 sh./call and make a reverse call. Their information would be counterchecked by regular survey visits. The idea seems to have worked so far

Execution of the radio programmes.

The radio programmes have been going on daily since, 2-4-01. For each day, the markets which were active are presented. This means there is a daily variation which creates interest. A typical daily programme is attached for reference. The format has been modified after two weeks to include varieties of peas, potatoes, Bananas. The farmers wanted the particular types of commodities defined as they command different prices. This information was from the market people. Another modification was the inclusion of rice, and French beans as commodities. We have included the weekly prices of meat live chicken, mutton and beef from the main private slaughter houses aired on Wednesday only.(annexe 2)

Results

There are different results depending on the respondents.

Farmers: Many farmers are responding positively as reflected by the following examples:

Case 1.0: in Kawangware, some farmers after hearing the programme, relayed the information to Timboroa (In Rift Valley province). The following market day saw a large supply of potatoes from Timboroa.

Case 2.0: In the Kiambu market, one trader who buys potatoes from Kinangop observed that the farmers were fixing the prices on the information obtained from the broadcast. Consequently, the price for a bag of potato from the farm gate increased by sh100 as they now had a bargaining position

Traders: Most traders were not quite receptive to the service.

Case 1: One trader in Kiambu felt that the market information service was creating awareness to the farmers on market trends. She felt that the prices should be looked at from the consumers side as they too bought the produce according to the prices broadcast.

Case 2.0 A major egg supplier located in the city centre noted that farmers get a raw deal since they are mostly price takers. She observed that with introduction of the information service farmers can have more leeway in setting prices for the eggs. This, she noted, would minimize price differences in the same market, for instance, Wangige market where she obtains her supplies.

Case 3.0 This trader from Kiambu felt the market information service was a market spoiler. She felt that with the introduction of the information service the farmers were asking for a higher price as opposed to earlier times. She would rather withhold the information from the compiler.

Our response to these challenges was that they should expand their vision and think beyond the farm gates. Since some of them had been in business for a long time they should utilise the market information services to obtain prices of commodities in far away markets and organize efficient means of travel to obtain better price margins. They could also think of adding value to these commodities like better packaging or higher grading

Challenges.

Lack of homogeneity in unit measurements. Potatoes, cabbages, green maize and carrots In some cases eg. maize, cabbages, the units are packed in a truck and delivered to the market. In some cases, there is variation of the bag sizes from big to small.

Conflicting interests, some traders want high consume prices to be announced so they can sell at a higher price. Others want low producer prices to be announced so that farmers sell cheaply to them. Some are totally disinterested in people who are not buying

Past and future challenges

The project was initially designed to cover Kiambu district alone which was about five market: Wangige, Limuru, Kiambu, Githunguri, Marigiti /Nyamakima (Nairobi) . It was also meant to be aired on two days per week. Due to the challenge from Kameme FM radio and farmers that this was too restrictive and not comprehensive enough, five other markets were included. These are Karatina, Kutus, kagio, Thika and the Mwea region These areas represent a very productive region of Central Province especially in rice, horticultural produce like French beans and tomatoes. These inclusions have made the service very successful because of the wider reach and diversity of markets. Through negotiations, a daily programme for the week was also worked out within the same air time budget. Since market day schedules are different every day, it has meant that we have a different programme everyday which has increased the interest in the information flow. We had to design a simple way by using field agents in which we could obtain information from the distant markets by use of reverse telephone calls. Their re-numeration may need topping up to increase motivation once reliable agents have been identified. This has, however, lead to an increase in our telephone bills an item which was not covered in the initial budget.. It has also meant a more frequent and distant field validation of the data.

From the information gathered so far, the area of interest is covered by the two radio stations. Kameme FM is popular in Kiambu and Nairobi environs but has a weak signal and is therefore not heard in the five distant markets mentioned earlier. Coro FM on the other hand was started only a few months ago but has a strong signal in all these areas mentioned. It may be viable in future to consider having both stations air the prices but with different formats.

Schedule of activities

Date	Activity	Results	Comments
5-03-01 9-03-01	Data collector interviews	One hired	BSc. Agr . econ
12-03-01	Market familiarization	Set-up and	5 markets

30-03-01		contacts established	
2-04-01 30-04-01	Radio market prices	Daily prices mon-friday	9.30 pm kameme FM
17-04-01	Format modification	More informative	
18-04-01	Supplement	Weekly livestock prices	Wednesday programme

Partnership building

MoA: We are in contact with MoA official Mr Mushangi in evaluating the effects of the programme and visited field officers in the Ministry of Agriculture

KWFS (Kenya women Finance Trust) This is a credit providing institution which targets women in the rural areas. We have visited Kenya women finance trust based in Karatina and expressed our wish to be associated with their members as regards market information and its use to their members

GTZ-PES - This is a GTZ funded project with the mandate of assisting private extension agents in formulating their work to suit farmers. We are liasing with them so that they can facilitate a stakeholders forum for farmers, consumers, input providers and others. The objective would be to 1) Get a feedback on the service so far. 2) Identifying problems and challenges and mapping the way forward. 3) Identify possible partners for the future sustainability of the programme.

Conclusion.

In conclusion, the services have been very successful according to many farmers and some traders. They have adjusted to these services and some have become daily listeners and look forward to comparing prices in the different markets.

Project 3

(FIRST DRAFT)
Marketing Opportunities for cassava based products: An Assessment of the Industrial Potential in Kenya

Prof. Edward E. Karuri
Prof Samuel K. Mbugua
Dr. Joseph Karugia
Kelly Wanda
John Jagwe

February 2001

University of Nairobi, Department of Food Science Technology and Nutrition
Foodnet / International Institute of Tropical Agriculture

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PREFACE

This study was carried out by the Department of Food Science Technology and Nutrition of the University of Nairobi, in collaboration with Foodnet which is a regional network promoting marketing oriented research in order to identify opportunities for value added processing of agricultural products.

Funding was provided by USAID through ASARECA, a sub-regional research organisation coordinating the Foodnet network

Prof. Edward E. Karuri, Prof. Mbugua and Dr. Joseph Karugia of the University of Nairobi and Kelly Wanda and John Jagwe of IITA-Foodnet wrote the report.

ABBREVIATIONS

ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
IITA	International Institute of Tropical Agriculture
KAM	Association of Manufacturers of Kenya
CPC	Corn Products Corporation (Kenya)
SBA	Starch-Based Adhesive
USAID	United States Aid for International Development

ACKNOWLEDGEMENTS

Much effort has gone into the preparation of this report. We wish to appreciate first and foremost the co-operation that we received from the personnel in the industries visited in the various parts of the country. Their willingness to provide us with relevant information without fear despite our calling on them at very short notice was very encouraging. Special thanks go to those who embraced our effort and were willing to participate in future industrial trials.

We would like also to thank all the staff of the Department who tirelessly devoted their time in supporting this survey.

Lastly, it ought to be pointed here that without the financial support from USAID through the Foodnet ASARECA network this report would not have been written and published.

SUMMARY

Since the era of development aid in Africa, research efforts have been focused on increasing agricultural productivity mainly through improved technology at the farm level. In spite of such programs, rural household incomes have largely remained low thereby perpetuating the relatively higher poverty level with all its negative consequences notably, low savings, low investment, low productivity and low incomes.

It has now been increasingly realized that real benefits to rural communities are going to come from forward linkages of rural producers to more stable and higher value industrial markets. In turn industry too stands to benefit from increased rural household incomes in terms of higher effective demand for industrial products.

Therefore, this report presents findings on the current state of the Kenyan market for starch, starch-based adhesives and high quality cassava flour for industrial purposes. An assessment of the potential for locally made cassava-based products to substitute for existing raw materials has also been attempted.

KEY FINDINGS

The total market for starch-based products in Kenya is estimated to be over 12,000 MT per annum. A bigger portion, about 60%, goes into the brewery industry. Other major consumers include paperboard, paper and the food sector.

Native maize starch dominates the market for starch. This is mainly produced locally. Modified starches are not significant.

Cassava starch has the potential to substitute maize starch in the paperboard industry. Some of the industry in this sector had used cassava starch before which they found preferable. However, use was discontinued due to inconsistency in quality and erratic supply. The manufacturing costs are high in the local scene because of inefficiencies in the production chain.

At the moment production and supply of cassava starch is low and not timely. This was attributed to higher costs of local production, poor infrastructure and low raw material production

The potential use of cassava in animal feeds has not been exploited in Kenya. This is mainly due to lack of information especially in terms of the processing steps and the rate of substitution of cassava for maize in the commercial animal feeds.

1.0 INTRODUCTION

The economy of most of the developing countries is still largely based on agriculture. However, if agriculture in the developing countries is to contribute to real growth and development in these countries, the link between it and industry has to be developed and strengthened. This would in turn then offer alternative and cheaper sources of raw material to industry while at the same time offer the much-needed internal market to stimulate industrial production.

1.1 Objectives of the study

This study aimed at making a rapid and detailed investigation of the existing industrial markets for starch-based products in Kenya and to assess the potential for cassava based products to replace or partly substitute existing raw materials.

In addition, an attempt was made to identify firms within the respective high priority industries that researchers could work with to achieve market penetration and assess consumer acceptability.

Survey effort was concentrated in the towns constituting the pinnacle of Kenya's industrial base and those around the production areas. These included Nairobi, Mombasa and Nakuru

1.2 Methodology

The design of the survey followed a sub-sector approach and the technique employed involved conducting unstructured and informal interviews in addition to directly observing the critical stages in the production-transformation line wherever possible. Also, sound secondary data sources were relied upon whenever possible.

Prior to the interviews contact with the respective business associations was established and a list of potential firms compiled. Through these preliminary visits, the objectives of the survey and its expected outcome were explained and appointments booked for the primary visits that were to follow. A deliberate attempt was made to contact key informants in each of the categories.

Thus the sample was purposively selected to include respondents from each of the relevant categories identified during the literature review as potential raw material users. Rather than concentrating on numbers, the focus was placed on contacting key firms in the industry in order to obtain a more representative sample.

For each industry to be visited, questions (guidelines) focusing on key production and marketing activities were developed. The semi-structured informal interview guidelines were not written up in the form of a formal questionnaire but they were drawn up as checklists of key issues and topics. Once the survey team was familiarised with the detailed questions of the

original checklist (approx. 7 pages), a shorter version of the latter (i.e. 1 – 2 pages max.) was found useful to stimulate a free-flowing discussion with members of the industries.

Researchers formed two different groups comprising of at least two a technologist and an economist. This combination was found to be very useful both for the research team and the industries visited. It made it possible to understand the relationship between technology and economics and also recent technological developments in the various concerned areas.

A report about each industrial visit made was compiled after the interview, relying on the checklist to make sure that no issue had been overlooked.

It was important that note-taking should not inhibit a free flow of discussion. This effort to keep the interviews informal seemed to encourage frankness on the part of the respondents.

For far away firms, where bookings could not be made by telephone due to various reasons, visits were nevertheless made. This form of "cold-calling" was generally accepted, and useful data was obtained. However, there is a danger that without prior appointment key individuals might be missed. In this case, another visit was obligatory.

Responses from each interview were carefully compared with the responses from other interviews carried out with firms in the same category. This approach was conducted through meetings of the entire research team, which were designed to:

- Ensure that all the collected data had been summarised.
- Identify gaps in the existing information.
- Start forming hypotheses about constraints and opportunities within the marketing system.
- Assess the progress of the survey.
- And design a follow-up of the fieldwork where necessary.

The researchers also used the team meetings to refine their understanding of the roles, responsibilities and links within the production and manufacturing business.

2.0 INDUSTRIAL DEVELOPMENT IN KENYA

Agriculture dominates the economies of sub-Saharan Africa, where it accounts for 70% of total employment and 40% of the total merchandise exports. In this region the contribution of agriculture to GDP is 32%. Agriculture is the mainstay of Kenya's economy, accounting for 26 percent of the gross domestic product (GDP) while manufacturing accounts for about 14 percent. Tea, tourism, coffee, and horticulture in that order are the main foreign- exchange earners (CBS, 1998). In Kenya one to two thirds of manufacturing value added is based on agricultural raw materials (Jaffee, 1995). Many services are linked to agriculture. Food processing, beverage and tobacco industries are among those dependent on agricultural raw materials. Of the industries mentioned, the food processing industry is the single largest component of the manufacturing sector of most African countries.

Since independence in 1963, the country has had mixed performance. In the first 10 years of independence, the country enjoyed high GDP growth rates averaging 6.5 percent per annum, low inflation, high job creation, and a relatively stable balance-of- payments position. During the 1973-1980 period the country's record growth was by three major shocks. The first was the sharp rise in oil prices in 1973, which created considerable internal and external economic imbalance. In 1997-78, the price of coffee and tea rose significantly, which immediately improved the balance of payments position but subsequently created internal economic imbalances. The third shock was in the GDP of 5.2 percent per annum, reflecting a moderate reduction in the high growth rates achieved in the first 10 years of independence. In 1990, growth in the GDP fell to 4.3 percent and 1991 to 2.2 percent; by 1992, it was just 0.4 percent per annum. In 1993, the government introduced more and far-reaching structural reforms, including removal of price controls, removal of all import licensing, and removal of foreign exchange controls. These growth slowed to 4.8 percent in 1996 and declined substantially to 1.2 percent in 1997 (CBS, 1998).

The food industry may be classified into formal and informal sector. The formal sector is classified into large, medium and small scale industries. The criterion for classification is based on the number of employees. Large-scale industrial units have above 50 employees; small-scale industrial units have below 20 while the medium scale industrial units have between 20 and 50 employees. A summary of some of the food industries is given in Table 2 below. On the other hand the informal sector consists of the cottage industry, family and the sole proprietor. After independence and up through the mid-1980's the policies and direct investments of the Kenyan government favoured relatively large-scale industrial units in the food industry and elsewhere. Most of these large scale units were owned by multinationals and some by farmer co-operatives. After the mid 80's the small scale to medium scale industrial units began to mushroom. This is mainly due to the high overheads incurred when running large scale industries. The food for export is processed mainly by the large-scale units while that for local consumption is produced by the medium to small scale industries. The informal sector has proved vital in supplying processed and ready to eat foods to domestic consumers particularly in towns.

The essence of food processing is to produce a high value food product. Processing begins with the articulation of consumer demand and leads to decisions to produce. This continues through

the series of activities which produce and subsequently transform the crop or animal product in form, time and place to match consumer demand (Breimer, 1976). In Kenya the best established industry is the dairy industry. This transforms raw milk to pasteurised milk, dry skim milk, butter, cheese e.t.c. Which fetch a higher price. This industry is dominated by the private sector. The development of the commercial dairy production and trade can be divided into five historical stages as listed below.

- The origins of export oriented butter production (1900-1930's)
- Discovering the domestic milk market (WW II- mid 1950's)
- Dualistic development (late 1950's to 1970)
- Market consolidation and the "publicization" of the private sector (1971- early 1980's)
- High cost expansion and creeping liberalisation (mid-1980's to present)

Most of the foods processed in Kenya can be historically classified in the same manner except the first two stages.

Table 1. Classification of some the Food processing

TYPE OF INDUSTRY	NUMBER OF INDUSTIRES, GROUPED ACCORDING TO SIZE		
I) FOOD MANUFACTURING	SMALL	MEDIUM	LARGE
Slaughtering, preparing and preserving meat	6		3
Manufacture of dairy products	11	4	10
Canning and preserving fruits and vegetables	14	7	1
Canning, preserving and processing of fish	12		
Manufacture of vegetable and animal oils and fats	17	8	1
Grain mill products	42	15	4
Manufacture of bakery products	17	2	4
Manufacture of cocoa, chocolate and sugar confectioneries	11	3	1
Manufacture of food products (N. E. C).	73	52	21
Sugar factories and refineries	7	1	9
Manufacture of prepared animal feeds	25	5	2
II) BEVERAGE INDUSTRIES			
Distilling, rectifying and blending spirits	2	3	1
Malt, liquors and malt	2	1	4
Soft drinks and carbonated waters industries	3	6	5
TOTAL	239	102	66

Much of the new agribusiness investment over the past decade by foreign companies has been made by firms, which had already been established for a long time. Investments have been geared toward diversifying product lines away form commodities facing adverse market trends. Kenya has witnessed the diversification of foreign owned tea, coffee and sisal companies into horticultural production and trade (Jaffee, 1995).

Gender in the food industry.

Most of the large scale to medium scale units are run by the men. In Kenya, the women take charge only of the micro enterprise and the informal sector in food marketing and processing. Several Kenya's small peri-urban firms including dairy processing are owned and/or managed by women including one that is considered to be the most dynamic single owned dairy company. The Table 2 below shows the ownership of micro enterprises in Kenya by gender. It is clear from the table that men dominate in the ownership of the food industry in Kenya. It is also evident that partnerships between men and women is not common.

Table 2. Ownership of micro-enterprises in Kenya by gender

Gender of proprietor %	Kenya
Female	43
Male	53
Mixed	4

3.0 CASSAVA PRODUCTION

Cassava is classified under roots and tubers, which is the class of foods that basically provide energy in the human diet in the form of carbohydrates. The term roots and tubers refer to any growing plant that stores edible material in the subterranean root, corm or tuber (FAO, 1990). The cassava is important historically for acting as a food security crop for various communities during tribal warfare and innovations where it was hidden under ground and for saving the Rwanda-Burundi kingdoms in 1943 when potato blight destroyed all their production. It also fed the Biafrans during the Biafran war in Nigeria in 1966-69.The spread of the cassava was facilitated by its ability to thrive poor husbandry and to tolerate drought. It originated in tropical America and was introduced in Kenya by the Portuguese and Arab traders (Jones, 1959).

In Kenya as in the rest of Africa, the cassava is usually a subsistence crop grown mainly as food and only the surplus is sold. Cassava is consumed as a basic source of low cost calories or as a supplement to cereals. The proximate composition of the cassava is shown in Table 1 below. This table shows clearly that the crop is a rich source of carbohydrate. It has been documented that the cost of cassava is about 25 to 50 percent that of the locally produced traditional grains and pulses (Goering, 1979).

Table 1. Nutritive value of the cassava

Food energy kJ	Moisture con-tent %	Protein g	Fat G	Total CHO and fiber	Fiber (g)	Ash (g)	P (mg)	Fe (mg)	K (mg)	Na (Mg)	Thia-mine (mg)	Ribo-flavin (mg)	Nia-cin (mg)	Ascor-bic acid (mg)	Folic acid (ig)
565	65.5	1.0	0.2	32.4	1.0	0.9	32	0.9	394	2	0.05	0.04	0.6	34	24.2

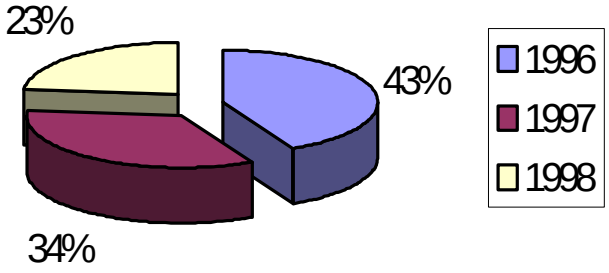
Source: FAO, 1972.

Cassava (*Manihot esculanta crantz*) is one of the major staple foods in Sub-Saharan Africa. It is estimated that Africa produces above 42% of the total tropical world production of the crop

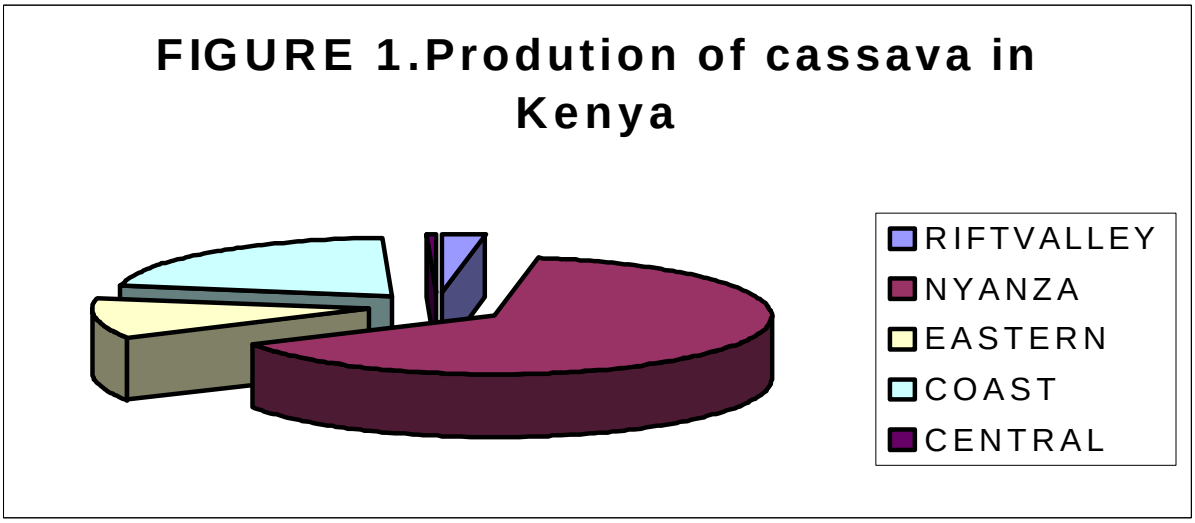
(FAO, 1978). Cassava is grown virtually throughout Kenya. However, the Western, Coastal and semi-arid (Eastern) regions of Kenya have the highest production in that order. Traditional utilisation in Kenya is limited to roasting and boiling of fresh roots for consumption in all the growing areas (Khaemba, 1983). In Nyanza and Western provinces of Kenya, roots are also peeled, Chopped into small pieces, dried and milled into flour for ugali. This is normally in combination with a cereal (maize or sorghum). In the Coast province cassava leaves are used as vegetable (Khaemba, 1983). In the Coast province cassava leaves are used as vegetable (Khaemba, 1983) while in Machakos and Kitui, cassava roots are used as a snack.

The bulk of cassava produced in the country is used for human consumption and surpluses are processed in to starch or used for animal feed. However, the present production is adequate for both the demands of starch production and as a food source (Khagram,1983). The market for fresh cassava as a food is more lucrative than for starch extraction but the market for fresh cassava is limited (Karisa, 1983). Fresh cassava has a very short post-harvest storage life, and it must be used or processed into durable forms soon after harvest (Ayernor, 1981). Except for cassava crips, there is no commercial processing of cassava for human consumption. Other products such as deep-fried and sun dried cassava are produced but at a very small scale in the coastal areas. The cassava production in Kenya unfortunately seems to reduce with time as shown by Figure 1 below. This may be because of the high opportunity cost of production.

Figure 1. Production of Cassava over the years 1996 to1998



Based on the data obtained from the Ministry of Agriculture, Nyanza province produces most of the cassava consumed in the country. This may be because of the cultural acceptability of the crop by the population living in the area. The communities living in this area utilise the crop for various traditional dishes. Central province on the other hand produces the least mainly because in the communities living in the area consider it a non-prestigious crop. The little produced in this area is used as cattle feed.



4.0 CASSAVA MARKETING

In Kenya, cassava is marketed mainly as a fresh root. The marketing of the roots is through village markets situated at the areas of production. Some of it is transported to larger markets situated in the district towns. Processed cassava products are also sold at the markets centres and at residential areas. These processed products include sundried cassava crisps and deep fried cassava. The two latter products are mainly sold in the coastal region. The price of fresh cassava fluctuates depending on the season. In Nairobi for example the price is highest in May and lowest in June.

In the market areas the cassava is marketed as heaps or in bags. There is need to standardise the quantity sold.

5.0 CASSAVA UTILISATION

Fresh cassava has a very short post-harvest storage life, and it must be used or processed into durable forms soon after harvest (Ayernor,1981). Various communities in the region have found different methods of cassava. The main reason for processing other than making the food palatable is to remove the antinutrients in the cassava especially the cyanide.

5.1 CASSAVA CONSUMPTION IN KENYA

5.1.1 INTRODUCTION

Traditional cassava utilisation in Kenya is limited to roasting and boiling of fresh roots for consumption in all the growing areas (Khaemba, 1983). In Nyanza and Western provinces of Kenya, roots are also peeled, chopped in to small pieces, dried and milled in to flour for ugali. This is normally in combination with are a cereal (maize, sorghum or millet). In the coast province cassava leaves are used as vegetable (Khaemba, 1983) while in Machakos and Kitui, cassava roots are used as snack.

The bulk of cassava produced in the country is used for human consumption and surpluses are processed in to starch or used for animal feed. Except for cassava crisps, there is no commercial processing of cassava for human consumption. This could be explored to make it more acceptable to a larger section of the population thereby increasing the demand for cassava products and the income of the farmer.
The following discussion focuses in the preparation of different cassava based food by 7 communities in Kenya.

Embu tribe of eastern province

- Mucui

Cassava roots, yams, potatoes and arrowroots are peeled, washed with a lot of water, sliced in to small pieces and mixed with meat. The mixture is fried in oil with onion to taste. Water is added and the mixture is left to boil until cooked. Mucui is served and eaten as a complete meal.

- Roasted cassava

Whole cassava roots are peeled, washed, either split in to smaller pieces or left intact as dictated by size, placed on burning embers and left to cook. Once done, the charred bits are scrapped off and the roasted cassava is served with tea.

Kamba tribe of eastern province.

- Mukimwa

Cassava roots are peeled, washed, sliced in to small pieces (chips) and mixed with green maize, par-boiled beans, par-boiled cowpeas or par-boiled green grams. The mixture is fried in oil with onions. Water is added and left to boil until cooked. After adding salt Mukimwa is served as a complete meal

- Mulikyo

Cassava roots are peeled, washed, sliced in to 2 or 3 big slices and placed in a cooking pot. Water is added and left to boil until cooked. It is served with tea or milk for breakfast.

- Raw cassava

This is prepared by peeling, washing and slicing cassava roots in to 4 or more slices. The pieces are spiced with a mixture of salt and ground chilli and eaten as a snack.

Luo tribe of the Nyanza province

- Ugali or kuon

Fresh cassava roots are peeled, washed and sliced into chips, which are then sun dried for a period of 1-to2 weeks. The sun-dried chips are then mixed with dried maize, sorghum, or finger millet at the ratio of 2:1 and the mixture is milled into fine flour. The flour is put in boiling water and stirred into a semi-solid porridge called ugali or kuon, which is then served with either, smoked fish, smoked meat or okra soup.

- Busaa (a local beer)

Cassava roots are peeled, washed and sliced into chips, placed and stored in a tightly closed darkroom. The cassava is removed from the sack after 1 week and sun dried for a period of 14 days. The dried cassava is then mixed with dry maize and pre-germinated finger millet that has been sun dried for 2 weeks. The mixture is milled in to flour and prepared in to ugali or kuon. The ugali is broken into small pieces, which are then sun-dried for 3 weeks then milled into

flour. The flour is placed in a big earthen pot where 40 litres of water is added, stirred and boiled to produce a light porridge or gruel called Busaa. After cooling, the Busaa is ready for drinking. It has been locally nicknamed two in one; it is a beer as well as a food.

♦ Mariwa

Cassava roots are peeled, washed, split into 2 pieces with the central pith removed and placed in a pot with 1 litre of water (strictly 1 litre to prevent the cassava from absorbing water and becoming watery). Salt is added and the pot is covered with either pumpkin or banana leaves on top of which a metal lid is placed and sealed with cow dung to become airtight. It is left to boil for 30 min after which it should be properly cooked. Mariwa is served with sour milk or milk for either lunch or supper or with tea for breakfast.

3.4 kuogo cassava roots are peeled, washed, placed in a sack or large baskets and stored in a dark cold room for a week. During storage, the cassava roots develop moulds and become soft. The roots are removed from the sacks and crushed in to small pieces, spread and sun dried for a period of 7 to 14 days. The dried roots are mixed with either millet, sorghum or maize and milled in to fine flour which is added in to boiling water, stirred and prepared into either light porridge (nyuka) or thick porridge (ugali). The ugali is served with fish, green vegetables or any stew.

♦ Chapati

The flour obtained in the preparation of kuoga is mixed with wheat flour and kneaded into dough. Small balls of the dough are spread into thin disks, which are then pan fried to produce chapatti. Chapatti is served with tea for breakfast or with fish or any stew for lunch or supper.

♦ Ugali

This dish is prepared for someone going on a long journey. Cassava roots are peeled, washed, sliced into small pieces and dried for 7 to 14 days. The dried pieces are mixed with finger millet at the ratio of 4:1 and milled into fine flour. The flour is added in to boiling water, stirred and prepared into either light porridge (nyuka) or thick porridge (ugali). The ugali may be served with fish, green vegetables or any stew.

Baluhya tribe of western province.

♦ Ugali or Obusuma

Cassava roots are peeled, washed and sun dried for about 6 hours to get rid of excess moisture. The semi-dried roots are heaped in a corner of the kitchen and covered with a sack, a piece of cloth or canvas for a period of 3 to 5 days. The mould formed during this period is scrapped off with a blunt knife and the soft roots are put on a clean floor and crushed with stone in to big soft pieces. The soft pieces are sun dried for a period of 12 to 14 hours. The dried roots are mixed with sorghum, millet, or maize and milled in to flour. Alternatively the dried roots may be milled into flour without any cereal. The cassava: millet or sorghum ratio is usually 4:1 and cassava: maize ratio is 2:1. A cassava: maize mixture is not popular. The flour is added to boiling water and stirred until it cooks into either ugali (thick porridge) or uji (light porridge). The uji is a beverage while the ugali is served with fish, meat or any green vegetable.

♦ Boiled cassava

Cassava roots are peeled, washed, chopped into small pieces, placed in a pot with boiling water and boiled soft or completely cooked. Salt is added during boiling and the dish is served with tea or light porridge.

♦ Roasted cassava

Unpeeled cassava roots are placed on glowing embers until cooked. The roots are peeled and served with a beverage.

♦ Infant light porridge

Cassava roots are peeled, washed, sliced into very small pieces and sun dried for 12 to14 hours. The dried pieces are ground using stone grinders into very fine flour, which is added into boiling water and cooked into a light porridge. The porridge is then served to young babies.

Maasai tribe of the Rift Valley province

♦ Boiled cassava

Cassava roots are peeled, washed, chopped into big pieces and boiled with water until cooked. The dish is served with tea or milk.

♦ Raw cassava

Raw cassava is prepared by peeling, washing and slicing cassava roots. The pieces are then eaten as a snack in the field.

♦ Roasted cassava

The cassava roots are peeled, placed on glowing charcoal and roasted until cooked. The cassava is served with tea or milk for breakfast.

Kikuyu tribe of the central province

♦ Stewed cassava

Stewed cassava dish is prepared from sweet cassava or low cyanide containing varieties. Cassava roots are peeled, split, sliced into small chips and boiled in water until soft or cooked. The cassava is fried with onion in oil after which water is added and the dish is served with any stew.

♦ Ugali and Ucuru

Cassava is peeled, split, central pith is removed, sliced into small pieces and sun dried for a period of 3 to 7days. The chips are milled in to flour, added into boiling water and stirred to produce either a thick porridge (ngima) or a light porridge (ucuru). Ngima is served with stew while ucuru, a beverage, is served alone.

♦ Cassava bread

Cassava is peeled, split, the centre pith is removed, sliced into small chips and sun dried for a period of 3 to 7 days. The cassava chips are milled in to flour mixed with wheat flour and kneaded into dough from which bread is baked. The bread is served with tea for breakfast or with any stew for dinner.

♦ Roasted cassava

Cassava is peeled, boiled and roasted on charcoal. Alternatively, the cassava is not peeled but placed on burning charcoal and roasted until properly cooked. The charred bits are scrapped off and the cassava is served with tea, milk, any stew or alone.

Coastal people of the coast province

♦ Mashed cassava with milk

Cassava is peeled, washed and cut into small pieces. The pieces are boiled with onions in salted water until done and then mashed together. Milk is added and dish is served.

♦ Cassava meat stew

The meat is washed, cut into small pieces and mixed with curry powder. Onions and tomatoes are cleaned and sliced. Meat is fried with onions until a golden brown colour is obtained. Salt and water are added to the stew. Cassava is peeled, washed, cut into small pieces and added to the meat stew. The mixture is cooked for 30 to 45 min until soft. Tomatoes slices are added 5 min before serving.

♦ Cassava-bean stew (kimanga)

In preparing cassava bean stew one may use cowpeas or grams instead of beans. Beans are cleaned, washed and soaked overnight. Cassava roots are peeled and cut into slices. The beans and cassava slices are boiled together until soft and mashed. Onions and tomatoes are also cleaned, sliced and fried in oil. Salt, pepper and milk are added and the mixture is cooked for a few minutes, seasoned to taste and served.

♦ Cassava-fish stew

Cassava roots are peeled, cut into slices and cooked for 20 min. Fish is cleaned and washed as well as onions and tomatoes, which are sliced. Cups of thick and thin coconut milk are prepared. The fish is put on top of the cassava slices and onions, pepper, tomatoes and coconut milk are added. The mixture is cooked until the fish and the cassava is done. Thick coconut cream is added and ladled over the fish. Season to taste and serve. A similar dish involves frying the fish with onions and tomatoes in a little oil. These are put on top of the boiling cassava and groundnut flour is added instead of the coconut milk. The juice of one lemon is also added. Dried fish could be used instead of fresh fish.

♦ Cassava leaves

Cassava leaves are washed, pounded and boiled in salted water for 60 min. Onions and tomatoes are cleaned, sliced and fried in oil. Curry powder, coconut cream and the cassava leaves are added. The dish is ready to be served with any carbohydrate.

♦ Cassava pudding

Grated cassava roots are mixed with grated coconut and sugar. A banana leaf is cut in to two big pieces and softened over fire. Half of the cassava mixture is put on one piece of the banana leaf, folded and tied. The other package is prepared in a similar manner. Both packages are put in a greased tin or a small pan and baked in a moderately hot oven until brown. The cassava pudding could either be served hot or cold. A variation in a similar dish involves steaming the pudding instead of baking and groundnut flour could replace the coconut cream

♦ Fried cassava

Cassava roots are split into 5-6 pieces and deep-fried in oil. The cooked cassava pieces are spiced with salt, pepper and lime or lemon to required taste. The dish is served and eaten as a complement to another meal or as a snack.

5.2 CASSAVA UTILIZATION IN UGANDA

5.2.1 INTRODUCTION

Cassava is a very important food especially to the low income group of people in Uganda. The traditional methods of processing cassava are boiling, baking, frying, sun drying, and either hand grinding or milling. Cassava can also be prepared mixed with broad beans, peas and sometimes meat. Composite flour is also produced usually consisting of cassava flour mixed with millet, sorghum or maize (corn). The main method of processing cassava is boiling. However, composite flour consumption is also significant and is the major method of cassava preservation.

5.2.2 Preparation of cassava products

❖ **Boiled cassava (‘mogo’ ‘otedo’ muwogo’)**

Fresh cassava roots are peeled, washed and boiled in water for 20-40 min until cooked. Mostly urban people may add spices, whereas the village inhabitants added salt to the cooking cassava. Some other foods like groundnuts stew, simsim paste, broad beans peas and, at times, meat were added to the cooking cassava and the mixture was called Aputta in Lira and Apach, whilst in Iganga it is called katogo.

❖ **Cassava paste (‘kwonmogo’ ‘chawda’)**

The cassava roots are peeled, sliced and then dried in the sun on mats, flat rocks, or specially prepared ground smeared with cow dung to reduce dust and dirt. The drying takes about 3-4 days, and the dried chips are then stored in old tins, baskets or granaries. When the paste is

required, the chips are pounded then ground into flour, and added to boiling water with mixing until a consistent paste is obtained.

❖ **Cassava flour mixed with millet and sorghum ('kwon kal' kwonbel' 'obuita' 'mutama')**

Cassava flour was mixed with either millet or sorghum and then a paste was prepared as in pure cassava paste. One part of sorghum was added to 2 parts of cassava and ground into flour, the resulting paste was called mutama. Millet was mixed with cassava and ground into flour; the resulting paste was called obuita. When one part of cassava is mixed with 4 parts of millet, the resulting is called kwon kal, whilst one part of sorghum added to 2 parts of cassava results to kwon bel. Some districts fermented cassava (obtained by slicing fresh cassava into chips and leaving them covered in a cool place for a day or 2 until the chips are slightly mouldy) for this use in which case the amount of cassava was reduced, and some people preferred this because of the flavour it imparted to the resultant paste.

❖ **Roasted cassava ('mogo obulo' 'muwogo mwokye')**

Cassava roots were placed in hot ashes or charcoal for 20-30 min. Roasted cassava was popular among school pupils who used it as a snack in school.

❖ **Fried cassava ('mogo ocelo' 'muwogo musike')**

Fresh cassava roots were peeled, washed, cut into small pieces and then deep-fried in oil.

5.3 FOOD TYPES PREPARED FROM CASSAVA IN THE SIX COSCA STUDY COUNTRIES.

5.3.1 COOKED FRESH ROOTS

❖ *Roasted cassava*

The simplest way of preparing fresh cassava roots is roasting whole roots of sweet cassava varieties in the coals of burnt down fires. The burnt peel is scrapped off when the root is cooked and the white steamed inner part of the roots is eaten alone or with palm oil or stew. The taste of roasted cassava is influenced by the length of time the roots remain in the ground before harvesting, and the variety of sweet cassava used

.

❖ **Boiled cassava**

The roots from low cyanide varieties may be boiled fresh after peeling, washing and cutting into small pieces. The pieces are usually submerged in boiling. Boiling in large quantities of water reduces or eliminates the small quantity of cyanide, which is also present in the fresh roots of sweet varieties. Boiled cassava is eaten with stews or vegetable soups.

❖ **Soaked boiled cassava**

Another variation of boiled cassava that is mainly a storage technique, is the 'wet abacha' found in eastern Nigeria. After the cassava has been boiled, the water is poured off and the boiled

pieces are covered in cold water and kept in a cool place. Abacha is eaten as a part of the main meal. By changing the water everyday, the boiled cassava can be stored for 2-3 days before fermentation begins.

5.3.2 CASSAVA FLOURS

❖ **Unfermented cassava flours**

The roots are peeled and cut into small chips immediately after the harvest and spread in the sun for drying. In dryer climates, like in northern part of Ghana, the chips may sundry in only a few hours. During the rainy season the chips are dried over the fireplace in the house. Roots or cuttings dried in the smoke need to be cleaned and scraped before milling in order to obtain nice white flour. The traditional methods for milling are pounding in a mortar or grinding on a grinding stone.

❖ **Fermented flours**

The fermentation of cassava before it is dried and milled is common where bitter cassava varieties are more important than the sweet varieties. Whole cassava roots are submerged in water from 3 to 5 days depending on the taste desired and the taste and the weather. A longer fermentation produces a sour tasting flour, which is preferred in some regions. Fermentation is also faster in hotter climates…the colour of the flour depends on the time used for sun drying. If the drying is not finished the same day, the product may start to ferment again or get mouldy. To shorten the drying time the fermented roots may be put in bags or baskets and pressed with stones or a screw press to remove excess water. In east Africa, fermentation is sometimes done in heaps without adding water.

5.3.3 GRANULATED CASSAVA

Roasted or gelatinised granules (gari)

Gari is prepared by fermenting grated fresh cassava in sacks, squeezing out the excess water, and then frying the semi-dry granules in a minimum amount of oil to prevent sticking until a gelatinised crust forms. Yellow gari results from using palm oil to fry the raw grated chips. The longer the period of fermentation the more sour the taste of gari. Grating is either done manually or mechanically, with diesel-powered rotating grating machine. Grated wet cassava is then bagged or put in baskets and pressed to remove excess water in a variety of ways: from stones on wooden frames to hydraulic presses. Frying is usually done in large round earthen pots or iron pans. The end product can be stored up to three months in plastic bags or other containers.

Gari can then be reconstituted with hot water and stirred to form a thick paste and eaten with soups and stews; it can also be mixed with cold water/milk and sugar and drunk as a snack.

5.3.4 COOKED GRANULES

Steamed fermented granules (atieke).

Atieke are cassava granules, which are steamed after they have been mashed, fermented, dewatered granulated and semi-dried in the sun. Four different methods exist for the production of starter cultures used for the fermentation of the cassava roots: boiling, roasting or cutting fresh roots which are fermented for three days; a forth method uses a filtrate from cassava which has been boiled, pounded and squeezed. These starter cultures are added to fresh cassava during the mashing and influence the taste and the quality of the end product. After fermentation and dewatering, the mash is pressed and rolled to produce a uniform granule, sieving or winnowing may further improve it. In Cote d' Ivore, atieka is eaten directly after steaming with stews and soups. The Hausa in Nigeria use pressed, sieved and fermented cassava granules mixed with onions, tomatoes and spices, to form cakes, which are then deep-fried in oil. These cakes are called kwosai and are eaten as a full meal or as a snack between meals.

5.3.5 FERMENTED PASTES

Boiled fermented pastes

The most common characteristic of this is the white colour and smooth texture of the boiled cassava pastes. Essential steps in preparation include, peeling, washing, (grating or cutting into finger-like pieces) fermenting in water, mashing and squeezing through a fine cloth or sieve. This raw paste is then boiled in water or steamed in wrapped leaves. The normal fermentation period is from 1 to 3 days, however in Ghana, the grated cassava is fermented for 7 days. Longer periods of fermentation result in a more sour taste, which is preferred by some consumers. After dewatering the fermented cassava is pounded into a fine paste, which is filtered through a cloth. The filtrate is settled and boiled in water and eaten with stews and soups. The sediment may be stored up to 8 days, depending on how long the cassava was fermented. The longer fermentation is positively related to longer storage ability.

5.3.6 SEDIMENTED STARCHES

❖ **Tapioca**

Cassava starch is made by peeling and grating fresh roots and stirring them in water in order to separate the fibre from the starch. The particles are allowed to settle on the bottom of the container, where it forms a white muddy cake. The water is then carefully skimmed off, and the cake is removed and further dried in the sun. The semi-dried starch may be roasted in iron pads until is completely dry to form tapioca. These granules are about 1 cm in diameter and can be eaten as a snack, or boiled as porridge. Alternatively the sun dried starch cakes can be pounded or milled into fine flour, which is used as a thickener in soups and stews.

❖ **Laundry starch**

Where cassava is being processed into gari on a large scale the water, which is pressed out during fermentation, is collected in large basins and allowed to settle. The starch so formed is not considered clean enough to eat and is used as laundry starch.

5.3.7 DRINKS WITH CASSAVA COMPONENTS

Cassava is used as a substitute for maize and other grains in the preparation of local brews. Cassava is also mixed with cereals to stretch out supplies and still arrive at a product, which

resembles the original cereal based beer. Consumers generally give priority to high alcohol content ever taste. The type of yeast used influences the quality of the end product, especially in the brewing of local beer. The taste of distilled drinks is less affected by raw materials and therefore the proportion of cassava used can be high. Many different cassava products can be used, and even the lowest quality products still ferment to alcohol, such as flours, which are not properly dried or have become off-coloured.

5.3.8 NON-CONVENTIONAL FOODS

Product development especially in the line of production of me too products have been engaged in order to facilitate the utilization of the cassava by creating more outlets. Some of the nonconventional foods prepared from cassava include balanced foods, vegetable cheese processing, fortified sago and starch products, noodles and Vermicelli, nutritious food mixes, gold finger, cassava Rava, putto, Biscuits and cakes.

6.0 Starch.

Starch exists as the major reserve carbohydrate of higher plants, where it is generally deposited in the form of minute granules or cells ranging from 1 up to 100 μm or more in diameter. Chemically, it is a polymer of glucose units joined by α linkages. The α linkages, being less stable compared to ß linkages of cellulose render the starch relatively liable. Starch exists as two polymers namely Amylase and Amyl pectin. Both polymers are made up of α-D-glucopyranose units, the major component – amylopectin- has a branched structure while amylose, the minor component, has a linear structure.

Most of the world's starch supplies are derived either from grains (corn, sorghum, wheat, rice), the major root crops (potato, sweet potato, cassava, arrow root), or the pith of the sago palm. Since time in memorial various communities using traditional methods have produced starch. The development was based on the observation that a white insoluble granular material settled to the bottom when quantities of cut tubers were washed. A classical example is seen in the extraction of starch to prepare pot bammie by the Jamaicans. The steps taken in the production of pot bammie include: grating the cassava and mixing this with water, straining the pulp through a towel, allowing the mixture to settle, decanting the water, sun drying the starch and finally baking it (FAO, 1990).

6.1 Production of starch

Starch was separated from other grains and from root vegetables such as potatoes long before corn was used as a raw material (Matz, 1970). John Biddies set up the first starch factory in the United States at Hillsborough, NH in 1802. He used potatoes. In 1842, Thomas Kingsford founded the cornstarch refining industry. He was the first person to extract starch from maize on a commercial basis.

6.1.1 Cassava starch.

There are many sources of starch and for the cassava starch to obtain a profitable and sustainable market share it must compete with other starches in terms of relative prices, quality and dependability of supply (Goering, 1979). It is therefore important to study its properties so as to market it appropriately. Its bland flavour, low amylose content, non-retrogradation tendency and excellent freeze-thaw stability makes it suitable for use in food processing (FAO.1990). When used as an adhesive it produces joints with high tensile strength and is hence preferred to starch (Balagopalan *et al.*, 1988).

6.1.2 Cornstarch

The process initially used to extract starch on a commercial basis can be summarized as follows. The corn was placed in wooden, flat-bottomed tank covered with warm water and allowed to stand. After the corn was sufficiently softened it was ground in stone mills, sieved and washed on silkscreen shakers powered by reciprocating engines. The slurry that was washed through the sieves was poured in wooden tubs, treated with caustic soda and allowed to settle. After settling, the water was sent to the sewer, taking all the gluten

and soluble materials with it. This settling process was repeated three times for each batch. The starch recovery could not have been more than 50% of the total starch available.

Morden efficient corn refining plants, which do not empty other valuable products down the drain, are today in use. These in addition have laboratory facilities. In these refining plants the wet- milling process is used. The flow diagram of the wet milling process may be summarized as shown on Figure 3 below.

Cleaning operations.
These involve passing the corn past powerful magnets, which remove metallic objects, which may have been introduced by previous handling. The cleaned corn is weighed on screen hoppers and sampled for quality. After sampling the corn is then cleaned by passing it over perforated screens. The upper screen has holes just large enough to let corn and smaller particles through and the lower screen holds back the corn, but lets cobs, sticks and stones through. High pressure is then used to separate the corn from other debris by density in cyclones.

Steeping.
The cleaned kernels are transferred to "steep" tanks and soaked for 36 to 48 hrs at about 120^{o} to 130 ^{o}F. The water used contains some sulfur dioxide, which prevents germination and keeps down unwanted fermentation and other undesirable microbiological changes but permits growth of lactic acid producing bacteria. So as to minimize the cost of production due to water used and to prevent pollution and wastage of raw materials, steeping is carried out in counter current flow. The in coming water passes over the corn, which has been steeped the longest, ensuring removal of the maximum amount of soluble material. The steep water is then concentrated to 54% dry matter.

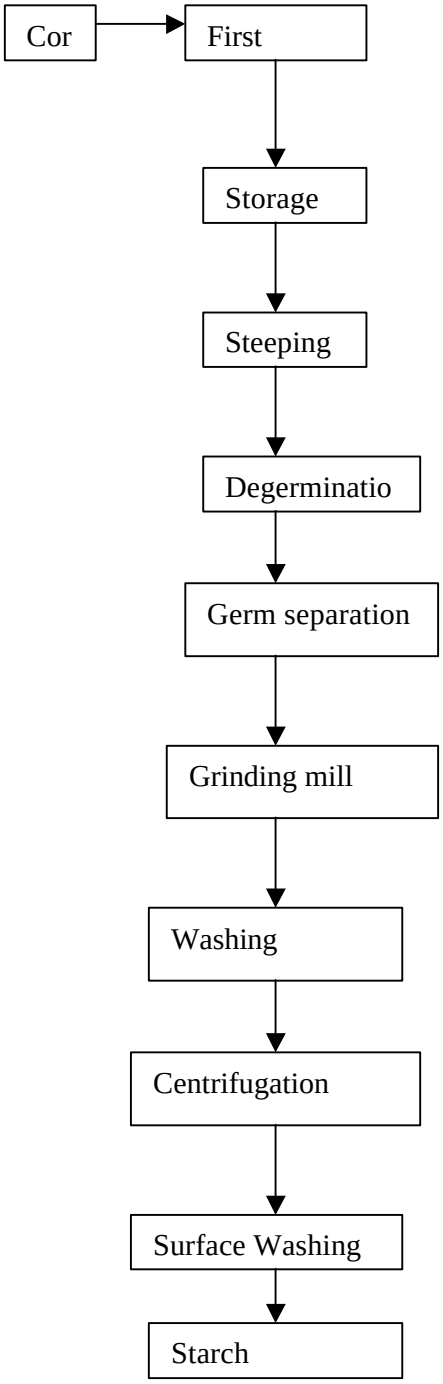
Degermination
After the steeping process the corn is now ready for the first milling operation degermination. De-germination, separates the oil rich germ from the starch, gluten, hulls, and fiber. The soft corn is then ground in attrition mills. The slurry from the mills, which consists of endosperm, germ, and fiber, is diluted with a carefully controlled amount of process water. This is then fed to a battery of hydrocyclones. The germ being lighter spins off the top, and the heavier endosperm and fiber flow out the bottom. The germ is then washed free of starch, dewatered and dried.

Separation of hulls and fiber from starch and gluten. The wet mash of fiber, hulls, gluten and starch, which remains on the reels and shakers, is fed to mills, which grind the materials to a very small particle size. The reduction in size is differential due to the nature of the materials. The hulls and the fibers are not reduced in size as much as the starch and the gluten in the milling process. The fiber and hull is then separated from starch and gluten by screening over a series of D.S.M (Dutch Slate Mines) screens.

Gluten-starch separation**.**

Starch and gluten are separated using gravitational methods. Centrifugation is used in the separation process and the two products flow out of the centrifuge in two streams. Starch and gluten streams. The starch stream contains about 1 to 2 % protein and is purified to contain less than 0.3 % protein by passing it through many small hydrocyclones. In addition the starch is washed to remove the last traces of solubles

The wet starch is dewatered on rotary vacuum filters, moving belt filters or basket centrifuges. The final drying takes place in tunnels (kiln) dryers, continuous belt hot air dryers, or in spray dryers
The gluten after centrifugation is either separated by sedimentation in large tanks or more generally, is de-watered and de-starched in another centrifuge filtered and dried. It is then ready to be used as corn gluten meal or corn gluten feed, or processed to recover the protein, seen, which has many non feed uses (Matz, 1970).


Cor
First
Storage
Steeping
Degerminatio
Germ separation
Grinding mill
Washing
Centrifugation
Surface Washing
Starch

6.2 HISTORY OF STARCH PRODUCTION IN KENYA

Tapioca starch factory
CPC starch factory
Starch importation data from KRA
Starch exportation data from KRA

7.0 SURVEY FINDINGS ON CASSAVA STARCH

7.1 RESULTS AND DISCUSSION.

Tapioca Limited Mombasa is the major cassava starch producer in the country. It currently produces ------ tones of cassava starch per year. In addition produces starch-based adhesives (SBA). The raw material – cassava roots is purchased locally from the neighboring coastal areas. The key manufacturers utilizing the cassava starch encountered in the survey are Goshrani printers, who utilize cassava based glue and Packaging Manufacturers (1976) Ltd. Mombasa who, utilize 1 tonne of cassava starch per month. The cassava starch is higher priced than the cornstarch in this country. The survey findings show that the cassava starch is sold at 40 Kenya shillings per kg, while cornstarch sells at 35 Kenya shillings per kg.

It is evident from the survey results tabulated on the Table 3 below that the price of the cassava starch is not the only constraint limiting it from reaching its utilization potential in Kenya. Other constraints include its high cost of production especially due to the large quantity of water required. This may be reduced by counter-current flow of water and other cost reducing measures.

Table 3. The results of the survey findings on cassava starch.

Organisation & Key contact	**Basic Information**	**Relation to Cassava**	**Current Situation**	**Next Steps**	**General Remarks**
Atta (Kenya) Limited P.O. Box 83272 Mwangeka Road, Mombasa Tel: 005-11-490864/5 Cellular: 005-72-410126 Fax: 005-2-490534 E-mail: attakltd@Net2000ke.com Contact person Rahim Lalji Marketing Manager	• One of the major millers in Mombasa • Main products include wheat and maize flour	• Does not process cassava flour	• Only processes wheat and maize flour	• Firm thinks cassava flour cannot work in bread due to taste and quality	• Sensitise the public on the value of cassava This is a long term goal
Carlton Products Ltd. P.O.Box 78105, Nairobi. Tel: 02-55667. Contact: Raj Kutecha.	♦ Producers of beverages and cooking aids	♦ They do not use cassava starch	♦ Corn starch is used as carrier in cooking aids ♦ Starch is bought at CPC at KShs33/kg ♦ Requirement is approx. 1MT/month	♦ They need information on the potential use of cassava starch in their industry	♦ Workshop to train on uses of starch ♦ Could use starch if the application could be demonstrated
Carton Manufacturers Ltd. Mr Singh Tel: 540687 Visited by; Jagwe, Githaiti	The factory was established 25 years ago	none	The factory utilises 250 tonnes of maize starch per year and it is all purchased locally at a cost of Ksh 45 per Kg (factory del.)		

Cartubox Industries EA Ltd. K.I.Estates Nakuru Tel: 037 215997 cartubox@todays.co.ke Mr Njoroge Managing Director Visited by; Jagwe, Githaiti	They manufacture corrugated cartons, beehives and mineral water. The raw materials used to make the adhesive for the boxes are Starch, Caustic soda and Borax	Cassava starch was once used but it produced a yellowish product that was undesirable.	1 tonne of maize starch is utilised per year and it is purchased from CPC at a cost of Ksh.39 (ex.Factory)	A 1 Kg. sample could be availed	Cassava starch could be used if the issue of colour is rectified and if the cost is attractive
Centrofood Ltd P.O.Box 1068, Thika. Tel: 0151-21780. Fax: 0151-21982 Contacts: Mr. Mburu; Mr. Ndirangu	♦ They produce juices and jams	♦ They have not used cassava starch	♦	♦	♦
Chandaria Industries Limited, Baba Dogo Road, Ruaraka, P.O. box 30621 Nairobi. Tel: 802252/3/4/5 Contact person Mr. K.V. Bhatt, General Manager-Projects	• The firm was not using any cassava based products	• It currently uses 100 tonnes of starch per year. It uses maize starch	• Could explore possibility of replacing maize with cassava starch		

Continental Products Ltd. P.O. Box 13458, Nairobi. Tel: 02-530766. Fax: 02-530712. Contact: Mr. Kariuki	♦ Producers of glue	♦ They do not use starch ♦ They are willing to use cassava starch for the superior adhesive quality	♦ Users of corn starch ♦ Requires about 1-2 MT/month ♦ Purchase from CPC at KShs35/kg	♦ Could try cassava starch for its superior adhesive quality	♦ Need information on resourcing ♦ Potential users of 100 % starch
Corn Products Kenya Ltd. P.O. Box 1012 Eldoret Tel: 0321 32511-6 Fax: 0321 33476 Mrs Monica Ragui Customer Service Manager Visited by; Jagwe, Githaiti	This is a multinational company with sister companies all over the world. The following are the products manufactured; -Maize starches (medical grade, natural grade) -Glucose Syrup The following bi-products are also produced; -Animal feed ingredients -Maize germ for oil extraction -High protein meal - The company imports starch				It would be necessary to change the entire production line if cassava starch is to be produced. The decision to make cassava starch has to be made by the directors. **NB** Management does not favour the publication of any figures in terms of quantity or price of products manufactured

	based glue and Cora gum from its sister companies in S. Africa				
Dais Bakery (1996) Ltd Arch Bishop Makarios Road P.O. Box 82802, Mombasa Kenay Tel: 005-11-230494/5/6/7 E-mail: daisbak@swiftmombasa.com Contact person Kamal Shah, Director	• This is a big bakery in Mombasa • It also manufactures biscuits	• In the past tried to use cassava flour due to shortages of wheat flour on the market • However the percentage of fiber was too high and far above the recommended figure • At the moment its no longer using cassava flour • The product made of cassava was not of good quality • It obtained the cassava from Tapioca	• Currently using wheat flour in both bread and biscuits • Using about 500 bags per day for bread and 100 bags per day for biscuits • The main market is Mombasa and the surrounding areas	• This bakery is currently faced with stiff competition from new firms coming into the market and is therefore willing to try cheaper alternatives • Its hence willing to use the recommended percentage for cassava flour in bread	• Provide the correct information • Provide the quality sample • Test the product on the market • This is one of the few firms in the bread industry that might provide a serious partner in product developing and market penetration • It might be a good idea to work with a few firms in the bread industry so that others may follow

East African Packaging Industries Ltd. Kitui Road, Off Kampala Road, P.O. Box 30146, Nairobi, Kenya Tel: 530176/7/8/9 531337/8/9 E-mail: it_eapi@africaonline.co.ke Contact persons: William K. Gacheru, Factory manager Muchiri Tel: 005-733-734053 Mutua Tel: 005-72-725678	• Its one of the major factories making corrugated boxes in the country • It mostly sells into the local market • It also exports boards to Uganda through its sister company PPL • It accounts for about 25% of the starch used in paperboard industry • On average it utilises about 30 to 35 tonnes of maize starch per month.	• Has used cassava starch before • Cassava starch was abandoned due to inconsistency in quality • Cassava starch was being got from Tapioca in Mombasa • However, had found cassava starch better than maize starch as it would give more mileage • Therefore willing to shift back to cassava starch if reliable supplies can be assured	• Currently using maize starch which is obtained from CPC in Eldoret • The cost of maize starch is 35 Kenya shillings per kg delivered to the factory • The firm produces about 1200 tonnes of paperboard per month. • Specification for maize starch is as follows: Moisture - 11.5 to 12.5% Appearance - white Starch content 87-88% Ash 0.25 - 0.35% Protein 0.5 - 0.7% pH 4-5 Shelf-life 12 months Packaging - 50 Kgs	• Interested in using cassava starch • Would like to get technological data on use of cassava • Is not aware whether cassava flour can work and is therefore willing to try it out • Specification for cassava products were as follows: Appearance - white Starch content 86 - 87% Moisture content 12.5 - 13.5% Fibre content < 0.2% Protein < 0.1% pH 5.0 - 6.0 Shelf-life 12 months Packing 25 kg	• Should get information on whether cassava flour can actually work Otherwise needs to get information where can obtain reliable supplies of cassava starch at a competitive price
Golden Biscuits (1985) Ltd. Mr Anthony Tel: Visited by; Jagwe, Githaiti	Probably the 3rd largest biscuit manufacturer in Kenya They make Ice cream cones too	None	-Utilises 2,000 tonnes of wheat flour p.a. at a cost of Ksh 33 per Kg (factory del.) -60-70% of the wheat is imported	They are not willing to try out a sample due to high risk of loss however they would like to taste a product where cassava has been used as part of the ingredients	**-Cheaper imported biscuits from S. Africa are causing serious competition**
Goshrani Printers Contact person Goshrani	Major stationery factory in Mombasa	At the moment uses cassava based glue	Uses about 100 kg of cassava based glue Glue obtained from Tapioca in Mombasa at a cost of 40 Kenya shillings per kg	Firm insists it uses very small quantities	
Henkel E.A. Ltd. Outer ring Rd. Ruaraka Nairobi	Manufacture adhesives and cosmetics	none	At present they use 12 tonnes of maize starch per year and	2 Kg sample of cassava starch could be availed for trials	The usage of any kind of starch beyond 4% as an ingredient causes the

Andrew Okeyo Technical Director Visited by; Jagwe, Githaiti	Starch is used increasing viscosity and wet tag and it is mostly used in ice-water resistant adhesives 300 tonnes of adhesives are manufactured per year		this constitutes 4% of the ingredients used in making adhesives. The maize starch is purchased from CPC		shortening of the shelf life of the adhesive.
House of Manji Likoni Rd. Ind. Area Nairobi Tel: 535064, 545827, 555944 Fax: 541694 info@houseofmanji.co.ke Mr. Francis Nyamboka Quality Assurance Manager Visited by; Jagwe, Githaiti	Probably the leading biscuit manufacturer in Kenya. The also make Weetabix, Pasta, Unimix and fambics		**They utilize 8,000 tonnes of wheat flour per annum at a cost of Ksh.29.5 per Kg. (cif Nairobi)** They also utilise 6,000 tonnes of maize flour per annum and about 2,000 tonnes of Soya flour while making Unimix	A sample of high quality cassava flour and cassava starch could be availed for trial.	Availability, cost, energy content and fibre content should be taken into consideration.
Jambo Biscuits (Britania) 1987 Ltd Mr Shetty General Manager Tel: 540698, 556613	-Among the two largest biscuit manufacturers in the country	none	**9,000-10,000 tonnes of wheat flour are utilized per annum.** Wheat is purchased locally and some	Management expressed a desire to carry out tests with high quality cassava flour and cassava starch	The management was very much concerned with the following aspects of cassava namely; shelf life, fineness, taste, texture, gluten content, moisture & protein content

Fax: 545660 britania@swiftkenya.com Visited by; Jagwe, Githaiti			imported from S.Africa Some starch is used in the process of making biscuits to improve taste and texture. About 12 tonnes of maize starch is used per annum at a cost of Ksh.40-45 per Kg. It is usually purchased from CPC (K) Ltd.	A sample should be availed	and the availability of cassava.
Jetlack Foods K. Ltd. P.O. Box 46238 Nairobi. Tel: 0151-54387. Contact: Mr. Bid; Mr. Shroff	♦ They specialise in production of juice, sauces etc	♦ They have not used cassava starch	♦ They use about 1MT/Month ♦ Use only modified starch from CPC at Ksh 36/Kg ♦ They also use dextrose monohydrate and liquid glucose	♦ They would like to try to use cassava starch in products	♦ Supply some starch samples for trial ♦ Quality and price must be reasonable
Kenafric Bakers Ltd. P.O.Box 42056, Nairobi. Tel: 0151-55467. Contact: Mr. Mukesh Shah.	♦ The business is in bread making	♦ They do not use cassava flour	♦ They purchase bakers flour directly from millers ♦ They produce 10,000-200,000 loaves/day	♦ They are willing to try composite flour	♦ Try the composite flours ♦ Obtain samples of flour ♦ They are concerned about the keeping quality, pricing, and acceptability of cassava flour products.

Kenblest / Kifaru Textile Mills Ltd., P O Box 581 Thika Tel: 0151 21671–5 Fax: 0151 21752 Mr Jeje Mills Manager, Visited by; Jagwe, Githaiti	**They make fabrics and garments but using 100% polyester.** When synthetic fibres are used, starch cannot bind to them hence is not required in any process. Starch can only bind to natural fibres.	none	Starch is not required	none	There are no prospects for cassava starch
Kenya Breweries Ltd P.O.Box 30131 Nairobi. Tel: 02-864423. Contact: Mr. ??/Ng'ang'a Cege	♦ Beer brewing is their main business	♦ They have not used cassava starch	♦ They use maize starch from CPC as an adjunct in the mashing process ♦ They use about 10,000 MT/Annum	♦ This would be a heavy user of cassava starch if they could be assured of the quality implications	♦ To try using cassava starch to replace corn starch ♦ The market is declining ♦ They would be concerned about the gelatinization temperature ♦ They would also be concerned about the filtration and handling steps in production
Kenya Cold Storage Ltd. P.O.Box 41229 Nairobi. Fax: 02-331819;Tel: 02-226165 Contact: Mr. Nurez Kurji	♦ Have been well established in handling meats/meat products	♦ Does not use cassava starch	♦ Uses corn starch as sausage filler ♦ Consumes 5-10 MT/annum ♦ Local purchase from CPC	♦ Would like to have cassava starch for tests	♦ Obtain information ♦ Obtain sample

Kenya Orchads Ltd P.O.Box 45065 Nairobi. Fax:02-537479, Tel:02-541231. Contact: Mr. Jolly Thomas	♦ Well established in fruit juices, Jams, canned fruits/vegetable	♦ Have not tried cassava starch	♦ Consume 25-30MT/annum ♦ Starch as a soup thickener ♦ CPC local supply ♦ Costs Kshs. 32/kg ♦ Also uses glucose syrup	♦ Interested in trying out cassava products	♦ Information on cassava products ♦ If no functional difficulties cassava products could be used to replace corn products
Milly fruits Processors Limited P.O. Box 90522 Mombasa Kenya Tel: 005-2-485551/486357 Cellular: 005-72-411608 E-mail: fruits@millygroup.com	• It's the largest fruit processor in Mombasa • Buys fruits from local producers	• Does not use cassava starch	• Uses maize starch from CPC • Uses small quantities i.e. 100 kg per month		
Mini Bakers Ltd. Oslo Road. P.O.Box 17592, Nairobi. Tel: 02-544845 Contact: Mr. Pai/Ghosh	♦ One of 15 other bakeries owned by Mini bakeries	♦ They do not use cassava starch	♦ They purchase wheat from millers and they use it directly without additives ♦ They produce about 20,000 loaves of bread /day ♦ They purchase wheat flour at 2950 Kenya shillings per 90Kg bag	♦ They would be interested in trying composite flours using cassava	Try experimenting with composite flours

Packaging Manufacturers (1976) Ltd P.O. Box 98541, Mombasa, Kenya Tel: 005-11-434152/3/4 Fax: 005-2-433234 E-mail: packmft@swiftmombasa.com Contact person Ketan M. Shah	• Manufacturers of high and low density polyethylene and polypropylene bags, sheeetings, tubings, and corrugated boxes • Started in 1976 • It's the major cardboard manufacturer in Mombasa	• Uses cassava starch from Tapioca equivalent to about 1 tonne per month • Starch is obtained at a cost of 40 Kenya shillings per kg • Also uses 1 tonne of SBA from Tapioca at a cost of 60 Kenya shillings per kg • All costs include factory delivery	• Supply of raw material is not consistent and at times delays • The firm also has to pay in advance	• Firm would like to see competition in the production of cassava starch as a way of eliminating supply constraints	• Explore opportunities for using cassava flour and hence supply a sample of cassava flour If successful explore opportunities for farmers supplying this directly to the company
Packwell Industries Ltd. P.O.Box 46826 Nairobi. Tel: 02-630322 Fax: 02-630321. Contact: Mr. Hemendra Patel/Mr. Dias	♦ Makers of corrugated cartons ♦ Starch is used as an adhesive/ binder	♦ They have used cassava starch from Tapioca Ltd ♦ They can use cassava starch if continuous supply is guaranteed	♦ They purchase corn starch from CPC at Kshs. 35/kg ♦ They require about 2-3 MT/month of corn starch	♦ They will use cassava starch if supply is reliable	♦ They require information on suppliers ♦ Company can use 100% cassava starch
Pan Africa Paper Mills EA Ltd. P.O.Box 535 Webuye,	The factory produces 48,000 tonnes of Kraft		800 tonnes of maize starch is utilised per year at a cost of		Cassava starch could be used instead of starch as long as it is readily available and if it

Bungoma Mr. Gatimbu Production Manager	paper and 40,000 tonnes of paper per year Starch is used in the process of sizing		Ksh.43 and it is purchased from CPC.		could be much cheaper.
Premier Cookies Ltd. Baba Dogo Rd. Nairobi Mr Patel Production Manager Tel: 802965/6 Fax: 802039 pfil@net2000ke.com Visited by; Jagwe, Githaiti	This is a sister company to Premier mills, one of the largest milling companies in Kenya It was established in 1974	Cassava starch was once used and it was discovered that a 10% substitution was acceptable. Beyond that, the shelf life was adversely affected.	About 2,000 tonnes of wheat flour is used per year and this wheat is mainly imported from Australia as grain. Wheat flour costs Ksh.30-33 per Kg (factory del)	2 Kg of cassava starch could be availed as sample for trials	When soft wheat is used, there would be no need to use starch. Starch is used in biscuit manufacture when hard wheat is an ingredient in order to counter the adverse effects of gluten.
Premier Flour Mills Ltd. P.O.Box 59307 Nairobi. Tel: 350113 Contact: Mr. Patel/Mr. Prabhaka	♦ Main business is wheat flour milling	♦ They do not use cassava ♦ They produce 100-200 MT/Month ♦ They do not use starch	♦ They produce bakers flour, biscuit flour and home baking flour	♦ Interested in trying cassava flour for baking	♦ Try using starch to dilute the gluten/reduce wheat strength ♦ There is potential use of cassava flour and cassava starch when they is guaranteed shelflife of products

Press Masters Ltd. P.O.Box 17560 Nairobi. Tel; 02-823044 Contact: Mr. Ochieng	♦ Produce corrugated cartons among other products	♦ They have used cassava starch previously	♦ They use about 2-3 MT of corn starch per month ♦ They purchase locally from CPC ♦ Price is kshs.36/kg	♦ They can use cassava starch to replace corn starch	♦ Establish the possibility of a constant supply of cassava starch ♦ Availability and quality of cassava starch are the main problems currently
Prime Cartons Ltd. Visited by; Jagwe, Githaiti	Began in 1996 They manufacture corrugated boxes.	Once used cassava and it was acceptable.	They are using 12 tonnes of maize starch per year bought from Orbit Chemicals Mombasa at a cost of Ksh. 33 per Kg.	A 50 Kg cassava starch sample could be availed to them for trials	The business is steadily growing.
Raiplywood Kenya Ltd. Uganda Highway Eldoret Mr Bainito Technical manager (Adhesives) Tel: 0321 33811-5 Visited by; Jagwe, Githaiti	The main products are plywood and block boards The factory uses 7.2 tonnes of Urea formaldehyde glue per year, 60 Kg of tyros Occasionally dextrin is used as a filler. Wheat flour is used as an extender and a thickener. The starch and gluten in	none	1,100 tonnes of wheat flour are utilised per year at a cost of Ksh 18 per Kg.		High quality cassava could substitute wheat flour up to 100%

	wheat help in extending the glue to the entire surface of the wood.				
Ray Pharmaceuticals Ltd. P.O.Box 22830, Nairobi. Tel: 02-536230. Fax: 02-540361. Contact: Dhirendra Shah	♦ They specialise in pharmaceutical products producing tablets, capsules and syrups.	♦ They have not used cassava starch	♦ They use corn starch pharmaceutical grade as a carrier in tablets ♦ Consume about 20MT/Annum ♦ They also use dextrose monohydrate and liquid glucose	♦ They will not mind using cassava starch of BSP/USP grade	♦ Experiment with cassava starch ♦ Quality is critical
RIVATEX Rift Valley Textiles Ltd. Kapsabet Rd. Mr Alex Kishuru Sales Manager Visited by; Jagwe, Githaiti	**The factory is under receivership and has not been in production for the last 3 years** It used to deal with textiles 100% cotton and cotton garments. It had a capacity of producing 5 million meters of cloth per	none	Not in production at the moment		It is alleged that cheap imports, smuggling and gross mismanagement have been the main causes for the collapsing of the textile industry in Kenya.

	month. At 20% scale of operation, 60 tonnes of maize starch would be utilised per year for the process of sizing. .				
Smithkline Beecham Likoni Rd. Ind. area Nairobi Eng. Nyambok Tel: 534241 Visited by; Jagwe, Githaiti	Manufacture tablets and injections Stop purchasing starch in 1998 due to a change of product range	none	Starch is bought in granules form that are purchased through buying centres in Europe		No prospects for using cassava starch since production of medical grade starch requires very high investment.
SunFlag Textiles Ltd. Kampala Rd. Ind. Area Nairobi Mr Sadya & Mr Ashok Plant Manager Tel: 559721 Fax: 559015 Visited by;	It is one of the largest textile manufacturers in Kenya Products include knitwear, fabrics and textiles	Cassava starch was once used in the process of sizing but it requires a temperature of $90^{o}C$ to gelatinise as compared to maize starch that requires $68^{o}C$ The higher the temp the greater the energy cost.	The factory utilises about 50 tonnes of maize starch per annum and it is purchased from CPC	A sample of cassava starch could be availed to their laboratory for further tests	

Jagwe, Githaiti					
Tapioca Limited P.O. Box 84059 Mombasa, Kenya Tel: 005-11-221849,226538,226578,228302, 222825 Fax: 005-11-222645,473033 E-mail: tapioca@africaonline.co.ke Contact person Rajese Khagram	It's the major cassava starch producer in the country	Buys fresh roots from neighbouring areas for starch processing	The costs of production are very high especially for utilities such as water		
Triclover Ltd. P.O.Box 17663, Nairobi Tel: 02-54173. Fax: 02-540530. Contact: Mr. Aviv Mavu	♦ Produce cooking aids such as baking powder and starch	♦ They have not used cassava starch	♦ They use corn starch as filler in their products ♦ They pack corn starch for sale ♦ They use 15-20 MT/Annum	♦ They need information on possible use of cassava starch	♦ To try using cassava starch in their products ♦ They are not aware of any shortcomings in the application of cassava starch
Tropical Sunshine Ltd. P.O. Box Tel: 0151-54392 Contact: Mr. Talib	♦ Produce juices and sauces	♦ They do not use cassava starch	♦ They use corn starch from CPC at a cost of Ksh 33/Kg ♦ Starch consumption is 2-3 MT/Month ♦ They use starch as thickener for sauce	♦ Potential users of cassava starch in all their products ♦ Their market is growing	♦ Experiment with cassava starch ♦ Concern over cost and availability

Trufoods Ltd. P.O.Box Tel: 557700. Contact: Dr. Shah; Mr. Singh; M. Njiru	♦ Well established in fruit juices, jams, sauces ♦ Exports to Arab countries ♦ Major local market	♦ Does not use cassava products ♦ Have not tried cassava starch	♦ Uses 3 ton/month corn starch in custard ♦ Uses 300kg/month modified starch in sauces ketchup ♦ Uses 10ton/month liquid glucose representing 25% max. of total sugar ♦ CPC supplies starch and glucose syrup ♦ Cost of starch 33/=/Kg	♦ Interested to try cassava products ♦ Concern is flow properties ♦ Concern for cost ♦ Concern for shelflife ♦ Concern for availability	♦ Looking for further information for application of cassava products ♦ Cost is major concern. Cassava products could replace all corn products if quality is guaranteed.

Unga Feeds Limited Dakar Road, Nairobi P.O. Box 41788 Tel: 005-2-541831/2 Fax: 005-2-541676/543688 E-mail: jmbugua@unga.com Contact person James Mbugua, Production Manager	• Manufacturer of animal feeds • Mainly poultry feeds • It's the biggest in the country • Subsidiary of Unga group of companies	• Has not used cassava products in feed making • Firm doubts whether cassava is an effective source of raw material	• Currently using maize • Thinks entire industry uses about 20,000 tonnes of maize per annum • Maize is procured at a cost of 16 to 17 Kenya Shillings per kg	• Firm is of the opinion that for cassava to work, supply constraints have to be addressed • It is interested in information regarding the use of cassava in animal feed	Provide data on use of cassava in animal feed
Unga Limited Ngano house Commercial Street, Industrial Area P.O. Box 30386, Nairobi, Kenya Tel: 005-2-532471/2 Fax: 005-2-545448 E-mail: fmutwiri@unga.com Contact person Mrs. Faith Mutwiri Quality Assurance Manager	• It's one of the biggest millers in the country • Processes a number of foods including maize flour, wheat flour • Maize flour is the main product • Has plans to produce composite flours or produces	• Wants to include cassava flour as one of the products.	• Wheat grain is imported while the maize grain is procured locally • Competition is stiff and the factory has undergone a major rehabilitation phase to try and reduce the costs of production	• Would like to get information on use of cassava flour in bread • Firm believes once cassava bread is acceptable to the market then cassava composite flour can be promoted	Provide recipe for bread using cassava flour
Unilever Kenya Limited. P.O. Box 30062 Nairobi Kenya Tel: 005-2-532505 Facsimile 005-2-543912 E-mail: peter.karatu@unilever.com Or joice.gathigi@unilever.com Or sarah.hikonyo@unilever.com Contact persons: Peter Karatu Technical Development Manager; Joyce Gathigi, Foods Development Manager , Sarah Hikonyo and Isaac Njoroge	• It's the leading manufacturing concern in Kenya producing several household consumer goods • It enjoys an export market in the region with Uganda being a major consumer	• At the moment it is not using cassava products • However it is seeking for a supplier of about 350 tonnes of cassava starch for use in its soap and detergent section • It failed to secure cassava starch locally	• Currently using corn starch in producing Mchuzi mix • Starch is used as a thickener in this product • It uses about 1000 tonnes of corn starch in Mchuzi mix alone • Starch is at the moment being used in Mchuzi mix alone • Corn starch is procured at a cost of 35 Kenya shillings per kg, factory delivered • Corn starch is obtained locally from CPC in Eldoret	• The company is interested in information on the properties of cassava starch compared with maize starch • It is further looking for a credible supplier of cassava starch in the near future (by the end of June) • It is willing to try cassava starch in its products but is only concerned about future availability of reliable supplies and at consistent quality	• Immediately contacts of world cassava starch producers should be availed • Provide all the technical information on cassava starch properties • This is a big company that is looking for cheaper alternatives that can work. • There is already an opportunity as the company is looking for cassava starch

A summary of the potential Cassava starch market by the above companies is given on Table 3 b below. The companies supervised utilise over 100 MT of starch. The first three consumption accounts for 83% of the starch utilised by the above companies. This is equivalent to only 0.8 % of the country's starch consumption. It is then evident that promotion of cassava starch production in Kenya is a feasible venture.

Starch is utilised in the pharmaceutical industry but if cassava starch is to venture into this market then medical grade starch must be produced. Another venture worth exploring is the use of cassava in composite flours. Cassava flour should be produced and used in optimal ration for the bakery industry.

Table 1b. Summary of the potential Cassava starch market.

FIRM	**QUANTITY (TONNES/YEAR)**	**COST (35 PER KG)**
PACKWELL INDUSTRIES NRB	36000	1260000000
PRESS MASTERS NRB	36000	1296000000
CONTINENTAL PRODUCTS LTD	24000	840000000
KENYA BREWERIES LTD	10000	35000000
CASTLE BREWERIES	4000	140000
UNILIVER KENYA LTD.	1500	52500000
RAIPLYWOOD[3]		
UNGA NRB[1]		
PAN AFRICA PAPER	800	34400000
DAIS BAKERY LTD MSA[1]		
CARTON MANUFACTURES LTD.	250	11250000
PREIMIER FLOUR MILLS[1] NRB		
CHANDRIA INDUSTRIES LIMITED	100	3500000
SUNFLAG TEXTILES	50	1750000
TRUFOODS	39.6	1386000
TROPICAL SUNSHINE THIKA	36	1188000
E.A.PACKAGING NRB	420	1225000
KENYA ORCHARDS NRB	30	990000
RAY PHARMACEUTICALS	20	700000
TRICLOVER LTD	20	700000
PRIME CARTONS	12	396000
JAMBO BISCUITS	12	540000
HENKEL E.A	12	420000
JETLACK FOODS	12	432000

CARLTON PRODUCTS NRB	12	396000
PACKAGING MANUFACTURERS	12	480000
CENTRO FOOD LTD	10	350000
KENYA COLD STORAGE NRB	10	350000
BEST FOODS LTD NRB	6	210000
MILLY FRUIT PROCESSORS LTD MSA	1.2	42000
CARTUBOX	1	39000
RIVATEX[2]	0	0
KENBLEST[3]	0	0
SMITHKLINE BEECHAM*	0	0
GOSHWAMI PRINTERS	0	0
ATTA (KENYA) LTD MSA	0	0
HOUSE OF MANJI[1]		
UNGA FEEDS LTD NRB[1]		
GOLDEN BISCUITS[1]		
KENAFRIC BAKERS[1]		
MINI BAKERS NRB[1]		
PREMIER COOKIES[1]		
Total cassava starch potential	**115600.8**	**3764694000**

Key:

*Utilises medical grade Starch.

[1] Produce flours and hence possible market for cassava based composite flours

[2] No longer in production.

[3] Using wheat flour as starch substitute

7.2. OVERVIEW OF THE KENYAN STARCH MARKET.

The total market demand for starch is currently estimated at about 12,000 MT. The partitioning of the starch produced is given in Table 4 below. Other cassava products include glucose and dextrose. The current utilisation of these products in the industry is given in Table 5 below. This is lower than the demand in the past. The downward trend is mainly explained by the collapse of the textile industry and competition from cheaper imports from the COMESA region.

Table 4. Partitioning of starch to various industries

Sector	1997(MT)	1998(MT)	2000(MT)	Market share(%)
Paperboard	1611.5	1,185.4	1,800	
Paper				
Textile				
Pharmaceutical				
Food processing				
Plywood				

Table 5. STARCH, GLUCOSE AND DEXTROSE UTILISATION

PRODUCT	1997 (MT)	1998 (MT)
Corrugator starch	1611.450	1185.400
Paper starch	1028.800	808.100
Textile starch	388.000	205.000
H/M pharmaceutical maize starch	0.000	12.500
Corn starch snowflake 3400	0.000	3.550
L/M pharmaceutical maize starch	0.100	0.000
Food grade H/M maize starch	466.725	559.650
Brewers maize starch	7378.900	7761.105
Food grade L/M maize starch	775.150	952.500
Bakers maize starch	796.850	923.450
Modified starch	5.850	55.608
43 BE/42 DE glucose syrup	5185.628	4529.446
43 BE/63 DE glucose syrup	36.492	29.989
45 BE/42 DE glucose syrup	1009.464	320.549
Amijel starch	0.500	0.550
White maize dextrin	6.000	9.700
Yellow maize dextrin	27.250	0.800
Waxy maize dextrin	0.150	34.750
Dextrose monohydrate	586.650	365.250

Most of the starch is native and is derived from corn. However, the plywood sector uses wheat starch. Concerns here were mostly about price. Wheat starch was obtained at a much lower price than corn- starch.

Local production accounted for most of the cornstarch that was used. On the other hand most of the of the cassava starch is at the moment being imported as local production costs are found to be higher. The resultant high price of the local cassava starch makes it difficult for it to compete in the market.

Starch based adhesives were also used by the packaging industry and one of the firms reported using about 1 tonne per month.

7.2.1 Paperboard

This sector comprises 3 major firms and a number of other smaller factories. These accounted for over 50% of the starch requirements. Most of the firms including all the 3 major ones are located in Nairobi.

This sector reported using cassava starch before although currently all the starch was corn-based and was produced locally. Use of cassava starch was discontinued due to inconsistency in both supply and quality

The market demand for starch in the packaging sector was estimated at about 1800 tonnes per year.

The price ranged from 39 to 45 Kenya Shillings per kg delivered to the factory.

7.2.2 Paper

Paper production in Kenya is the second major channel of starch utilisation. This industry consumes over 800 MT with most of it being consumed by Pan Africa Paper Ltd in Webuye. The starch utilised in paper production mainly goes into the production of Kraft paper, which is mainly used for packaging.

7.2.3 Textile

The textile industry in this country has virtually collapsed with the introduction of liberalisation, The once vibrant industry has had many of its factories which depended on cotton as an input shut down. Some of the factories were private while others were parastals. This resulted in loss of jobs and reduced the overall demand of starch in the country. Those still operational produce synthetic materials e.g. Polyesters, Nylon, etc., and do not use starch.

However, with the new development i.e. African Growth Opportunity Act (AGOA). There are signs that cotton farming will be encouraged and textile revived. Now that textile business with USA market seems to be doing extremely well with the market share given to the developing world has been increased from 1.5 to 3.5 percent there is need for cassava starch to find a niche in this market.

7.2.4 Pharmaceutical

Cassava starch is not utilised in the pharmaceutical industry mainly because medical grade starch is required. All of the starch used in this industry is imported. It is important that cassava starch is processed to meet the required medical grade starch requirements if it is to venture into this market.

7.2.5 Food Processing

Starch is used in various food products it performs various functions including Sweetening, as a flour, binding e.t.c.

Composite Flours

Cassava flour should be incorporated in other widely used flours so that it can be used in two of the large food industry inputs Bread and Biscuit production.

- ***Biscuits***

There are 3 major factories producing biscuits in the country. All of these are located in Nairobi. This food sub-sector utilises about 40,000 MT of wheat flour per annum.

The cost of wheat flour for biscuits ranged from 29 to 30 Kenya shillings per kg

In the past there were shortages of wheat flour, notably around 1990 and there was an attempt then by some factories to substitute wheat flour with locally produced cassava flour.

However biscuits made from cassava flour were found to have a shorter shelf life. Beyond six months the biscuits changed colour.

Also the fibre content was found to be high which affected the texture of the flour.

Other problems associated with use of cassava flour included lack of commercial quantities, quality and low protein content

- ***Bakery***

This sector comprises numerous firms enjoying small portions of the market. Not all of the bakeries could be visited. Competition was found to be stiff and all of the firms were interested in efficient methods of production so as to bring down the cost per unit of output.

None of the bakeries was found to be using cassava flour at the moment. The industry was very sceptical that cassava flour could produce quality product.

General

Most of the manufacturers that had used cassava flour stopped because of quality inconsistency. There is hence need to maintain quality of the cassava if cassava starch is to compete for a profitable market share. Thus hazard analysis of critical control points (HACCP) should be carried out to provide quality assurance of the cassava. The market demands that cassava starch for use in the paperboard industry meets the following criteria:

Moisture content	**-11.5% to 12.5%**
Appearance	**- white**
Starch content	**- 87% to 88%**
Ash	**- 0.25% to 0.35%**
Protein	**- 0.5% to 0.7%**
pH	**- 4 to 5**
Shelf life	**- 12 months**
Packaging	**- 50 Kgs**

In addition, it was found necessary to promote awareness of cassava utilization as flour and in animal feeds. Information on the use of cassava flour in production of bread, cookies, biscuits and other baked products should be publicized in the country. This information should include recipes of some products. Cassava has been used for production of feeds includes pig feed (Oke, 1990). The information on the processing steps and ratios of the cassava meal added to the feed should also be publicized.

Although the textile industry in Kenya has seen better days it is important to capture the little market available. The limitation of cassava starch utilization in this industry is it's high gelatinization temperature (90 ^{0}C) as opposed to that of maize (68 ^{0}C). High gelatinization temperatures translate to high cost of production. Modifying the starch will eliminate this limitation. Modifying cassava starch and ensuring quality consistency will ensure that it has an advantage over maize starch in the brewing industry.

7.2.6 Plywood and paperboard

This is a sector where cassava based raw materials have a chance of being used in the short-run. The combined raw material demand for this sector is over 2000 MT per year. Cassava has already been used as a raw material in this sector and some industries expressed preference for its starch over cornstarch. The rural producers can also easily meet quality specifications for this sector, as standards are relatively lower.

Issues

Factors that industry is concerned about include the following:

- Quality consistency
- Timeliness of supplies
- Availability of supplies
- Competitiveness of price

Recommendations

It is therefore important that production and supply studies be carried out to identify the likely constraints that may hinder supplies of commercial quantities to this sector

Samples of the high quality cassava flour should also be availed to the industries for testing under different technological conditions and where positive results are obtained supply schedules should be looked into to plan for them well before hand.

More information needs to be provided to all of the other firms within this industry and to enable them explore the potential for cassava.

7.2.7 Utilisation in feeds

A factor restricting the development of animal production in many developing countries is the cost of imported feed, which has often gone up several fold because of local currency with respect to world markets. If part of the feed could be substituted with root crops such as the cassava then part of the feed could be freed for human nutrition.

The low protein, fiber and high content of soluble carbohydrates are notable features of the cassava root. Cassava tops, stems and leaves are also available as animal feed and are comparatively high in utilizable protein.

The International Development Research Centre in Canada has recommended that cassava could be a substitute of up to 40 percent for maize in the nutritionally balanced rations of pigs without any deleterious effects, and up to 30 percent in poultry rations. It has also been reported that when cassava was substituted for maize in a poultry broiler ration at levels of up to 30 percent, there was no significant difference in the performance at all levels, but the 20 percent level of substitution was the most economical (Gomez *et al.*, 1984). It required 215 kg of feed to produce 100 kg live weight with a 20 percent substitution. High levels of cassava intake are more acceptable for broiler than for layers. In the economic assessment of the rations, the least cost broiler diets containing 20 percent cassava meal gave the least returns while profitability increased with the level of cassava meal in the case of pig trials.

In pig feed the performance was progressively better as the level of cassava in feed was increased. It required 339 kg of feed to produce 100 kg weight with corn

alone, where as it required 337 kg and 331 kg respectively with 20 percent and 30 percent cassava substitution.

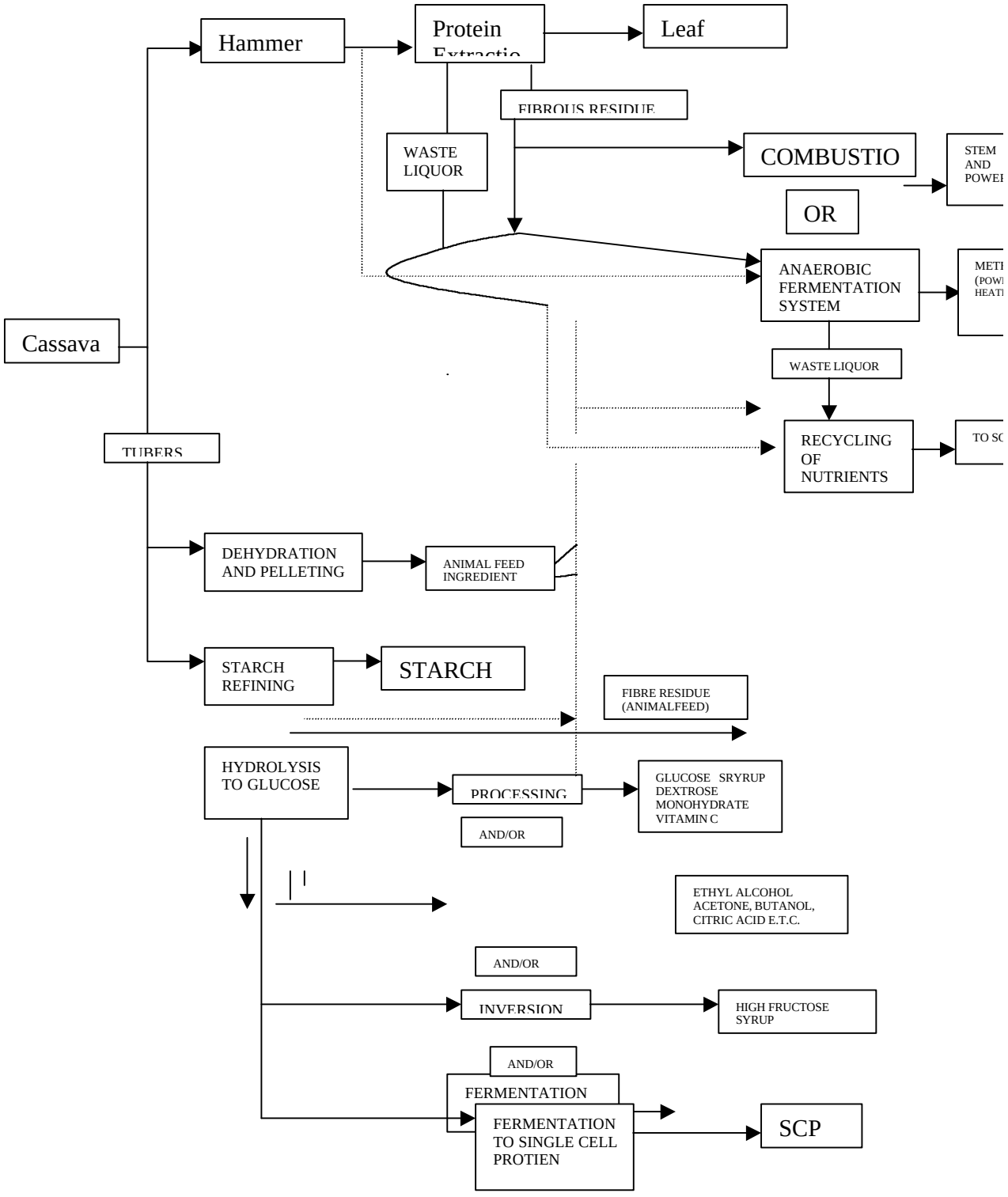
Cassava may also be used as a substitute for maize in cattle feed. Cassava has been used as the main source of energy in dairy feeds, resulting in higher milk and fat yields and live weight gains (Pineda &Rubio, 1972). Similar results have been obtained for beef cattle and cassava- based diets gained significantly faster than those fed bran or corn and corn – based diets.

On average about 246 000 MT of animal feeds are produced per year of this maize constitutes about 10 percent. Given that cassava can be substituted for Maize at the rate of 20% than over 4900MT of Cassava can be utilized in animal feeds in Kenya per year. In addition, the ministry of agriculture has reported that between 1993 and 1998 over 6.9 million cattle and calves were slaughtered for beef The pigs slaughtered over the same duration amounted to 4.2 million (CBS, 1999). It is evident from the data collected in the survey that cassava is not utilized in the production of animal feed in this country. From the statistics quoted above it is clear that the cassava industry has been loosing on this very important market. It is now time to take action and promote the use of cassava in the animal feed production.

7. 2.8 Other potential uses of the cassava

The products discussed above are those that represent the felt need of the market as it is now. In no way do these products do these products exemplify the potential of the cassava. One needs to have only needs look at the agro-industrial system for cassava given in Figure 3 below to understand that many other products could be produced from this priceless resource.

Figure 3. An Agro-Industrial System for Cassava



SOURCE: Mc Cann, 1976

8.0 Conclusions

Cassava is widely used in Kenya by almost all communities, but has limited uses in terms of the products manufactured from it. Starch has potential for application in the food industrial subsector. The demand according to this study stands at over 100000 MT per annum. The food subsector takes only about 13% of the total. There is need for development of starch production to meet the demand. The only starch manufacturer produces erratically and at high costs. The flour is finding more acceptance in compositing with cereal flours for different local food preparations. There is also potential use of cassava flour in plywood manufacture. Industrialists have yet to fully utilize cassava in animal feed manufacture. The challenge in the utilization of cassava starch and flour lies in; convincing the end user of the safety of the products and possible use in diversified products, demonstrating high quality products from cassava. This calls for efficient information flow from the researchers to the manufacturers in terms of potential utilization areas, quality improvement and the assurance of sustainable supply.

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Foodnet Project No: 4

PROGRESS REPORT ON PROJECT ACTIVITIES
Period : January- March 2001

PROJECT TITLE : **Marketing of cassava produce and products in Umutara and Bugesera regions of Rwanda for improved food security**

Initially the project was supposed to be executed by World Vision Rwanda Program, due to a reorientation of that NGO from agriculture to social implications, activities are executed directly by farmer groups under the supervision of ATDT.
So far World Vision technicians (in Umutara province) have helped us to conduct preparatory meetings with farmers to elaborate an implementation plan of the project.
In Bugesera region, the drought which has prevaled there for more than 2 years has reached a pick of hunger which constitutes a handicap to start the post harvest project now.Nevertherless, the selected group has planted large fields of cassava in order to produce enough cuttings for further productions as well as to have row materiel to start processing with next year(2002).the group in Bugesera has identified the place where to install to processing equipments and the people responsible for all planned activities.
Since the processing activity will not happen in Bugesera group this year, we are suggesting to start with 2 groups from Umutara .

Activities achieved

1. Umutara (with URUNANA farmers association)

- Identification of the groups(2) and ressource persons
- Identification of the place and house to host the processing equipment
- Identification and nomination of farmers(3) to be trained in donkey rearing (whom then after will keep them at their farms).
- Identification and nomination of members of the group to be trained in the « project management ».
- Campain for large multiplication plots of cassava in the area by members of URUNANA farmers association in order to have enough row material to run the processing plants in the near future.

2.Bugesera

As mentioned above , due to the problem of cassava scarcity (roots) in this region, we are not planning any processing activity this year. This is the reason why I am suggesting to transfer the equipment to Umutara and start to processing units instead of one as initially scheduled in the project proposal.
Farmers have just planted 2.5ha last November as a multiplication plot to start with for further dissemanation to the group in order to have enough material to process in the future.The idea was to have 11ha under multiplication in 2001 A season, but ISAR was not able to avail enough cuttings on time.

3.Planned activities for the next quarter(April to June)

- Training of farmers in donkey rearing
- Install processing units(2)and start processing activities
- Market studies for cassava products

4.Problems encountered in the quarter

- Purchasing and transport of the processing equipemnt from Uganda by Foodnet was not done on time, it was expected to start the project with February, but to date only part of the equipment has been received. We are therefore requesting Foodnet to speed up the process of shipping the remaining parts of the equipment
- The outbreak of foot and mouth disease for animals prevailing in Rwanda for the moment will delay the importation of donkeys from Uganda . The Ministry of Agriculture , Livestock and Forestry has temporary declared a ban of importating animals in Rwanda till May this year.Movements of animals in the country are also forbidden now in most of the provinces (including Umutara).

As already mentioned in the last quarterly report, initially this project was supposed to be implemented by World Vision Rwanda Program in partnering with 2 farmer groups , but due to a reorientation of that NGO from agriculture to social implications, activities are executed directly by farmer groups under the supervision of the ATDT research and extension liaison officer (Speciose Kantengwa) as the one who prepared and submitted to Foodnet the concept paper for the project (on cassava processing equipment) at the time she was managing the agriculture department of World Vision Rwanda.

During these last 2 months (April- May), we have received the equipments from Foodnet Uganda composed of the following :

- 2 grain millers
- 4 presses
- 4 power graters
- 5 chippers
- 1 plastic roll (for drying)

The group in Bugesera has received 1 press, 1 chipper and 1 power grater.
The 2 groups from Umutara have received received each 1 power grater, 1 chipper, 1 grain miller,and 1 press.
Farmers have got organized for processing operations but we are still waiting for an expert person from Foodnet to help and train them in operating these equipment.
Another planned activity is the training of 3 farmers in donkey rearing which might help in transport of row cassava from fields to the processing plants. These farmers are supposed to be trained in Uganda where the donkeys will be purchased from.The period has to be fixed by Foodnet as farmers are ready from their side.

Foodnet Project No: 5

Progress report

Project title: Establishment and commercialization of a small-scale integrated cassava-processing enterprise in Lira District, Uganda.

Project purpose

- To link rural economies to growth markets in a profitable and sustainable way,
- To promote the diversification of rural production, and
- To generate higher incomes while reducing agricultural production losses.

Progress to date

Conducted:
A needs and constraints assessment of cassava marketing in Lira district was conducted using rapid reconnaissance methods, which involved secondary data collection and organization, and informal interviews with key informants who included district political leaders, contact farmers and traders.
Outputs of this activity included

- A socio-economic profile of the study area,
- Identified the importance of cassava in Uganda and the study area,
- Compiled a list of the food markets in Lira both spatially and temporally,
- Identified constraints faced during production, utilization and marketing of cassava in Lira, and
- Highlighted key researchable areas in the cassava food system matrix.

Ongoing work:
Semi-structured questionnaires have been designed for cassava producers, processors and traders. A formal survey of 120 cassava farmers, and 80 cassava traders in Lira district is ongoing and half of the respondents have been interviewed and data analysis has been initiated. A follow up of the marketing chain have led to interviewing participants in the neighboring district of Nakasongola and the final destination of Kampala. Issues being investigated include processing, utilization and marketing of cassava at the various market levels.
Output of the survey will include quantification and qualification of constraints, and needs in the cassava food system matrix with a view to improving the efficiency of cassava marketing.

Foodnet Project No: 6

Progress Report Grant 6
By

Kiddo J. Mtunda
Mariam Kilima
Sugarcane Research Inst., Kibaha
c/o Sicco Tel: 007 22 2700092
Tel:255-52-402017
SARRNET@cats-net.com

1. Processing equipment:

The cassava chippers from Kampala were delivered to the roo / tuber programme at Kibaha in October 2000. The 2 chippers were not used immediately. SARRNET regional scientist took them for further modification. The Kalimatakijai women group received the cassva chipper on 20th February 2001, while the Kwa Mathias women group received it on 29th March 2001.

2. Kalimatakijai Women group (Dar es Salaam)

The Kalimatakijai women group is composed of 15 members, with only 8 being very active. The group was established in 1990 and the previous activities done included;

i) Making tie and dye cloth
ii) Preparation of Hema (Local nail vanish)
iii) Cultivation of Mushrooms

The group has a central meeting place where they carry out their activities. The three activities have stopped due to greater competition from Dar es Salaam.

3. Kwa Mathias Women group:

The Kwa Mathias women group is composed of 5 active members. The group was established in 1998 and the activities commonly carried out included the growing of vegetables such as cucumber, okra sweet pepper and sweet potatoes. The group does not have a central meeting place and most of their activities are conducted at the chairperson's place.

4. Training:

Training on cassava processing was done in February with the Kalimatakajai women group and in March 2001 with the Kwa Mathias group. The topics handled included; how to process high quality cassava flour, how to operate the chipper and the marketing of cassava products.

5. **Promotion issues**:

In order to popularize the high quality cassava flour, the Kwa Mathias group participated in the 'World Women Day' celebrations held nationally at Kibaha. Both the cassava equipment and the products were displayed for 3 consecutive days. From 6th to 8th March 2001. The group received a certificate of participation.

6. Problems Faced

i) The group ahs very little experience in the marketing aspects. They have to identify the new marketing channels/ outlets or intervene the old marketing channels. Normally traders would go to Kigoma or Tanga to bring fermented cassava flour to sell at different outlets like Kariakoo, Kisutu or Manzese markets.

ii) The price of cassava roots is relatively high at the buying points. They buy at Tsh. 3,000 or more per bag of 80 kg of fresh roots. Due to this, the selling price of cassava flour should also be high, above Tsh.200 per kg.

iii) The Kalimatakijai Women group in Gezaulole is less active in marketing. They are reluctant to process until they are assured of the market.

iv) The rain season has begun and the groups are forced to postpone the processing activities until the weather is favourable.

Follow Up:

1. The project leaders are trying to link the groups with some entrepreneurs in Dar es Salaam. A few of them operating in the Kariokoo Market have shown interest.
2. Packaging of cassava flour is the next activity. The appropriate packaging materials have to be identified with the help of project leaders.
3. Some customers are interested in white fermented flour. We are in the process making trials to determine the best soaking hours for chips, because customers have complained about the sweet taste in flour made in one day. Later, cassava flour will be marketed in two categories; the unfermented and the fermented.
4. Through exhibition during the “World Women Day” many women groups applied for training. This is planed to be on-station or on-farm.

Project 7
Equipment delivered, currently project under review with Sicco Kolijn

Project 8

The marketing potential of Potatoes in Uganda and market opportunities for Rwanda.

Draft Report

Okoboi Geofrey

International Institute of Tropical Agriculture

October 2001

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Report Summary

This report is the result of a rapid national Potato market survey designed to analyse the marketing potential of the Potato sub-sector in Uganda. The survey involved formal and informal interviews to a cross-section of participants in the Potato sector.

Key Findings

- Production figures indicate that output of Potatoes in Uganda is stagnating, this suggests that more technical and farming systems investments is required to raise both production efficiency and levels of output.
- Potato yields are low in Uganda due to very low rates of quality inputs (clean seed, fertilizers, and chemicals) utilisation. In Kabale 1% of farmers are reported to use fertilisers (Low, 2000).
- While Potatoes are a major food staple and cash crop in the highland areas where they are cultivated, they are considered a cash crop in the lowland areas, where they have been promoted.
- The high level of perishability and lack of appropriate long-term storage facilities has significantly influenced the degree of price uncertainty in the Potato market.
- Brokers are a key link in the Potato marketing chain and this group appears to charge excessive fees for their services.
- Within the supply chain, travelling traders attain the highest net margins.
- There is no significant cross border trade in ware potatoes between Uganda and the neighbouring countries. However, limited formal and informal trade takes place along the Uganda-Rwanda border during the months of September to November when there is Potato supply shortage in Uganda. This is the most ideal time for Rwanda Potatoes to sell profitably in Uganda.
- Seed potato production and marketing in Uganda is least developed. Monopolised by the 25 members of Uganda National Seed Potato Producers' Association, a 100kg bag of seed potato is sold at 5 times that of ware potato!
- Potato chips is the most popular potato product in urban areas as evidenced the increasing number of fast food outlets. The potential of potato crisps is encouraging though currently not very popular.

POTATO PRODUCTION

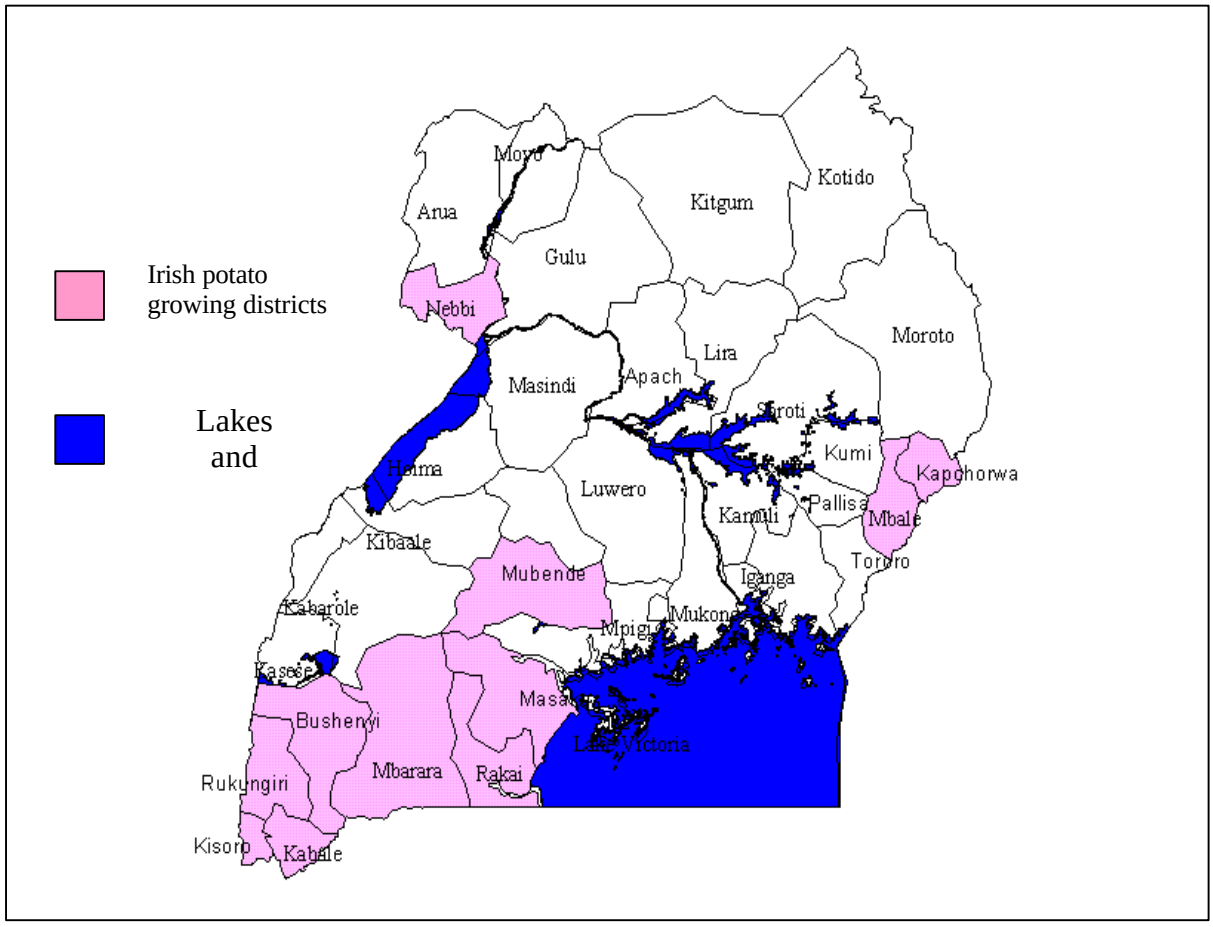
Potato Production in Uganda

Potato production areas

Potato production is concentrated in two areas in Uganda, the highlands of Kabale, Kisoro and Mwizi (Mbarara) in south-western Uganda and the mount Elgon districts of Mbale and Kapchorwa in eastern Uganda.

Kabale district is very hilly and interlaced with narrow and broad valleys. Altitudes range from 1,400-2,500m, the annual rainfall range is 1,000- 1,500mm occurring in two peaks and the mean annual maximum temperature is below 22.5^{o}C with annual minimum below 10.0^{o}C, making Kabale one of the coldest districts in Uganda (Low, 2000). Low (2000) further states that the soil moisture and temperature regime make Kabale suitable for temperate crops. The physical and climatic conditions of the mountainous districts of Kisoro, Mbale and Kapchorwa closely relate to those in Kabale. Although the hills of Mwizi in Mbarara have relatively lower altitude (1,200-1,600m) and rainfall (800-1100mm) ranges than Kabale, they are inhabited by migrants from Kabale who have came along with their tradition of Potato cultivation.

Ware potatoes are produced in both highland and lowland areas. This was made possible through the introduction Potato varieties (e.g. Victoria), which is adapted to high and low altitudes. Seed potato is exclusively produced in highland areas. Due to the wide adaptation of Victoria, many new districts have taken to ware potato production, See Map 1.



Map 1: Major districts producing Potato in Uganda

In the highlands where Potatoes are grown, the crop is both a major food staple and cash crop. In her study, Low (2000) noted that Potato and sorghum are by far the most important cash crops for both women and men in Kabale district. In the low and mid altitudes zones that have adopted Potato cultivation, the crop is not a major food staple but a cash crop.

Potato production statistics

Potato production in Uganda has spread over the years from the highlands of Kigezi (Kabale and Kisoro) districts to many other districts of Uganda. (See production by district table –Appendix 1). Data source for the production figures is Ministry of Agriculture, Animal Industry and Fisheries, though the reliability of these is questionable. According to the figures in Appendix 1, it is unlikely that in the year 2000, Lira district, a major buyer of Potatoes from Mbale produced 13,194 Metric tonnes more than Mbarara, which produced 10,791 Metric tonnes. Similarly, it is not possible that Soroti district, a dry and warm area where Potatoes are rare produced 11,509 Metric tonnes more than Kapchorwa district (11,058 Metric tonnes) in the year 2000.
The figures in Appendix 1 also show that Kabale district is consistently the leading producer of Potatoes in Uganda and followed by Kisoro district. This is reasonably realistic. Thus even if the data is questionable nevertheless it is the only important reference source.

Figure 1: Percentage share of Potato Production in 2000 by major districts

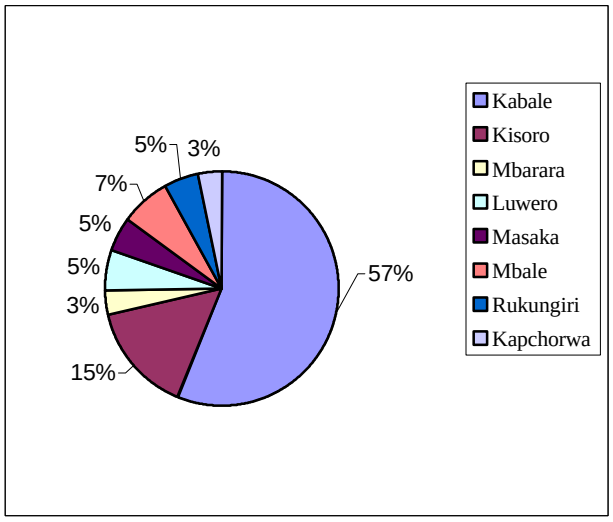
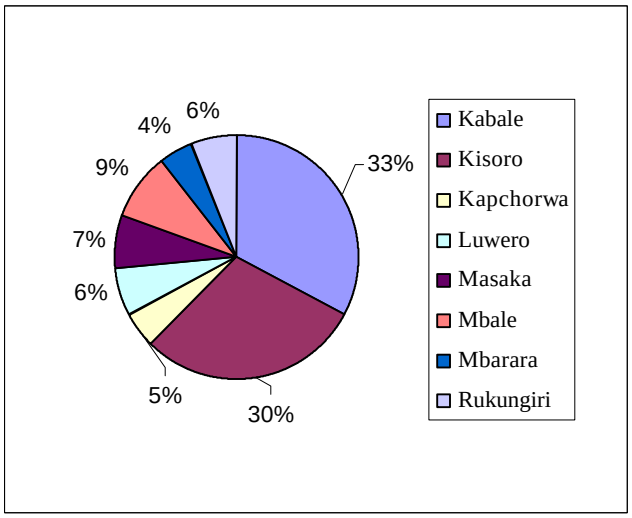


Figure 2: Percentage share of Area planted with Potato in 2000 by major districts



Figures 1 and 2 show the percentage share of production and area planted by the major Potato producing districts in Uganda for the year 2000. These charts were derived from Ministry of Agriculture, Animal Industry and Fisheries statistics in Appendix 1. With the exclusion of minor Potato producing districts in Uganda, Figure 1 shows that Kabale district produced 57% of the overall output of Potatoes on 33% land (Hectare) utilisation. Due to poorer soils, Kisoro district produced 15% using about 30% of the land area. Table 1 shows that Potato yield in Kabale was approximately 16 Metric tonnes per hectare while in Kisoro the yield was only 5 Mt/Ha. Information on yield is important in underpinning the agro-ecological conditions and farming practices of different communities in various districts. Furthermore, information on yield indirectly relates to:

- Intensity of land use. Number of seasons Potatoes planted in year
- Level of soil conservation and use of fertilizer to improve soil nutrients
- Use pesticides and fungicides against a host of Potato vermin and diseases.

Table 1: Output, Area planted and Yield of Potatoes from Major production Districts in Year 2000

District	Kabale	Kapchorwa	Kisoro	Masaka	Mbale	Mbarara	Rakai	Rukungiri
Output (Mt)	179,571	11,058	49,125	15,767	21,627	10,791	6,172	15,084
Area planted (Ha)	11,332	1,559	10,285	2,433	3,050	1,522	871	2,127
Yield (Mt/Ha)	15.85	7.1	4.78	6.5	7.1	7.1	7.1	7.1

In a working paper No. 2000-1 for the International Potato Centre, Jan Low, noted that potato yields are high in Kabale due high plant densities per hectare and good soils. Low found out that farmers in Kalengyere who had high plant densities (50,000) per hectare also had better yields per hectare (29Mt) than those in Bukinda with low plant densities (40,000) per hectare whose yield was 20 Metric tonnes. In the study, Low also analysed other factors that affect yield such as the quality of seed, soil type and fertility and management of potato diseases.

Figure 3 shows the trend of Potato production ('000 Mt) in Uganda for the period 1980-2000. The trend line indicates a stead increase in output for the period albeit the fluctuating production graph.

Figure 4 is a production growth rate graph, a derivative of Figure 3. Although Potato production and growth rates varied considerably in the earlier years (1980-1989), the growth rate is has stabilised in the past 10 years to about 2% per annum. Thus, there is critical need to increase farmers' yields through increased use of high yielding certified seed, fertilizers to supplement on soil nutrients and pesticides to control the destructive bacteria wilt and late blight.

Figure 3: Potato production ('000 Mt) in Uganda, 1980-2000

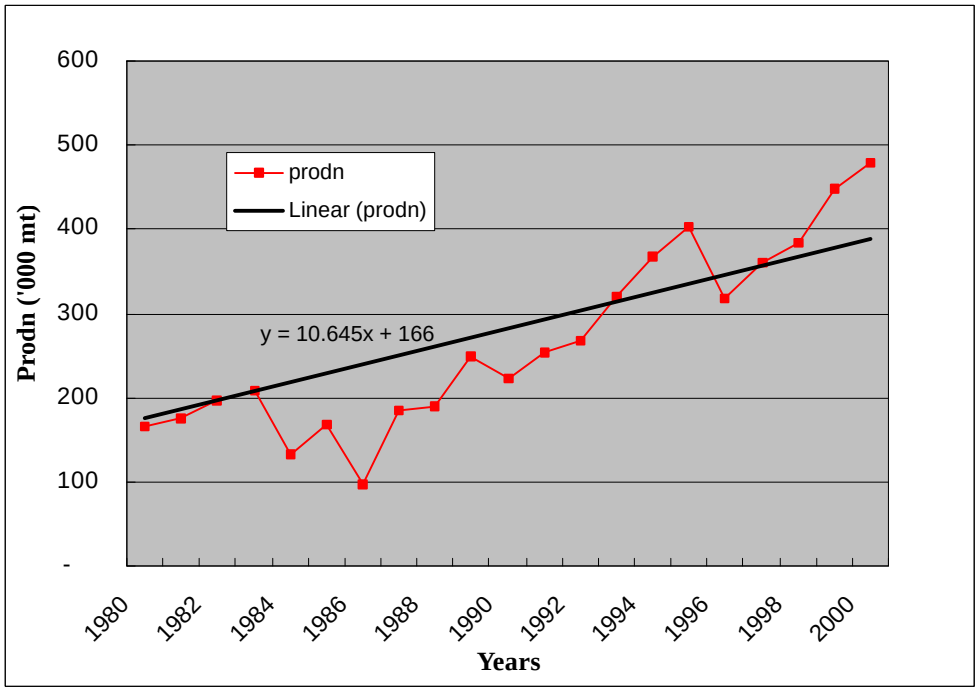
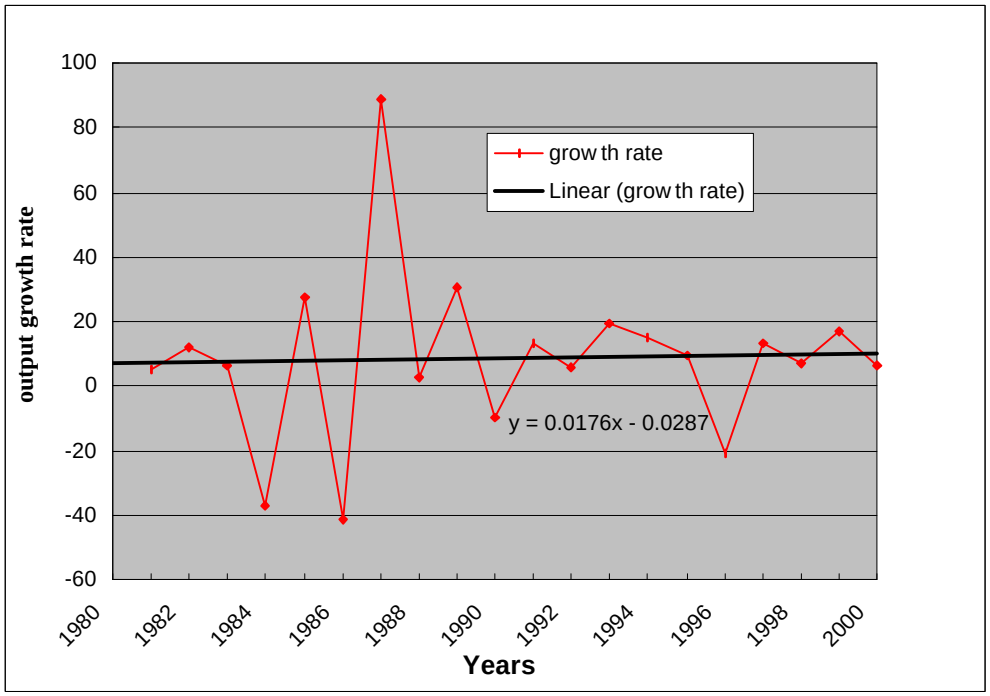


Figure 4: Potato production ('000 Mt) in Uganda, 1980-2000



Seasonality of Potato Production.

In Kabale, there are no clear-cut distinctive seasons for production of Potatoes. There appears to be a seasonal overlap depending on weather conditions, hence Potatoes are in production almost all year round. The main reason why Potatoes are produced all year in Kabale is due to the intensive use of all available hills slopes, swamps and valley bottoms (non-swampy) for cultivation. Farmers interviewed, said there are three Potato cultivation seasons in the year.

Table 2a shows the Potato cultivation calendar in Kabale in which the planting and harvesting times are presented. The first season starts from mid February during the *short* rains with planting on the hills slopes and ends June when most farmers have harvested. Harvests from this season are relatively small and the farmers consume a big proportion. Within this period of low rainfall, some farmers utilize non-swampy valley bottoms to plant Potatoes between December and January and harvest in March and April. This means that in the first season, Potatoes are harvested from non-swampy valley bottoms and hills slopes hence a reasonable market supply from March to June.

Table 2a: Potato Production Calendar for Kabale District.

Area of cultivation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Hill slopes	Potato Harvesting		Potato planting			Potato harvesting			Potato planting			Harvesting
Swamp land					Potato planting			Harvesting				
Valley bottom	Potato Planting		Potato harvesting									Potato Planting
Mean monthl Rainfall 199(2000 (mm)	72.3	73.1	136.5	114.9	98.4	43.0	13.7	56.4	88.8	131.4	98.4	90.0

The second season is the most important commercial season in the potato cultivation calendar of Kabale. This season has a *long* rain period from September to December when most farmers again plant Potatoes on the hills slopes and harvest mainly in January. In December to January is the period when Potato production in Kabale is highest and there is over supply on the market leading to the lowest seasonal prices. (See Figure 8 for Kampala Grand Seasonal Index).

Third season Potato cultivation is done in the swamps using irrigation canals during the dry period.
Commercially oriented farmers who often time planting so as to harvest when Potato price is high mostly exploit this season. Swampland planting is between May and July and a short harvesting season starts from August ending mid September.

During the second season planting (September to November), there is very little supply of Potatoes from western and southern Uganda (Kabale, Kisoro, Mbarara, Rukungiri and Rakai) to Kampala markets. During this period, a relatively high price of Potatoes is also recorded in Kampala, Figure 8.
Interviews with the traders at the Uganda-Rwanda borders of Katuna and Kyanika also indicated that July to October is the window period when traders import Potatoes from Rwanda, repack them locally and sell as Kabale Potatoes.

In Kisoro and Mwizi (Mbarara) Potato production closely follows that of Kabale except that these districts do not have significant swampland to warrant production of swamp irrigated Potato. Therefore these districts only have two major Potato seasons with the first season (minor) starting from February ending in May and the second season (major) starting September ending in January.
Mbale and Kapchorwa districts also have two Potato production seasons in a year. The first season is between March (planting) and June (harvesting), while the second season starts from August and ends in December, Table 2b.

Looking at the Potato productions in Tables 2a and 1b, the greatest window of opportunity for Rwanda to sell Potatoes to Uganda is between late August and early November. During this, there is virtually no supply from western and southern as it is the major planting period while this time also coincides the second planting season in eastern Uganda. Furthermore, due to low supply during this period Potato off-lorry prices (28,000/=) are relatively high in Owino market, hence making it possible to sell Rwandan potatoes profitably.

Table 2b: Potato Production Calendar for Kisoro, Mbarara, Mbale and Kapchorwa Districts.

District(s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Kisoro and Mbarara	Harvesting	Planting		Harvesting					Planting			Harvesting
Mbale and Kapchorwa			Planting			Harvesting		Planting			Harvesting	
Rainfall (mm) 1994 Mbarara	100.2	30.8	85.9	68.7	164.9	6.1	6.0	31.6	29.1	128.8	156.2	104.4

Potato varieties

The range Potato varieties that have been released and are being grown in Uganda are shown in Table 3 (PRAPACE, 2001). The survey revealed that many farmers in south-western Uganda were growing different varieties identified in the table except NAKPOT 1,2, &3, which seems to be unknown. Despite their good commercial characteristics, NAKPOT 1, 2 and 3 have not been adopted quickly since their release in 1999. Farmers interviewed said that they are cautious at adopting other potato varieties they are not familiar with. Some peasant farmers still grow old non-commercial local varieties such as Matare because it is tasty. Overall, the rate of variety adoption depended on the marketability of the variety, maturity rate, yield and tolerance to bacterial wilt and late blight and even the income level of households necessary for buying new seed.

Table 3: Characteristics of Potato Varieties Released/Grown in Uganda

Common name Yr 1st release	Tuber size	Skin colour	Flesh colour	Tuber shape	Vegetative cycle (days)	Seed dormancy (weeks)	Resistance/ Tolerance		Storability
							LB	BW	
Uganda 11 (1973) (Rutuku)	Large	Light red	Cream	Oval round	110-130	11-13	Toler	Suscep	Good
Victoria (1992)	Large	Red	Light yellow	Round	90-110	8-10	Mod resist	Toler	Good
Kisoro (1992)	Medium large	White	Cream	Oval long	110-120	10-12	Resist	Toler	Good
Kabale (1992)	Large	Purple white	White	Round	110-125	11-13	Mod resist	Suscep	Excellent
NAKPOT 1 (1999)	Large	White	White	Oval long	80-90	9-12	Resist	Toler	Good
NAKPOT 2 (1999)	Medium large	Rose red	Cream	Round	85-100	9-11	Resist	Toler	Good
NAKPOT 3 (1999)	Medium	White	White	Round	85-100	9-12	Resist	Toler	Good
Cruza 148 (1982) Ndinamagara	Large	Light red	Cream	Oval round	110-130	4-6	Toler	Toler	Fair
Sangema	Medium	Pink	Yellow	Oval oblong	90-110	10-12	Toler	Suscep	Good

(1980)	large								

Victoria is the most common commercial variety that is high yielding, early maturing, tolerant to bacteria wilt (BW), but susceptible to late blight (LB). The farmers in Mbarara, Kabale and Kisoro easily adopted this variety because South Western Uganda Agricultural Rehabilitation Project (SWARP) and African Highland Initiative (AHI) promoted it

Uganda Rutuku introduced in Uganda in 1972, also one of the most successful varieties in Kabale. Uganda Rutuku is highly sought after by traders because it the best for making chips. Mainly grown in Kabale at high elevations (+1,800 metres), this variety sells at a premium price. The survey also revealed that the wholesale price of 100kg bag of Uganda Rutuku was 33,000/= while that of Victoria and other varieties was at 28,000/= in Owino market. Because Victoria has almost similar characteristics as Uganda Rutuku (large tuber size, red/light red skin colour and yellow/cream flesh) unscrupulous traders in Owino are said to be selling Victoria as Uganda Rutuku to unsuspecting buyers

In Mbale a variety locally called Wanale with all the characteristics of Uganda Rutuku is also highly demanded by chips makers in eastern Uganda.

Potato Production Costs

Production of ware and seed potato effectively requires the same inputs and labour. However, for a farmer to produce clean seed (certified seed) he must purchase to use basic seed from a recognised source. To produce ware Potatoes, the farmer can use any Potato tuber that can sprout be it certified seed or disease infected local seed. Seed quality significantly determines the yield. From our field survey it was found that most respondents (farmers) complain experiencing declining yields because they do not use certified seed. Farmers said they use local seed retained from their harvests or buy from neighbours. The costs incurred and margins received by an average farmer in Mbale or Kapchorwa for cultivation of one acre of Potatoes using minimum inputs is shown in Table 4.

Table 4: Ware Potato Production Costs in Kapchorwa District, Uganda for Year 2001.

Item	Unit price (U shs)	Total (U shs)	% of sales
Inputs			
Land Rent/Hire 1 Acre	25,000	25,000	
Seeds 15 bags (1 bag ~100kg)	10,000	150,000	
Chemicals (Ambush & Diathane)		30,000	
Fertilizers (NPK) 1 bag (optional)	35,000	35,000	
Labour			
Ploughing 2 Times	15,000	30,000	
Making Ridges and Planting	15,000	15,000	
Adding more soil on the ridges	15,000	15,000	
Weeding 2 Times	15,000	30,000	
Fertilizer application (optional)	10,000	10,000	
Spraying	5,000	5,000	
Harvesting	20,000	20,000	
Total costs		**365,000**	

Revenue return 1 acre = Yield = 100 bags Farm-gate price per bag = 4,000/= **Gross Revenue**			**400,000**	
Net Margin			**35,000**	**8.75%**

Table 5: Sensitivity Analysis of the effects of Changes in Costs and Revenues on farmers' Margins

Variable option	Total costs (U shs)	Yield (bags) 1 bag ~100kg	Price per bag (U shs)	Revenue (U shs)	Profit/loss (U shs)	Remarks
No fertilizer use	325,000	80	4,000	320,000	-5,000	Common with peasant farmers
No fertilizer & pesticide use	285,000	70	4,000	320,000	35,000	Common with subsistence farmers
No fertilizer use & land hire	300,000	80	4,000	320,000	20,000	Most common situation
No fertilizer use & land hire	300,000	80	5,000	400,000	100,000	Most common situation with off season production

Informal interviews with farmers in Mbale and Kapchorwa revealed that most farmers do not use fertilizers and pesticides in the production of Potatoes. Non-use of fertilizers, pesticides, certified seed and land hiring is the most common agricultural practice of peasant farmers in Uganda. However, data in Table 4 illustrates the probable costs of cultivating 1 acre of Potatoes, the yield and returns as given to us by a number of farmers interviewed. The table shows that with a total investment (cost) of 365,000/=, the likely yield given favourable weather conditions is 100-120 bags. Table 4 further shows that the farmer earns 35,000/=, which is only 8.75% of the total sales.

Table 5 illustrates the various cost options that the farmers may incur in cultivating 1 acre of Potatoes and the resultant revenue given the price. Given the most common situation is that farmers do not use fertilizers and do not hire land, the farmer incurs about 300,000/= in production costs and earns 20,000/= only from a gross revenue of 320,000/=. The analysis further demonstrates that the most profitable (100,000/=) situation is when the farmer produces off-season when the farm-gate price improves to 5,000/= per bag.

POTATO MARKETING

Ware Potato Marketing in Uganda

Description of trading and the marketing chain

Constrained by high product perishability and limited storage facilities, farmers do not harvest Potatoes until they identify a buyer. Travelling traders/brokers also rarely buy from farmers before contacting their buyers in Kampala. Therefore, Potato trading is a demand-led business; that is, there has to be demand before supplies come to the market. This caution aims to reduce post-harvest loses that are associated with fresh produce.

For the production areas of central, western and southern Uganda, the focal destinations of the Potatoes are the Kampala markets (Owino, Nakawa, Kalerwe, Natete and others). Potatoes from Mbale and Kapchorwa generally go to Mbale main market first. Although there are travelling traders who may directly supply other towns and urban centres, Kampala is the main wholesale market for Potato traders from other towns such as Entebbe, Mukono, Kayunga, etc. Mbale market is the main distribution centre for Tororo, Iganga, Pallisa, Kumi and Soroti urban markets. A small number of restaurant operators and retailers in Gulu and Lira occasionally used to get their supplies from Kampala, but are now shifting their focus on Nebbi district that has become a dominant producer of Potatoes in Northern Uganda.

For goods to move from their origin (production) to their final destination (consumption), there are various people who perform the physical functions (e.g. sorting, packing, transporting, loading and unloading) and others who undertake the economic activities of selling and buying. The stages through which Potatoes move from the farmer to the consumer is described below.

Farmers

Farmers are the first link in the Potato market chain due to the high level of people depending on agriculture in Uganda (over 80%). Farmers are both producers and consumers. A sizeable portion of output is consumed by farmers from own production and by buying from neighbours and village markets.

Farmers harvest their Potatoes only when they have a buyer. At the time of sale farmers either seek the local village trader/broker or the trader/broker approaches the farmers. After striking a price deal, the farmer and village trader/broker agree on activities such as harvest date, sorting and packing. In most cases it is the farmer who harvests the Potatoes from the soil while village trader/broker provides the packing bags and does the packing. It is rare that individuals or farmers groups harvest their Potatoes, transport and wholesale them at urban markets. Most often, produce is sold at farm-gate and on a cash basis.

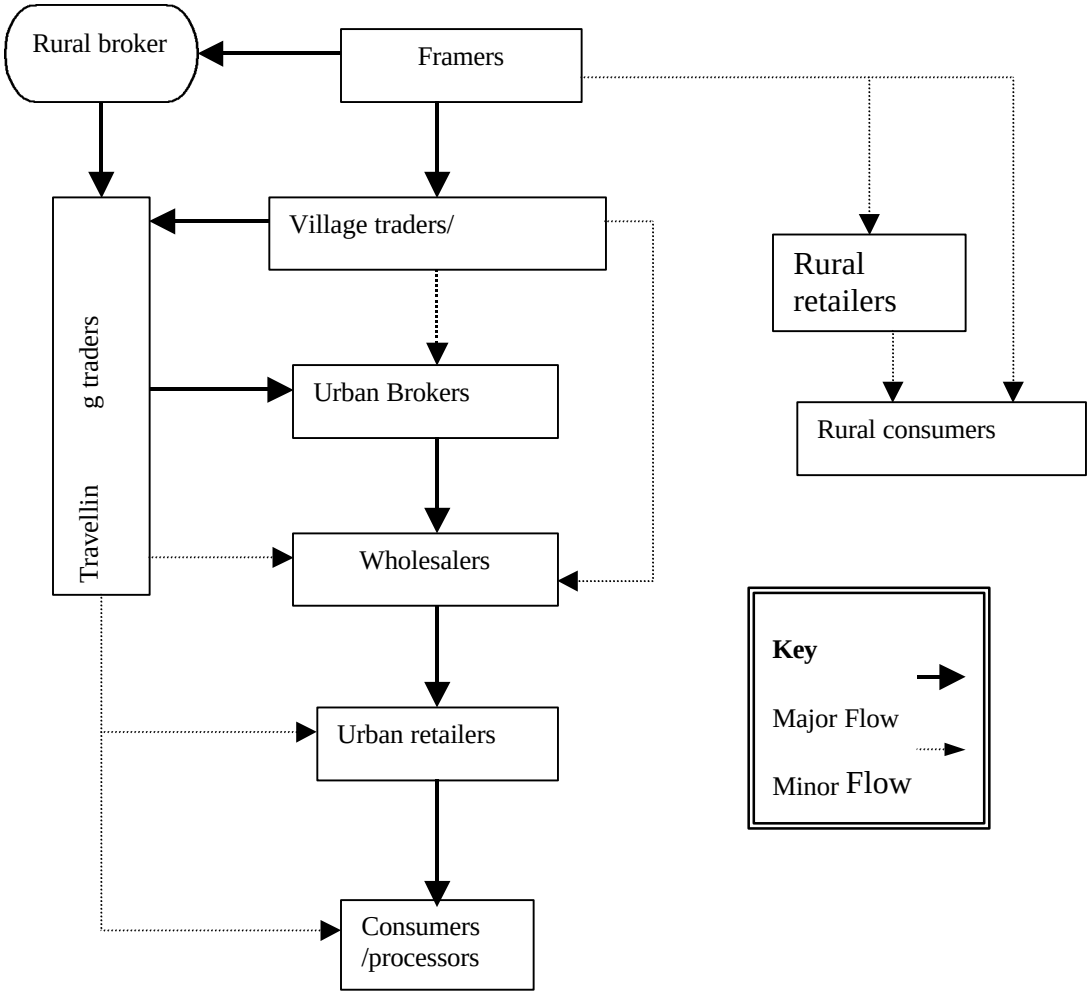
Other than selling to village assemblers and brokers, farmers also sell their Potatoes by the roadside and take them to the weekly village markets or sell them to the village retailer.

Village traders/assemblers

Village traders from the product areas o and know the farmers in their village and surrounding areas. They know what farmers have planted and when it is likely to be harvested. The village traders are in contact with transporters, wholesale buyers and financial service providers. After identifying farmers willing to sell and a price is agreed between the local farmer and wholesale buyers, village traders contact their buyers using mobile telephones. Once an agreement is struck, the deal is concluded on a trust basis. Trade can also be initiated by the wholesaler who requires urgent supplies. When wholesaler requires Potatoes, he will call his contact (village trader) agree on a price and other marketing arrangements and in turn the village trader will assemble to fulfil the amount required by the wholesaler. To accelerate the process, village traders are given cash advances from wholesalers, in which case they at times regard themselves as brokers.

Village traders/assemblers also sell to travelling traders from Kampala and to contacts in other towns. See Figure 5 a schematic representation of the Potato trading chain.

Figure 5: The Ware Potato trading chain.



Brokers

Brokers are one of the prominent market participants in Potato trading. In rural areas, brokers are the contact for travelling traders and wholesale buyers to farmers and the key link of farmers to traders. Brokering is a lucrative activity and some successful village traders and wholesalers switched roles to brokers. Brokers get instant pay (commission) per Potato bag for their services. The amount ranges from 500-1,000/= per bag depending on the quantity required and the urgency with which the consignment is required.

Apart from rural brokers who link farmers with the travelling traders, there are also brokers in most urban centres who link travelling traders to wholesalers and urban retailers. For example, in Kampala or Mbale travelling traders or village traders who have brought a lorry load of Potatoes, surrender it to the broker.

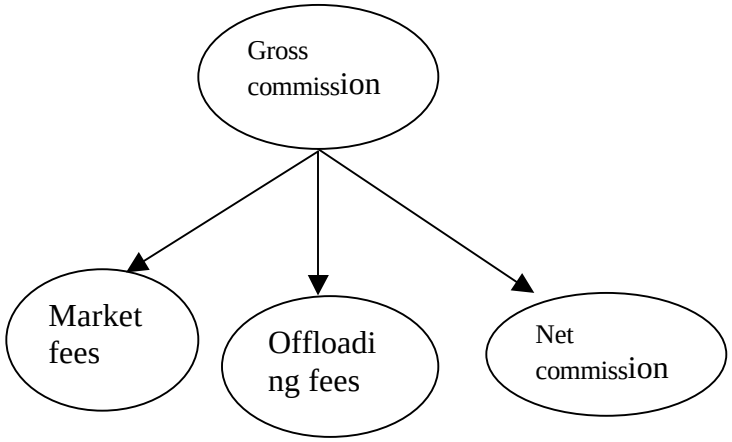
Before the broker accepts the responsibility, a number of issues are agreed, i.e,

- The number of bags that are on the lorry
- The price per bag that the travelling trader is going to receive
- The minimum price per bag at which the broker will sell, hence commission per bag.

- Who pays the market fees and off loading costs

In Kampala markets, we found out that after agreeing on the price that the travelling trader is to receive per bag, brokers were free to sell at whatever price they could negotiate with the buyers. Thus the commission that the brokers receive, varied from 500-2,000/= per bag depending on demand and supply conditions in the market. Brokers are an organised and influential group in the market (especially Owino market) and few travelling and village traders can directly sell to wholesalers and urban retailers as shown in Figure 1, by dashed lines (minor flow).

Mbale brokers are not different from their kinfolk in Kampala. They also takeover the transaction activities of Potatoes as soon as the lorry load enters the market. While Kampala brokers usually accept to over the responsibility of paying for off loaders as a fraction of their gross commission, Mbale brokers negotiate to pay even for markets fees as shown below.



Sometimes brokers make windfall gains. Urban brokers negotiate a fixed price with the travelling traders and sell at a higher price to the wholesalers while the rural brokers may negotiate a different price (higher price) with the buyers and pay a different price (lower price) to the farmers.

For example, suppose a broker buys from the farmer is willing to sell 100 bags of Potatoes at 8,000/= per bag while the trader is willing to pay 10,000/= per bag. The broker will gain (10,000-8,000)x100 = 200,000/= for a single transaction. Given the production costs, a farmer can hardly make such a profit margin from a production of hundred bags of Potatoes. Like wise few traders (travelling traders) can make such profit given the high marketing costs involved in Potato trading.

Brokers do not incur losses. At worst, they sell at the travelling traders' reserve price otherwise a price above the reserve price guarantees them of a minimum commission.

On the whole, the market has now accepted brokers (urban and rural) as a necessary iniquity. They are a key link in the marketing chain. They are the most informed about the market (demand and supply) conditions.

Travelling traders

These are traders who either own trucks or hire them for buying Potatoes from farmers or village traders and then transport and sell to wholesalers and urban retailers in other district markets. These traders supply most of the Potatoes to wholesalers and retailers through brokers. In Kampala, travelling traders can station and sell their Potato truckload in one market or move from one market to another until the consignment is sold.

Travelling traders with fresh Potatoes (high quality) typically hike their prices relative to those prevailing the market. However, when their stocks do not sell quickly as they anticipated and the quality starts to degenerate, these traders reduce the price accordingly. Travelling traders will sell at clearance prices to avoid further overhead costs such as accommodation costs, overnight parking fees, product loss and transport surcharge from truck owners.

Wholesalers

Major Potato wholesalers are largely found in Kampala (Owino and Nakawa) Mbale markets. In other towns, traders double as wholesale and retail traders because of the lower volumes. More often, wholesalers get their supplies from travelling traders. Rarely do wholesalers venture out to buy directly from the farmers.

Most traders do not know the names of different varieties but can distinguish them according to the skin and flesh colours. As experienced traders they soon know which varieties that are most highly sought by restaurants (good for chips and crisps). Accordingly, wholesale traders sell different varieties at varying prices. A popular variety, Uganda 11 (Rutuku) most preferred for chips and crisps is sold at a premium price of 7-13% over that of other varieties.

Retailers

Potato retailers are many and range from supermarkets to village roadside sellers.
In urban areas retailers in markets buy 1-5 bags from the wholesalers and then sell it in various heaps sizes for amounts ranging from 100-2,000/= A heap sold at 1,000/= weighs an average of 3kgs. Retailers sort and grade Potatoes according to variety and degree of freshness. Recently, some supermarkets such as Shoprite have started selling Potatoes in 5kg packages.
In rural areas Potatoes are sold on the road sides heaps or tins. A heap which has an average weight of 10kgs, sells for approximately 2,000/=.

Processors

Hotels, restaurants and Take-Aways (Fast Food outlets) are the main business enterprises that process Potatoes into chips. In urban areas, over 50% of Potatoes are consumed as chips. Minimum inputs needed to process chips include fresh Potatoes, cooking oil, fuel energy and a pan. These inputs are locally available. The team was shocked to discover that despite the abundance of good quality Potatoes available in Uganda, the South African based fast food restaurants such as Nandos and Steers get their Potatoes from South Africa. This would appear to be a valuable niche market if Ugandan growers could produce the varieties grown in the Republic of South Africa to supply these outlets.
There are some small-scale food processors that make crisps from Potatoes. Crisps being not a very popular product that is mainly eaten by students and young people in urban areas means that its market is limited thereby limiting its production.

Consumption and prices

In Uganda, Potatoes are consumed in areas where they are produced and surplus is sold in urban areas. Market patterns indicated that almost no Potatoes moved to non-producing areas where Potatoes are not regarded as a staple food.

Potatoes are consumed in a number of ways. Potato farming communities and rural dwellers, where Potatoes are consumed as a major food staple, mainly eat Potato boiled or mashed. At times they also eat Potatoes mixed in beans, beef, or other vegetable stew. In these communities, Potatoes are eaten by all ages of people.
In the urban areas of Uganda, Potatoes are mainly consumed as chips, snacks (crisps) and occasionally in a boiled or mashed form. The major consumers of Potatoes in towns are young people of working class and students of higher institutions of learning who eat Potatoes mainly as chips. Particularly, it is interesting to note that on average, more women eat chips than men. The rapid rate at which fast food outlets (Take-Aways) are becoming popular in urban centres is evidence to the high level of Potato (chips) consumption. The principle product of the take-ways is chips and chicken. Young people we interviewed said they prefered chips to other foods because it is tasty, cheap easy to prepare, and considered a status food.

Estimates from the 1994/95 Uganda National Household Survey indicated that the region with highest average monthly household consumption expenditure on Potatoes was western Uganda followed central and eastern and lastly northern Uganda, Table 6. Tables 6, 7 and 8 indicate the average monthly household consumption expenditure on major food staples in Uganda. They were complied from the Uganda National Household survey (1994-95) statistics report

Table 6: Average monthly household consumption expenditure on Potatoes by region in 1995

	Rural		**Urban**		**Total**	
Region	Per H/H Monthly Exp in U.shs.	% of total Exp on major food	Per H/H Monthly Exp in U.shs .	% of total Exp on major food	Per H/H Monthly Exp in U.shs .	% of total Exp on major food
Northern	20	0.04	450	0.45	48	0.1
Eastern	83	0.16	563	0.59	124	0.23
Central	513	0.6	946	0.55	633	0.58
Western	1,250	2.16	858	0.84	1,222	2.00

Table 7: Average monthly household consumption expenditure on Matooke by region in 1995

	Rural		**Urban**		**Total**	
Region	Per H/H Monthly Exp in U.shs .	% of total Exp on major food	Per H/H Monthly Exp in U.shs .	% of total Exp on major food	Per H/H Monthly Exp in U.shs .	% of total Exp on major food
Northern	332	0.73	1,442	1.43	403	0.82
Eastern	1,309	2.59	3,477	3.65	1,492	2.74
Central	8,092	9.48	11,224	6.53	8,965	8.19
Western	7,986	13.78	8,612	8.39	8,031	13.11

Table 8: Average monthly Household consumption expenditure on major food staples in Uganda in 1995

	Rural		**Urban**		**Total**	
Food staple	Per H/H Monthly Exp in U.shs .	% of total Exp on major food	Per H/H Monthly Exp in U.shs .	% of total Exp on major food	Per H/H Monthly Exp in U.shs .	% of total Exp on major food
Matooke	4,866	7.92	9,020	6.17	5,458	7.42
Sweet Potato	4,385	7.13	2,779	1.9	4,156	5.65
Potato	512	0.83	841	0.58	559	0.76
Cassava (fresh, flour)	3,030	4.93	1,850	1.27	2,862	3.89

Source: Uganda National Household Survey (1994-95), Min. Planning and Econ. Dev't.

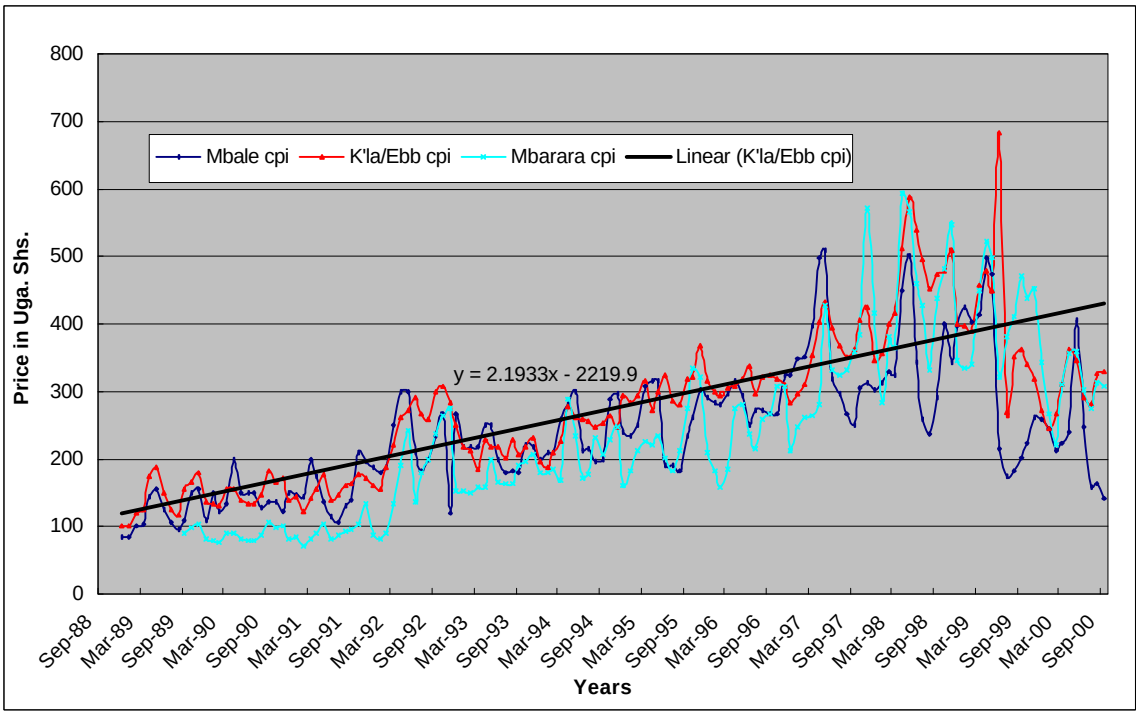
Although the estimates in the tables above may not portray an accurate status of the current levels of staple food consumption, it provides a guide to the magnitude and direction of expenditure flow by households on major food staples in various regions of the country.

Table 6 highlights the comparative household monthly expenditures on Potatoes between regions and between rural and urban areas. Noticeably, the rural part of western Uganda has a higher monthly expenditure (1,250/= per month) on Potatoes than the urban areas of western Uganda (858/= per month). This finding is reasonable as potatoes are the main food staple for rural people in Kabale, Kisoro and Rukungiri. People in urban areas have a greater choice of buying other food staples such as matooke and rice brought from other districts. In the regions of central, eastern and Northern Uganda, urban dwellers spend more on Potatoes than rural.

Comparatively, both rural and urban households in all the regions of Uganda, spend over 5 times their monthly consumption budget on cooking/bananas matooke than Potatoes. (See Tables 6 and 7). Matooke is a very close substitute to Potatoes and it is ranked number one food staple in central and in some parts of eastern and western districts of Uganda.
Table 8 shows that of all the 4 major food staples consumed in Uganda, the highest monthly household expenditure goes to matooke, closely followed by sweet Potatoes, and then cassava and lastly the least expenditure goes Potatoes. The data in Table 8 reveals that the urban community spends about twice as much on matooke and Potatoes than the rural populace while on the other hand the rural populace is observed to spend about two times more on sweet Potatoes and cassava.

Figure 6 shows the nominal retail price of Potatoes in selected markets in Uganda. This graph shows how unstable Potato prices can be. The linear trend shows that over time Potato prices have more than doubled in the last 10 years (see linear equation) in direct relation to the macroeconomic conditions (inflation, exchange rate instability, supply shocks, etc.) prevailing in the country.

Figure 6: Trend of monthly nominal retail price of Potatoes in select district urban markets



Source: Uganda Bureau of Statistics; Min. of Finance and Econ Dev't.

Figure 7: Trend of monthly nominal retail price of Potatoes in select district urban markets

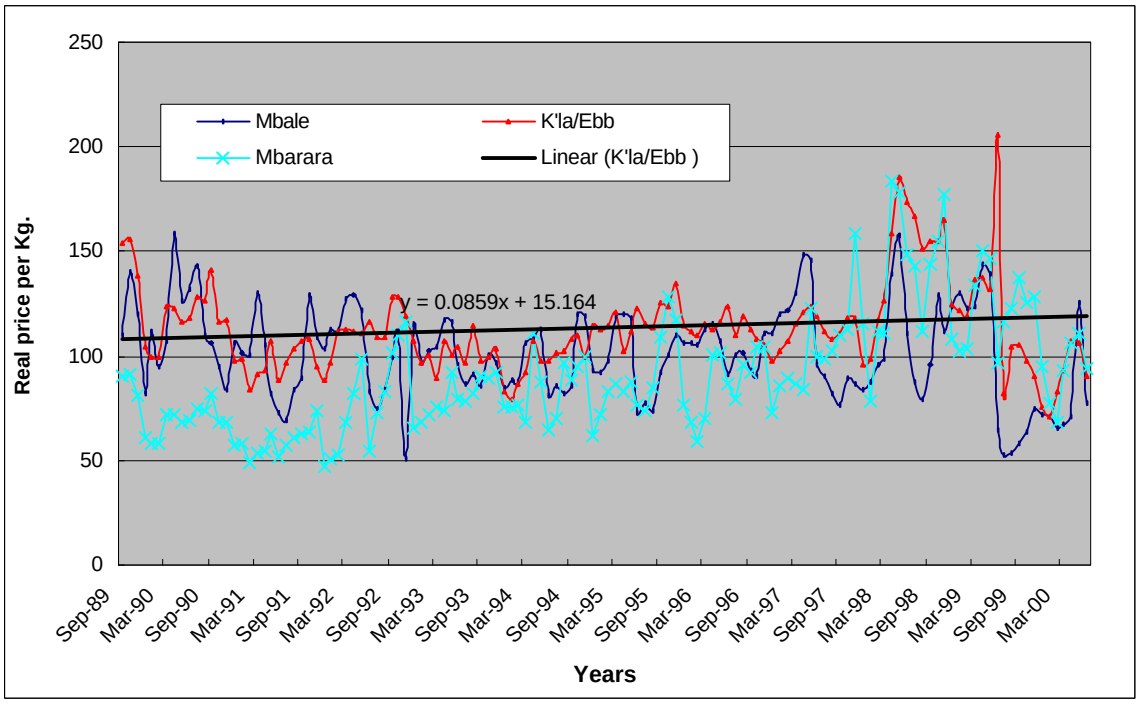


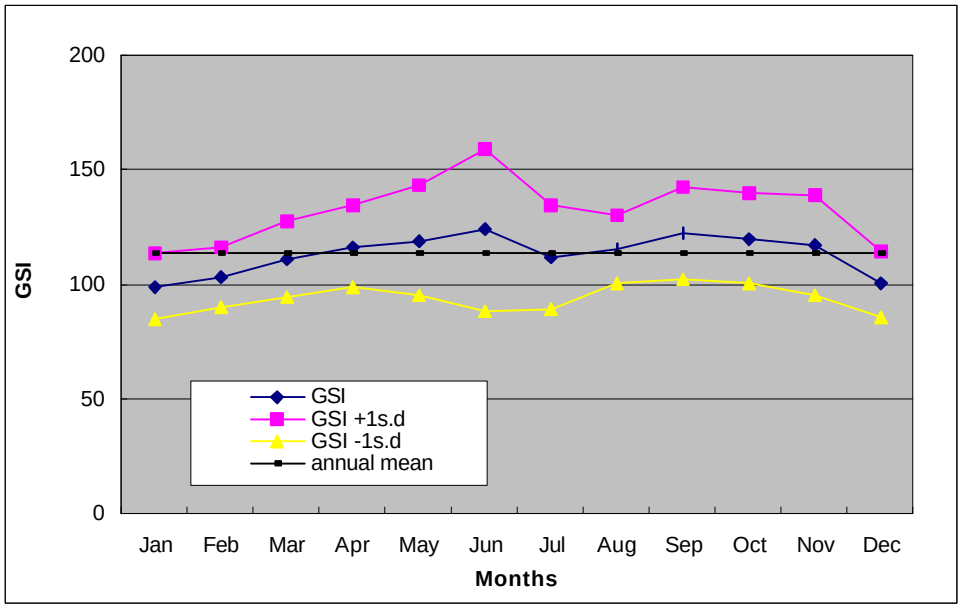
Figure 7 shows real (adjusted for inflation) retail price of Potatoes in Kampala, Mbale, Masaka and Mbarara for the period September 1989 to June 2000. While the graphs in Figure 7 clearly shows that Potato prices are highly unstable, the trend line for the Kampala real price series indicate that over this period, real prices have been stable. A likely reason why Potato real prices have remained almost constant over the long run is because whilst demand for Potatoes has increased, supply has matched this growth.

In Uganda, ware Potato production is no longer a monopoly of the highland regions of the old Kigezi districts. Victoria, a versatile Potato variety with a short maturity period can be grown in virtually all parts of Uganda which have adequate rainfall.

Examination of the graphs in figure 6 and 7 indicates that the seasonal fluctuation of Potato prices have existed over the entire period. However, a closer scrutiny shows that price fluctuations have worsened since 1997. In 1998 Uganda experienced the famous El Nino phenomenon. These adverse weather conditions led to supply shocks of most agricultural output that exacerbated price volatilities. Another possible reason for the high level of Potato price instability is its high degree of perishability due to lack of appropriate packing, handling and storage facilities. The mode of production that depends on rain-fed agriculture also affects supply, and a change in transaction costs directly affects the price stability.

Figure 8 shows the seasonal real retail price movements for Potatoes in Kampala for the period 1989-2000. The grand seasonal index (GSI) is a statistic that calculates the monthly average price from a price series for a given period of time. (For more on calculation see Appendix 2)

Figure 8: GSI for potatoes in Kampala, 1989-2000



Our calculations, Appendix 2, indicate that the annual mean real retail price of Irish Potatoes is 113.19/= per kilogram. Figure 8 shows that the trend in seasonal prices is more or less stable and shifts above and below the annual mean. The graph further indicates that the seasonal price index does not exceed the annual mean by 9%, and at its minimum the seasonal index does not go below 12.5% of the annual mean.

In Figure 8, there are two more graphs that deserve an explanation. GSI +1s.d and GSI -1s.d are graphs that were derived by adding to and subtracting from GSI a standard deviation of every month's seasonal index. Standard deviations measure the magnitude of variation of the series from their mean. The above graphs are thus introduced as a measure of the level of uncertainty in the seasonal price fluctuations. These graphs show a significant pattern. The standard deviations are lowest in August and December to February, when the market's uncertainty is at its lowest level. Major Potato harvests come to the market late in December and continue to early March. Second season harvests register their presence in the market in August but because production volumes are low in this season, speculation is common and price volatility increases. Standard deviations are at their peak just before harvests in May to July and November. Lack of reliable information on supply and demand conditions tends to exacerbate the level of uncertainty, however, during these periods; off-season production from swamplands and some imports from Rwanda usually filter into the market to ameliorate the erratic situation. September to November is the opportune period for Rwanda to export potatoes to Uganda.
Despite these erratic price movements, we did not obtain any information suggesting that farmers or traders store ware potatoes for speculative purposes.

In Uganda, the rate of population growth and urbanisation is well correlated with the level of Potato consumption, especially in the form of chips and crisps. Therefore, demand for Potatoes is likely to increase in the future and it is expected that supply from low and mid altitude zones where Potato cultivation is a cash crop will increase. Therefore, the long-term future trends of Potato demand and supply are certain but changes are more difficult to judge, as this will depend on competition.

Spatial Analysis of ware potato market

In an integrated market system scarcity in one location creates demand of products from other locations. Consequently, local prices in an integrated market system would be more stable and only differ due to transaction costs between locations. Correlation coefficients (r) between pairs of markets are the quantitative estimation used to measure the level of the market's spatial integration.

Tables 9 and 10 contain results of correlation coefficients between four towns for Potato prices calculated using nominal and real prices respectively. From Tables 9 and 10, the following observation worth noting.

- All coefficients in Table 9 exhibit moderate (0.6<r<0.8) to high (r>0.8) correlation while all coefficients in Table 10 exhibit almost no correlation except for the moderate values indicated in bold. If nominal prices are used in calculating correlation coefficients (Table 9), an inflation bias is introduced. Two markets with no possibility of exchanges between them (for example it is unlikely that Mbarara and Mbale can supply one another with Potatoes given that they are both among the major producers and the distance between the two towns make Potato trade unprofitable) but affected by the same macroeconomic factors (e.g. inflation) would exhibit high correlation coefficients.

Table 9: Correlation Coefficients (r) for Potato between four towns using nominal prices

	Kampala	Masaka	Mbarara	Mbale
Kampala	1.00	**0.8938**	**0.8834**	0.7477
Masaka		1.00	**0.8983**	0.7970
Mbarara			1.00	0.7017
Mbale				1.00

Table 10: Correlation Coefficients (r) for Potato between four towns using real prices

	Kampala	Masaka	Mbarara	Mbale
Kampala	1.00	**0.7220**	0.5587	0.3336
Masaka		1.00	**0.6239**	0.2521
Mbarara			1.00	0.1043
Mbale				1.00

To overcome the inflationary bias, correlation coefficients in Table 10 have been calculated using real prices. The coefficients between Mbale and other towns (Kampala, Masaka and Mbarara) are low indicating that Potato market conditions (demand and supply) in Mbale have nothing to do with Potato prices in Kampala, Masaka and Mbarara. These results suggest that Mbale markets are independent and even isolated from Kampala, Masaka and Mbarara in terms of Potato marketing. Apart from feeding its own urban population Mbale supplies most its Potatoes to the neighbouring districts Tororo, Kumi, Soroti and Pallisa. Furthermore, a combination of high transport costs and low quality Potatoes make it unprofitable to sell Potatoes to Kampala, Masaka and Mbarara.

In Table 10, the coefficients between Kampala and Masaka (0.722) and between Masaka and Mbarara (0.624) reveal a modest degree of correlation. While Masaka, Rakai, Mubende and Mbarara districts produce less compared to Kabale and Kisoro, most of their output is destined for the market and competes favourably in Kampala markets because of proximity that reduces on the transport cost. This may be one of the credible reasons why Kampala-Masaka and Masaka-Mbarara demonstrate a moderate form of spatial integration.

Although, calculation of correlation coefficients between pairs of markets is not enough to pass judgement on the level of integration between such markets as it needs to be backed with empirical and historical research of the markets under consideration, it can considerably increase research knowledge on the way such markets work.

Marketing Costs and Margins

Table 11 shows the practical costs and margins derived during the market survey for various market participants in Potato marketing chain. While Table 12 shows the assumptions used to derive costs in Table 11. The cost and price information used to assemble Tables 11 & 12 are part of the fieldwork data collected in August 2001. The tables present the costs and returns on Potato trading between western Uganda (Kabale, Kisoro, Mbarara, Rakai) and Kampala.

Table 11 illustrates that at farm-gate, farmers sell Potatoes at 8,000/= per 100kg bag. From the survey we found that the farm-gate price varies between 5,000-15,000/= depending on the potato variety and also due to the lack of accurate and timely market information by the farmers As indicated in the Potato marketing chain, Figure 5, travelling traders are the main buyers of Potatoes from the farmers through a third party

(rural broker). To ensure quality and minimum post harvest losses, travelling traders provide packing bags, pay labour to sort and pack and incurs a host of other costs as indicated in Table 11.
Travelling traders are exposed to a multitude of risks to move food from rural areas to urban centres. In Uganda Potatoes are grown in highlands that have the worst road network. While in transit, traders may find that a section of the road was washed away or their truck may breakdown. In such case travelling traders are faced with 50-100% loss of the consignment. In business, the higher the risk, the higher the return to attract investment. This is also true in Potato trading where the travelling trader gets more than 35% net margin.

While wholesalers seem to earn a lower net margin of 2,393/= (9.5%) per bag of Potatoes, retailers get an average net margin of 3,700/= (12.3%). It is important to note that wholesalers usually have a higher turnover than retailers. For example a wholesaler may sell between 200-400 Potato bags per month giving him a net income ranging from 400,000-800,000/= per month while the retailer may sell between 20-40 bags giving him a monthly net income range between 70,000-150,000/= only. Brokers who have an opportunity to handle 5 10-tonne lorries in a month can also get a monthly income of between 250,000-500,000/=

Table 11: Potato Marketing Cost and Margins

	U Shs./100kg bag	% of selling price
Farmer		
Farm-gate price	8,000	
Travelling trader		
Purchase price	8,000	
Selling price	22,000	
Gross margin	14,000	63.64
Costs		
Commission (Rural broker)	1,000	4.5
Packing bags	500	
Sisal rope for sowing top	83	
Grass for packing	33	
Sorting, packing & sowing labour cost	300	
Loading	200	
Sub-county tax levy	200	
Transport	5,000	
Total cost before Kampala market	7,316	
In Kampala markets		
Market fee	500	
Offloading fee	200	
Commission (Urban broker)	1,000	4.5
Costs in Kampala market	1,700	
Total costs	9,016	
Net Margin	4,984	35.60
Wholesaler		
Purchase price	22,000	
Selling price	25,000	
Gross margin	3,000	12.00
Costs		

Market stall rent	14	
Miscellaneous Overhead costs	100	
Post harvest loss	500	
Total costs	614	
Net margin	2386	9.50
Retailer (Owino market)		
Purchase price	25,000	
Selling price	30,000	
Gross margin	5,000	16.67
Costs		
Market stall rent	200	
Miscellaneous labour	300	
Miscellaneous Overhead costs	100	
Post harvest loss	700	
Total costs	1,300	
Net Margin	3,700	12.33

Table 12: Assumptions used to derive costs in table 5

Item	Unit cost	Capacity	Cost per bag
1 Sisal bundle	2,500/=	Sowing 30 bags	83.3/=
1 Bundle of packing grass	1,000/=	Packing 30 bags	33.3/=
Market stall rent per month	7,000/=	Wholesaler sells 500 bags per month	14/=
		Retailer sell 35 bags per month	200/=
Post harvest loss	250/=	Wholesaler loss = 2kg per bag	500/=
	350/=	Retailer loss = 2kg per bag	700/=
1 Potato Heap	Retail = 1,000/=	1 bag = 30 heaps	30,000/=

Ware Potato Imports/Exports.

Interviews held with traders and government revenue officials along the Uganda-Rwanda and Uganda-Kenya borders did not give the impression of a brisk business in Potatoes between Uganda and her neighbours.

At Katuna border (Uganda-Rwanda), a prominent Potato trader we interviewed showed us Uganda Revenue Authority Customs Department receipts indicating the custom taxes he paid for importing Potatoes from Rwanda. When there is a window of scarcity in Kabale (September-November) amidst high demand from Kampala, traders from Kabale and Kisoro exploit the situation by importing Potatoes from Rwanda, repack them in Kabale and sell as Kabale Potatoes. The traders say they repack the Potatoes by mixing a large percentage of Rwanda Potatoes with a smaller amount from Kabale. This is done to hoodwink travelling traders from Kampala that the whole consignment is from Kabale. Sometimes the adulteration of Kabale Potatoes with that from Rwanda is done by the Kabale brokers who are advanced credit by their trading patterns in Kampala. This phenomenon of Potato repacking is influenced the fame (quality) of Kabale Potatoes.

Other than at Katuna border, the traders revealed that Potato trade between Uganda and Rwanda exists informally along other smaller border crossings in Kabale and Kisoro such as kyanika border . Some traders occasionally bring Potatoes from Eastern Congo.

No cross border Potato trade has reported along the Uganda-Kenya border. Even the TechnoServe/University Technical reports on Unrecorded Cross-Border Trade between Uganda and Kenya have no mention of Potato trade. Traders from Kapchorwa who normally sell maize grain in Kenya said they have never attempted to sell Potatoes from Kapchorwa to Kenya. Also no traders from Mbale, Tororo, Busia and Malaba districts that border Kenya claimed to have imported or exported Potatoes between Uganda and Kenya. Potato production map of Kenya shows a major Potato production belt at the slopes of mount Elgon on the Kenya side. This means that all the Kenyan districts bordering Uganda have adequate and cheap Potato supplies from within Kenya.

Seed potato Marketing in Uganda

Other than the National Agricultural Research Organisation (NARO) potato research institutes, in Uganda, there is only one recognised farmers group (UNSPPA) that produces high quality seed potatoes. Since the inception of Uganda National Seed potato Producers Association (UNSPPA), the leaders of the association have been compiling detailed bi-annual reports on production and marketing of seed potatoes by the members of the association – See UNSPPA 2000A report by R. Kakuhenzire and S. Tindimubona below and others in Annex 2-3. These reports give detailed cost-benefit analysis of seed potato production by the members, rate of seed potato utilisation and yield. A detailed breakdown of how many bags each member plants, all inputs used with costs and the total harvests. Thus these reports give a first hand analysis of the costs incurred, gross revenues and net returns received by each member of the association.

PRODUCTION REPORT FOR UGANDA NATIONAL SEED POTATO PRODUCERS ASSOCIATION (UNSPPA) FOR 2000B SEASON

R. Kakuhenzire and S. Tindimubona

Introduction.

The Uganda National Seed potato Producers Association (UNSPPA) is a group of farmers whose main aim is to produce, store and distribute quality seed potato to other Potato growers preferably at the community level. The association was started in 1996 with ten members. Current membership stands at 25 people, 15 men and 10 women. In the second season of 2000, (2000B), the membership stood at 25 people however, only 15 farmers collected 120 bags seed potato. Among the fifteen three did not submit production reports for 2000B. The farmers are Kiiza, Gareeba, Kanyima who took three, six and ten bags of seed potato respectively. Thus 101 bags of seed were accounted for while 19 were not.

Seed potato Procurement in 2000B.

Fifteen (15) members among 25 procured 120 bags equivalent to 9.6 Mt. However, only 12 farmers returned production reports equivalent to 101 bags (8.08MT) of seed (Table 1 and appendix1). The total capital investment was Sh. 8,872,000 producing a gross return of Sh. 17,442,000 (Table 1). The farmers as a group made a net profit Sh.8,534,000 equivalent to 96.2% of the investment (Table 1). The farmers together produced 785 bags 160.6 MT) of potato. Two farmers, Mr. Sentaro and Mrs. Rubereti had their plot downgraded to ware potatoes and made net losses (Table 1).

Table 1: Cost benefit analysis for seed potato producers in 2000B season

Name	[1]Bags planted	Bags harvested	Multiplication rate	Capital input (Shs)	Gross return (Shs)	Net return (Shs)	Net return (%)	Direct beneficiaries
Beinamaryo	10	70	7.0	87	1788000	982000	121.8	1*
Bitarabeho F.	10	66	6.6	82.6	1064000	285800	36.7	4*
Karibushe	10	82	8.2	100.2	2150000	1188000	128.3	4
Kemani E.	3	18	6.0	27	630000	414200	191.9	2
Kihumuro A	10	66	6.6	82.6	1400000	734000	110.2	4
Kikafunda	5	19	2.7	26.7	445000	97500	28.1	1
Kisiizi	8	48	6.0	62	1170000	547500	88.0	1*
Mwongyera	12	100	8.3	120.3	2860000	1808000	171.9	2*
Rubereti	6	29	3.2	38.2	255000	-221000	-46.6	0
Sentaro	10	68	6.8	84.8	560000	-355000	-38.8	0
Tindimubona	14	115	8.2	137.2	4520000	2772500	158.7	5*

Twesigye V	3	24	8.0	35	600000	280500	87.8	3
Total	102	705	7.8	883.6	17442000	8534000	96.2	27

[1]One bag weighs 80 kg

The level of tuber damage at harvest was minimal (Table 2) compared with previous seasons. For every bag that was planted, 7.8 bags were harvested (Table 2). There was a marked increase to this ratio, which could be probably attributed to better crop management. The mean production per bag was Sh. 11,302 with a minimum and maximum break-even points at Sh. 10,091 respectively. For farmers whose crops were not degraded to ware Potatoes, the average marginal net rate ranged between 28.1% and 191.9% (Table 2). Average marginal net return for all the members was 96.2%. Farmers with low multiplication rates and high production costs per bag made less marginal net returns (Table 2).

Table 2: Analysis of production cost for UNSPPA members in 2000B season

Name	Bags* planted	Bags* Harvested	Damaged Bags	Net harvest	Multiplication rate	Capital input (Shs)	Production cost per bag (Shs)	Net return (%)
Beinamaryo	10	70	1.5	68.5	7.0	157	1,1514	121.8
Bitarabeho F.	10	66	3	63	6.6	148.6	11,791	36.7
Karibushe	10	82	4.5	77.5	8.2	182.2	11,293	128.3
Kemani E.	3	18	.5	17.5	6.0	45	11,988	191.9
Kihumuro A	10	66	3	63	6.6	148.6	10,091	110.2
Kikafunda	5	19	1.5	17.5	2.7	45.7	18,289	28.1
Kisiizi	8	48	3	45	6.0	110	12,969	88.0
Mwongyera	12	100	6	94	8.3	220.3	10,520	171.9
Rubereti	6	29	3	26	3.2	67.2	16,414	-46.6
Sentaro	10	68	0	0	6.8	84.8	13,456	-38.8
Tindimubona	14	115	3	112	8.2	252.2	15,196	158.7
Twesigye V	3	24	1	23	8.0	59	13,313	87.8
Sub-Total	**101**	**705**	30.0	**755**	**7.8**	**1520.6**	**11,302**	**96.2**

*Each bags weighs 80 kg

Considering resource allocation by UNSPPA members, the greatest proportion of resources was spent on seed (Table 3). Farm labour took 18.2%, fertilizers, 8.5%, transport, 7.3% pesticides 6.4% and empty bags took 2.7%. Among the pesticides, the expenditure on insecticides was low. The bulk of this item was used to procure fungicides (90%).

Table 3: Resource allocation (UShs) in seed potato production by members of Uganda National Seed potato Producers Association (UNSPPA) in 2000 B

Name	Cost of seed (Shs)	Farm labour (Shs)	Fertiliser (Shs)	Pesticides (Shs)	Empty bags (Shs)	Transport (Shs)	Total cost (Shs)
Beinamaryo J.	500000	500000	40000	50000	20000	40000	1150000
Bitarabeho F.	500000	500000	90000	33000	21600	5600	1150200
Karibushe G.	500000	500000	42000	50000	36000	140000	1268000
Kemani E.	150000	150000	5000	7800	2000	2000	316800
Kihumuro A.	500000	500000	0	22000	15000	20000	1057000
Kikafunda B.	250000	250000	0	35000	3500	5000	543500
Kisiizi K.	400000	400000	42000	58000	12500	0	912500
Mwongyera A.	600000	600000	86000	45000	53000	87000	1471000
Rubereti E.	300000	300000	0	40000	10000	7000	657000
Sentaro P.	500000	500000	106500	91500	10000	5000	1213000
Tindimubona	700000	700000	340000	88000	50000	310500	2188500
Twesigye V.	150000	150000	0	50000	8500	24000	382500
Total	**5050000**	**5050000**	**751500**	**570300**	**242100**	**646100**	**12310000**
Percent	**56.9**	**18.2**	**8.5**	**6.4**	**2.7**	**7.3**	**100.0**

Conclusion.

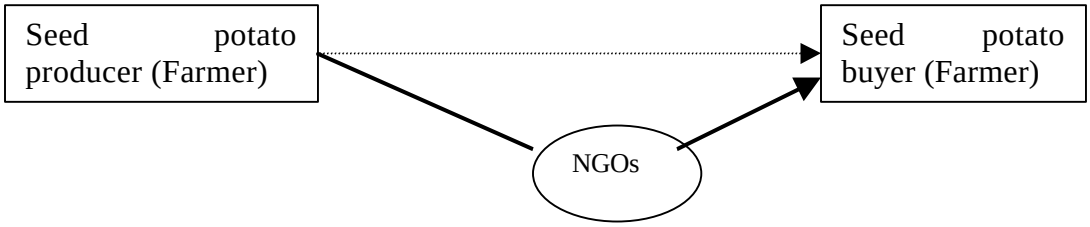
It is evident that the highest cost goes towards seed. Considering average price of ware potatoes for 2000, it is clear that the going price for seed in artificial and is cushioned by monopoly and subsidies from the NGO's and decentralized districts. Resource allocation indicated that more money that previously has been allocated to purchase of fertilizer, which could have improved productivity during the season. Farmers who fail to send seasonal returns and those who do not participate in production led to the reduced performance of the association. It can be argued that only half of the members were active in 2000B season.

	Bags* plted	Cost of seed	Land prep	Plantin g	Weeding	Spraying	Fertilis er	Pesticide s	Deha ualmi ng	Guardi ng	Harvest ing	Empty bags	Transport	Total cost	C r
maryo	10	500000	60000	35000	25000	10000	40000	50000	6000	0	20000	20000	40000	806010	1
ıbeho	10	500000	60000	20000	10000	5000	90000	33000	3000	15000	15000	21600	5600	778210	1
ushe	10	500000	30000	10000	25000	30000	42000	50000	2000	25000	36000	36000	140000	926010	2
ıni	3	150000	17000	3000	4000	3000	5000	7800	2000	15000	5000	2000	2000	215803	6
nuro A.	10	500000	50000	20000	10000	6000	0	22000	3000	0	20000	15000	20000	666010	1
unda	5	250000	14000	10000	10000	6000	0	35000	2000	0	12000	3500	5000	347505	4
i K.	8	400000	45000	13000	18000	6000	42000	58000	2000	0	26000	12500	0	622508	1
ngyera	12	600000	51000	28000	35000	16000	86000	45000	6000	10000	35000	53000	87000	1052012	2
reti	6	300000	65000	7000	15000	3000	0	40000	4000	0	25000	10000	7000	476006	2
ro P.	10	500000	100000	40000	20000	8000	106500	91500	4000	0	30000	10000	5000	915010	5
mubona	14	700000	110000	30000	17000	27000	340000	88000	10000	40000	25000	50000	310500	1747514	4
igye	3	150000	54000	6000	9000	8000	0	50000	1000	0	9000	8500	24000	319503	6
otal	**101**	**5050000**	**656000**	**222000**	**198000**	**128000**	**751500**	**570300**	**45000**	**105000**	**258000**	**242100**	**646100**	**8872101**	**1**
eba															
ima	3														
R.	6														
	10														
	120														

Commentary on UNSPPA Seed potato Production Marketing Reports

1. UNSPPA being the only organisation that is engaged in commercial seed potato production and marketing means that it is a monopoly in producing and selling high quality seed. Clearly there is need for other Potato farmers to join this association to learn techniques of better quality seed production and sell of surplus certified seed.
2. The reports indicate that the average production costs per bag of seed potatoes ranges from 10,000-20,000/= while an 80kg bag of seed potato is sold at 50,000/=. Because of the natural monopoly (seed potato is best produced in highlands of altitude range 2,000-2,500m) that UNSPPA enjoys, it has unreasonably overpriced an 80kg bag of seed potato to the extent that apart from UNSPPA members and Non-government Organisations (NGOs) indeed very few Potato farmers can afford such a price (50,000/= per 80 kg bag), which compares unfavourably with that of uncertified local potato seed that goes for 10,000-15,000/= per 100kg bag. A farmer with a meagre income has no time to think of an expensive input (seed potato) when there is a cheaper alternative.
3. In marketing of seed potato, there is no intermediary. There are no brokers, village/travelling traders or wholesalers. It is a one to one mapping. That is the seed producer (farmer) sells directly to the input buyer (farmer). Occasionally some NGOs or groups buy on behalf of their farmers.

Figure 5: One to One mapping of the Seed potato Marketing Chain



Certified seed potato being such an expensive input, it is mainly the NGOs and District agricultural offices that have been buying seed potato from UNSPPA for onward distribution to the farmers. For example, to encourage Potato cultivation in Nebbi district, the district agriculture office bought over 150 bags of seed. African Highlands Initiative (AHI) a food security NGO that is supporting farmers groups in Kabale with the provision of clean potato seed. NGOs supporting Potato farmers in Rwanda also once bought seed from UNSPPA. In Figure 5, the thick arrow shows the main way seed potatoes reach farmers is through NGOs. The dashed line illustrates the few farmers who can afford using their own resources to purchase seed potatoes, particularly members of UNSPPA.

APPENDICES

Appendix 1: production of Potatoes (‘000 tonnes) by district

	Appendix 1: PRODUCTION OF IRISH POTATOES ('000 TONNES) BY DISTRICT								
District	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Apac	652	779	896	979	774	877	935	1,094	1,164
Arua	3,061	3,655	4,203	4,591	3,632	4,112	4,386	5,129	5,460
Bundibugy	2,703	3,227	3,711	4,054	3,207	3,630	3,872	4,527	4,820
Bushenyi	1,289	1,539	1,770	1,934	1,530	1,732	1,847	2,160	2,300
Gulu	-	-	-	-	-	-	-	-	-
Hoima	2,683	3,204	3,685	4,025	3,184	3,605	3,845	4,496	4,787
Iganga	5,712	6,820	7,843	8,568	6,777	7,672	8,183	9,569	10,187
Jinja	5,610	6,698	7,703	8,415	6,656	7,536	8,038	9,399	10,006
Kabale	100,681	120,216	138,248	151,020	119,464	135,242	144,258	168,677	179,571
Kabarole	5,238	6,254	7,192	7,856	6,215	7,036	7,505	8,775	9,342
Kalangala	122	146	168	184	145	164	175	205	218
Kampala	-	-	-	-	-	-	-	-	-
Kamuli	6,816	8,138	9,359	10,224	8,087	9,155	9,765	11,418	12,156
Kapchorw	6,200	7,403	8,513	9,299	7,356	8,328	8,883	10,387	11,058
Kasese	5,694	6,799	7,819	8,541	6,757	7,649	8,159	9,540	10,156
Kibaale	2,273	2,714	3,121	3,409	2,697	3,053	3,257	3,808	4,054
Kiboga	1,637	1,955	2,248	2,456	1,943	2,199	2,346	2,743	2,920
Kisoro	27,543	32,887	37,820	41,314	32,681	36,998	39,465	46,145	49,125
Kitgum	96	115	132	144	114	129	138	161	171
Kotido	-	-	-	-	-	-	-	-	-
Kumi	5,785	6,907	7,943	8,677	6,864	7,770	8,288	9,691	10,317
Lira	7,398	8,833	10,158	11,096	8,778	9,937	10,599	12,394	13,194
Luw ero	9,675	11,552	13,285	14,512	11,480	12,996	13,862	16,209	17,256
Masaka	8,841	10,556	12,139	13,260	10,490	11,875	12,667	14,811	15,767
Masindi	2,675	3,194	3,673	4,012	3,174	3,593	3,833	4,481	4,771
Mbale	12,125	14,478	16,650	18,188	14,388	16,288	17,374	20,315	21,627
Mbarara	6,050	7,224	8,308	9,076	7,179	8,127	8,669	10,136	10,791
Moroto	-	-	-	-	-	-	-	-	-
Moyo	211	252	290	317	251	284	303	354	377
Mpigi	2,539	3,032	3,487	3,809	3,013	3,411	3,638	4,254	4,529
Mubende	2,455	2,931	3,371	3,682	2,913	3,298	3,518	4,113	4,379
Mukono	1,478	1,765	2,030	2,218	1,754	1,986	2,118	2,477	2,637
Nebbi	3,037	3,626	4,170	4,555	3,603	4,079	4,351	5,087	5,416
Ntungamo	-	-	-	-	-	-	-	-	-
Pallisa	2,191	2,613	3,005	3,283	2,597	2,940	3,136	3,667	3,904
Rakai	3,460	4,131	4,751	5,190	4,105	4,648	4,958	5,797	6,172
Rukungiri	8,457	10,098	11,613	12,686	10,035	11,360	12,117	14,168	15,084
Soroti	6,453	7,705	8,861	9,680	7,657	8,668	9,246	10,811	11,509
Tororo	7,161	8,554	9,837	10,746	8,500	9,623	10,265	12,002	12,777
TOTAL	**268,001**	**320,000**	**368,002**	**402,000**	**318,000**	**360,000**	**384,000**	**449,000**	**478,000**

	Production ('000 Mt) of potatoes in Uganda 1980-1992												
Year	1980	1981	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	
Prodn ('000 Mt)	166	175	209	132	168	98	185	190	248	224	254	268	

Appendix 2: Grand Seasonal Index for Potato in Kampala Calculated from Real Retail prices

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1989									154.440	156.152	138.409	103.808
1990	99.635	99.833	123.524	122.992	116.360	117.998	127.772	126.203	140.827	116.328	117.086	98.111
1991	99.096	84.056	91.586	93.268	107.307	88.654	97.305	103.339	106.860	108.067	94.741	88.789
1992	97.275	111.215	112.520	112.076	110.847	116.171	109.123	108.546	128.059	128.361	118.953	106.696
1993	96.767	100.132	89.196	106.793	100.899	104.665	96.902	113.980	97.700	100.076	103.401	83.152
1994	79.296	86.837	92.517	106.732	97.384	97.553	101.481	102.589	108.173	109.827	99.350	114.106
1995	112.693	114.020	121.002	102.681	111.689	122.484	115.143	113.014	125.783	123.750	134.289	114.641
1996	111.685	110.010	115.476	112.930	115.826	123.873	109.805	119.056	112.986	107.609	105.335	97.359
1997	102.319	106.791	115.417	120.629	123.973	119.013	112.061	108.302	110.922	118.353	118.364	95.977
1998	98.753	117.422	126.798	158.626	185.235	173.584	166.745	151.508	155.409	154.956	164.826	124.555
1999	121.793	118.845	136.212	137.796	132.303	205.319	82.145	104.470	105.128	97.344	90.849	75.669
2000	70.757	82.941	92.981	107.338	106.481	90.522						
N	11	11	11	11	11	10	10	10	11	11	11	11
Maximum	122	119	136	159	185	205	167	152	155	156	165	125
Minimum	71	83	89	93	97	89	82	103	98	97	91	76
Mean	99.10	102.92	110.66	116.53	118.94	123.62	111.85	115.10	122.39	120.07	116.87	100.26
S.D	14.398	13.237	16.435	18.231	24.112	35.549	22.887	14.784	20.179	19.846	22.050	14.502
Variance	207.316	175.218	270.125	332.384	581.400	1263.758	523.817	218.563	326.882	278.554	483.530	232.148
t value	-0.979	-0.776	-0.154	0.183	0.238	0.293	-0.059	0.129	0.456	0.347	0.167	-0.892
GSI	99.10	102.92	110.66	116.53	118.94	123.62	111.85	115.10	122.39	120.07	116.87	100.26
GSI +1s.d	113.496	116.156	127.093	134.764	143.049	159.171	134.735	129.885	142.569	139.921	138.923	114.763
GSI -1s.d	84.699	89.682	94.222	98.301	94.824	88.072	88.961	100.317	102.211	100.229	94.823	85.758
annual mean	113.190	113.190	113.190	113.190	113.190	113.190	113.190	113.190	113.190	113.190	113.190	113.190

Annex 1: PRODUCTION REPORTS FOR UGANDA NATIONAL SEED POTATO PRODUCERS' ASSOCIATION (UNSPPA) FOR 2000A SEASON

R. Kakuhenzire and S. Tindimubona

A growing potato crop cannot be properly managed from a desk, home or pickup truck. An effective manager is in the field often throughout the season (Randal C. Rowe, 1993).

Introduction

The Uganda National Seed potato Producers' Association (UNSPPA) is a group of farmers based in Kabale and Kisoro districts with the sole aim of producing and distributing seed potato to other potato farmers in the country. During this season, the association had a membership of 19 farmers, seven women and 12 men. Four farmers are from Kisoro while the rest come from Kabale. There is need therefore to deliberately increase the number of farmers in UNSPPA from Kisoro district.

Seed Potato procurement and production reports

Among the 19 members in UNSPPA, only 11 farmers together collected 117.5 bags (9.4Mt) of seed in this season. Eight farmers did not get seed because either they did not request for seed or they had unsettled debts with the association. These farmers are: B. Kikafunda, Fokushaba V, Rubereti E., Mwongyera A. Bifakubaho Y., Byarugaba F., Tibaijuka and G. Karibushe. Two of these farmers happen to come from Kisoro district. For the 11 members who collected seed, 10 members submitted production reports equivalent to 110.5 bags (8.84 Mt) (Table 1) while one member, Mrs R. Barisigara who collected 7 bags (0.56 Mt) did not return the production report for unexplained reasons. The seed potato that is not accounted for is therefore 0.56 Mt or 7 bags. Two production reports were unsatisfactory because they did not reflect real facts on the ground; however, they were reviewed and included in the analysis. Some costs were either unrealistically low or high compared to the seed procured. This could be attributed to failure either to keep proper farm records or use or quantify family labour where one uses it. These reports were from Mr. B. Gareeba and Mrs. K. Kisiizi. The rest of the farmers' reports were adequate with Mr. S. Tindimubona submitting the most comprehensive production report, Mrs Kihumuro a good report while the remaining farmers gave just satisfactory reports. The production analysis will therefore be for ten farmers who submitted reports. These members are, Beinamaryo J., Bigirimana E., Bitarabeho F., Gareeba B., Hanyurwa F., Kanyima J., Kihumuro A., Kisiizi K., Sentaro P. and S. Tindimubona on whom analyses will be based.

Seed potato Production analysis for UNSPPA in 2000A season

Ten out of the 11 farmers who collected seed submitted production returns accounting for 110.5 bags or 8.84Mt, 94.04% of the 117.5 bags (9.4 Mt) of seed (Table 1). The ten members produced 401 bags of which 24 were damaged in the harvesting process (Table 1). The average multiplication rate was 3.6 per bag planted. The total capital input for the whole group was Sh. 9,024,900/= while the production cost per bag produced was Sh. 22,506/=. The rate of produce utilization as seed was 92.5 percent (Table 1).

Cost-benefit analysis for seed Potato producers in 2000A

The total production capita input covering seed, agro-chemicals labour and services was Sh. 9,024,900/= (Table 2). The farmers as a group made a gross profit of Sh. 12,775,000/= and a net profit of Sh.**!The Formula Not In Table**/= which was 41.6% of the invested capital. Individual net returns were all below 100% compared to the previous seasons. Two farmers, Bigirimana E, and Hanyurwa F. made losses and were unable to recover their capital (Table 2). In a period of six moths, the group earned Sh. 62,5016/= per month, excluding members who made losses (Table 2) because profits are made on individual level and are not shared. This was low compared to the previous seasons. This was partly due to the fall in the price of seed Potato and the low productivity per bag planted. To offset the low seed potato prices, average yields per unit planted should be improved. This can be achieved by increasing input in agrochemicals and improving the management practices. One of the members (Hanyurwa F.) who made a loss was a result of late planting despite early seed delivery.

Table 1: Production analysis for seed potato producers in the first season of 2000 A

Name	Bags planted	Bags harvested	Bags damaged	Bags kept as seed	Multiplication rate	Capital input	Production cost per bag	Percent utilization as seed
Beinamaryo J.	14	40	2	37	2.9	95.9	23675	92.5
Bigirimana E.	5	15	0	11	3.0	34	29440	73.3
Bitarabeho F.	15	50	1	49	3.3	118.3	20508	98.0
Gareeba B.	6	18	4	14	3.0	45	20555	77.0
Hanyurwa F.	10	20	1	19	2.0	52	18500	95.0
Kanyima J	15	77	3	74	5.1	174.1	15820	96.1
Kihumuro A.	9	30	4	26	3.3	72.3	22767	86.7
Kisiizi K.	8	42	2	39	5.3	96.3	13905	79.6
Sentaro P.	14	45	5	40	3.2	107.2	29178	88.9
Tindimubona	14.5	64	2	62	4.4	146.9	27573	96.9
Total	110.5	401	24	371	3.6	942	22506	92.5

The single most expensive input in the production process was seed comprising 54.24% of the invested capital (Table 3). Labour took 26.04% while the pesticides, fertilizers, and transport each took less than 7% of the capital investment (Table 3). The cost of seed is unproportionately high and should be reviewed in the present circumstances.

Seed potato distribution by seed producers in 2000A

The members who produced seed in 2000A season supplied seed to 43 entities covering 30 locations. These appear low figures but there were bulk supplies to local governments in Kabale, Mbarara, Mubende and Kapchorwa districts. Thus, on individual level, there was more spread distributions done by the district extension services which information cannot be accessed by UNSPPA.

Table 2: Cost-benefit analysis for seed potato producers in the first of 2000 (2000A)

Name	Bags planted	Gross return (Shs)	Capital input (Shs)	Net Profit (Shs)	Profit per month over 6 months (Shs)	Percent net profit (%)
Beinamaryo J	14	1480000	1480014	533000	88833	56.3
Bigirimana E.	5	440000	440005	-1600	0	-0.36
Bitarabeho F.	15	1470000	1470015	444600	74100	16.7
Gareeba B.	6	490000	490006	120000	20000	32.4
Hanyurwa F.	10	490000	490010	-188000	0	-27.7
Kanyima J	15	2220000	2220015	1001800	166966	82.2
Kihumuro A.	9	1040000	1040009	357000	59500	52.3
Kisiizi K.	8	1065000	1065008	481000	80166	82.4
Sentaro P.	14	1600000	1600014	287000	47833	21.9
Tindimubona	14.5	2480000	2480014.5	715300	119216	40.5
Total	110.5	12775000	12775110.5	3750100	625016	41.6

Table 3: Itemised production input for seed producers (UNSPPA) in 2000A season.

Item	Total cost (Shs)	Percent (%)
Labour	2349800	26.04
Seed	4895000	54.24
Pesticides	602000	6.67
Fertilizers	617000	6.84

Transport	394700	4.37
Empty bags	166400	1.84
Total	9024900	100.0

Table 4: Seed potato distribution by UNSPPA in 2000A season

Seed producer	Number of beneficiaries	Number of villages
Beinamaryo J.	5	4
Bigirimana E.	3	2
Bitarabeho F.	0	0
Gareeba B.	1	1
Hanyurwa F.	0	0
Kanyima J	7	3
Kihumuro A.	9	6
Kisiizi K.	9	5
Sentaro P.	2	2
Tindimubona	7	7
Total	**43**	**30**

Conclusion and recommendations

The average net return (41.6%) was low compared to the previous season. This was attributed to the low seed Potato prices and the low productivity per unit planted. Low productivity was caused by drought in few cases as sited by some farmers while in some cases, there was heavy rain and the farmers had not taken measures to effectively control late blight. Farmers who were affected by drought delayed to plant in comparison to when seed was delivered. The low return on investment was also caused by the high cost of seed, which comprised more than 50% of the production input. To improve average returns, there is need to increase productivity and have the price the seed potato reviewed. There was more national coverage than previously because of publicity and bulk purchases by district local governments and non-governmental organisations. Members who fail to submit production reports negatively affected the performance of the association. It is important that the chairman of the group should ensure that all members hand-in reports as agreed in the by-laws otherwise this practice spoils the production level and the image of the group.

Appendix 1: Ware potato growers who benefited from the informal seed system run by UNSPPA members.

Seed producer	Number of beneficiaries	Names of beneficiaries	Village/sub-county	Number of villages
Beinamaryo J	5	LCV Kabale	Various	Various
		H.Land Hotel	Rukungiri	
		Kaguta D.	Kabale M.C.	Makanga
		Kweyamba H.	Kaharo	Kaharo
		Self	Kaharo	Kaharo
Bigirimana (Mrs)	3	Buchana (Mrs)	Kisoro Town	KTC
		Mr. Bigirimana	Karumena T.C	Nyakabande
		Self	Kibaya	Nyakabande
Bitarabeho F.	0	0	0	0
Gareeba B.	1	LC3 Buhara	Buhara	Buhara
Hanyurwa F.	0	0	0	0
Kanyima J.	7	Byabagambi W.	Kakumiro	Mubende
		Tindimubona	Kashambya	Kitunga
		Mugisha S	Ndorwa	Ndorwa
		Kataryeba	Ndorwa	Ndorwa
		Byaba (Mrs)	Kamuganguzi	Ndorwa
		Tindimwebwa	Kamuganguzi	Ndorwa
Kihumuro A.	9	Ibumba W.G.	Rwamucucu	Ibumba
		Kazahura (Mrs)	Bukinda	Wacebe
		John	Rwamucucu	Nozi
		Maheru Cell	Rwamucucu	Maheru
		Mbabazi P.	Kaharo	Kaharo
		Bamanya	Kabale M.C.	Central
		Amos	Rwamucucu	Rwamucucu
		Rukashanga (Rev)	Rwamucucu	Rwamucucu
		Kihumuro (Mr)	Rwamucucu	Maheru
Kisiizi K.	9	Tindimubona	Kashambya	Kitunga
		Muyebe man	Muyebe	Muyebe
		Kasimbazi J.	Kabale MC	Central
		Kwesiga	Bukinda	Bukinda
		Kashaija Mrs.	Bukinda	Bukinda
		Kabahima Mrs	Bukinda	Bukinda
		Tibikumbya Mrs.	Kamwezi	Kamwezi
		Kissizi K.	Bukinda	Bukinda
Sentaro P.	2	Mbarara LC V	Mbarara	Mbarara
		Ntungamo LCV	Ntungamo	Ntungamo
Tindimubona S.	7	Bandaganire G.	Kashambya	Kitunga
		Betonde	Kashambya	Kashambya
		NARO - TTP	Bubale	Nyamiyaga
		LCV Kabale	Kabale	Kabale
		Kanzikwera	Mpigi	Namulonge
		Mateeka B.	Muko	Kalengyere
		Tindimubona S.	Kashambya	Kitunga

Appendix 2: Seed potato production costs by members of Uganda National Seed Potato Producers Association (UNSPPA) in 2000A

Name	Bags plted	Cost of seed	Land prep	Plantin g	Weeding	Spraying	Dehaua lming	Fertiliser	Pesticides	Guarding	Harvest ing	Empty bags	Trar ort
Beinamaryo	14	700000	40000	12000	12000	27000	0	40000	36000	0	60000	20000	0
Bigirimana	5	250000	79000	22600	25000	5000	0	0	20000	15000	20000	5000	0
Bitarabeho	15	750000	67000	14000	12000	10000	3000	60000	57000	5000	10000	21400	160
Gareeba B.	6	300000	30000	5000	10000	3000	1000	0	13000	0	3000	0	500
Hanyurwa F.	10	500000	50000	9000	3000	2500	1000	35000	34000	0	12000	0	315
Kanyima J	15	750000	65000	20000	10000	24000	10000	120000	122000	30000	8000	37000	222
Kihumuro A.	9	450000	75000	20000	8000	5000	5000	32000	18000	20000	20000	15000	150
Kisiizi K.	8	400000	45000	15000	1300 0	10000	3000	40000	20000	0	20000	18000	0
Sentaro P.	14	700000	165000	66000	40000	20000	5000	110000	72000	30000	56000	25000	240
Tindimubona	14.5	725000	179000	54000	25000	56700	10000	180000	210000	3000	16000	25000	281
Sub-total	**110.5**	**5525000**	**795000**	**237600**	**66300**	**163200**	**38000**	**617000**	**602000**	**103000**	**225000**	**166400**	**394**

Conclusions and Recommendations

There is growing commercial orientation of potato production in highland areas (Kabale, Kisoro, Mbale and Kapchorwa) that were predominantly growing the crop for home consumption. But variable climatic conditions, small plots of land and high costs of inputs have limited potato yields, thereby limiting the profits of small-scale producers.

A combination of a new, high yielding and adaptable variety (Victoria) and rapidly expanding demand in Kampala has attracted a number of districts formerly not cultivating potatoes to undertake potato farming as a cash crop hence an increase in supply.

Increasing demand matched by increasing supply from new areas of production has led to a near constant real price of potatoes in Uganda. Farmers receive 26.7% as farm-gate price of the final retail price, travelling traders get a net margin of 16.7%, wholesalers get 8% and retailers get about 12.3% of the final price. Over 36% of the price goes into the marketing transaction costs. Brokers charge high commissions for their services while the travelling traders appear to earn high margins from trading to compensate for the risks in the potato business. Eliminating brokers reduces transaction costs by more than 6% and improves earnings of the main market participants.

The demand for chips and fries is increasing in Uganda. Efficient production of quality chips and fries require use specific potato varieties as evidenced by Nandos and Steers fast food outlets that are importing potatoes from South Africa. Therefore there is need for local companies that require specific varieties of potatoes to encourage local farmers by giving them the basic seed to cultivate such varieties under contractual farming arrangement.

Traders from Uganda only buy potatoes from Rwanda when there is scarcity of supply locally. The traders sell Rwandan potatoes disguised as a local variety from Kabale. Therefore for Rwanda to efficiently break in Uganda's potato market, it is imperative that an agent be established in Uganda who will import and sell potatoes exclusively from Rwanda.

If Rwanda is interested to get a niche of the Uganda potato market, it is important for Rwanda to identify and produce quality varieties that are highly demanded in Uganda such as Uganda Rutuku 11 and Victoria. Since these varieties perform well in Kabale and Kisoro, it is certain they do well in the Rwanda.

The Potato production and marketing in Kenya and the marketing Potential for Rwanda

Draft Report

Okoboi Geofrey

International Institute of Tropical Agriculture

October 2001

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Report summary

- Potato production in Kenya that deteriorated due to drought is now increasing but has not attained the pre-drought production levels
- Potato production yields have also continuously decreased over time from 7.6Mt/Ha in 1975 to 4Mt/Ha in 2000.
- Potato marketing in Kenya is dominated by well organised travelling traders.
- Potato market in Nairobi is competitive where prices are determined by demand and supply, and quality difference while in the production areas, travelling traders fix prices.
- Chips and crisps are the principal products from potatoes that are highly consumed in Kenya's urban areas.
- A number of small-scale industries process potatoes into snacks
- Kenya imports potatoes from Tanzania to supplement local production

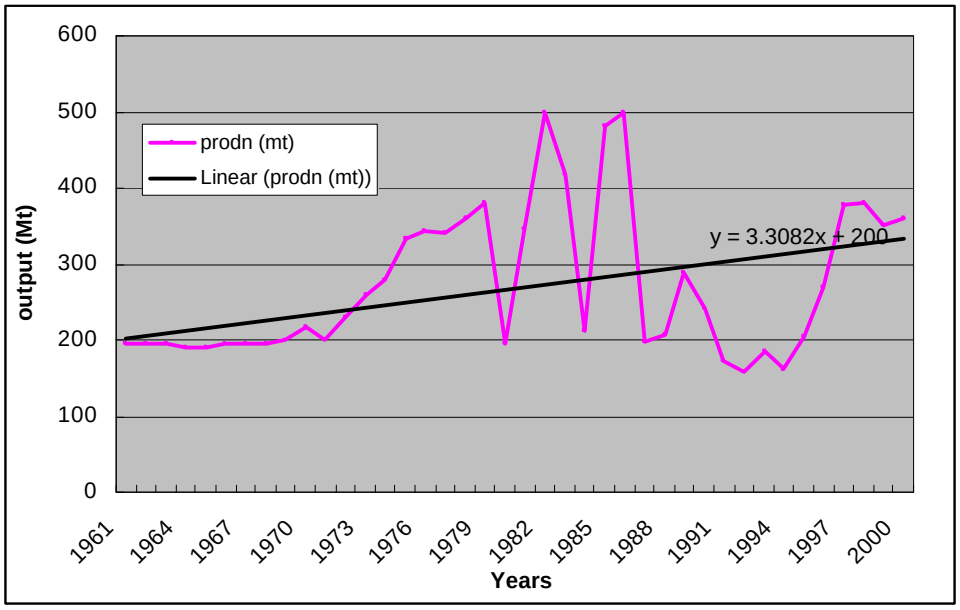
Potato production in Kenya

Most of the potato production in Kenya occurs in the highlands of central, eastern and rift valley districts in the Mau Range, Aberdare Range and the slopes of Mt. Kenya, Maps 1a & b. Other highlands such as Mt. Elgon in the western province and Taita Tabeta in the southern border region with Tanzania have also started growing potatoes on commercial basis. Therefore the main districts growing potatoes include; Meru, Kiambu, Nakuru, Kiisi, Nyandarua, Transi-Nzoia, Laikipia and Uasin Gishu.

Over 70% of potato output is said to come from highlands in Map 1a of altitude of 2,100m and above. It is in areas above 2,100m that Research stations and NGOs have also encouraged growing of potatoes for seed.

FAO statistics indicate that from 1961, production had steadily increased till 1980 when it fell back to levels of 1961, Figure 1. The output rose again sharply reaching 500,000 metric tonnes before plunging back to 200,000 Mt in 1984. After various years of unstable production, output has again steadily increased since 1995; however, it is yet reach the volume attained in 1996 (499,000 Mt).

Figure 1: Trend of production ('000 Mt), 1961-2000

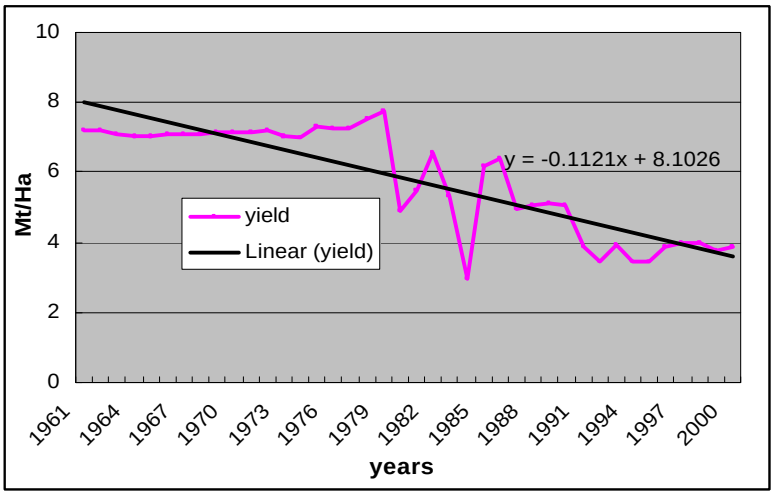


Source: FAO 1990-1998

It should be noted that FAO statistics are estimates that may differ from other statistical sources such as country governments' publications.

J.N. Kabira, the director of National Potato Research Centre-Tigoni (Kenya) whom we interviewed contended that the dramatic drop in output in 1980 and 984 and was caused by drought that greatly devastated the output of potatoes in Kenya and since then production has never recovered to the level of 1986 (~0.5 million Mt).

Figure 2: Trend of Potato Yields in Kenya: 1961-2000



Source: FAO 1990-1998

Despite the increased area (hectares) of cultivation under potatoes, potato production yields in Kenya continuously deteriorated since 1980 when the country experienced prolonged drought. Kenya attained the highest yields (7.6 Mt/Ha) of potato production in 1979 when it produced 0.36 million Mt under 48,000 Ha of cultivation. However, in 1984, the yields were below 3 Mt/Ha, and since then till year 2000 yields have averaged to 4 Mt/Ha.

This trend indicates that potato yields in Kenya have been falling at rate of 11% per year. Apart from the adverse weather conditions that have affected yields, J.N Kabira blamed the poor yields on low soil fertility due bad soil management practices hence the urgent need for farmers to use fertilizers and clean potato seed to improve their yields again

Potato varieties

Potato varieties of major economic importance in Kenya are listed in the table 1. There are also many other varieties that are location specific because of the qualities that the natives in such localities identify in the variety, table 2.

Table 1: Major potato varieties grown in Kenya

Name	Strength	Weakness	Trend of prodn
Nyayo	Early maturity excellent for chips	Suscep. LB, BW	Down
Kerr's Pink	Excellent for crisps Premium price	Suscep. LB, virus	Down
Desiree	Good taste	Low demand	Down
Mukori	LB tolerant	Late maturity	Up
Ngure	LB tolerant	No seed	Up
Tigoni	LB tolerant	Greening, BW suscep	Up
Tana Kimande	High yield	Late maturity	Up

Table 2: Other important varieties by Location

Name	Major prod zone	Strength	Weakness	Trend
Roslyn Tana	S Kinangop	Chips, LB Resist	Declining yield	Down
Kihoro	S Kinangop	LB Resist	Late maturity	Flat
New Desiree	S Kinangop	Home use	LB Suscep	Down
Asante	Laikipia	LB Resist	No seed	Up
Furaha	Laikipia	LB Resist	Poor cook quality	Up
Anett	Laikipia	Early mature	Poor cook quality	Down
Tiga-niwe	Mau Narok	LB Resist	Virus suscep	Up
Munyaka	Mau Narok	High yield	Hollow heart	Up
Comesha	Oll Kalou	High yield	Poor storage	Up
Dutch Robyjn	Molo	Market, crisps	LB Suscep	Flat
Romano	Central	Storability	Low demand	Flat

Source: NPRC-Tigoni, 2001

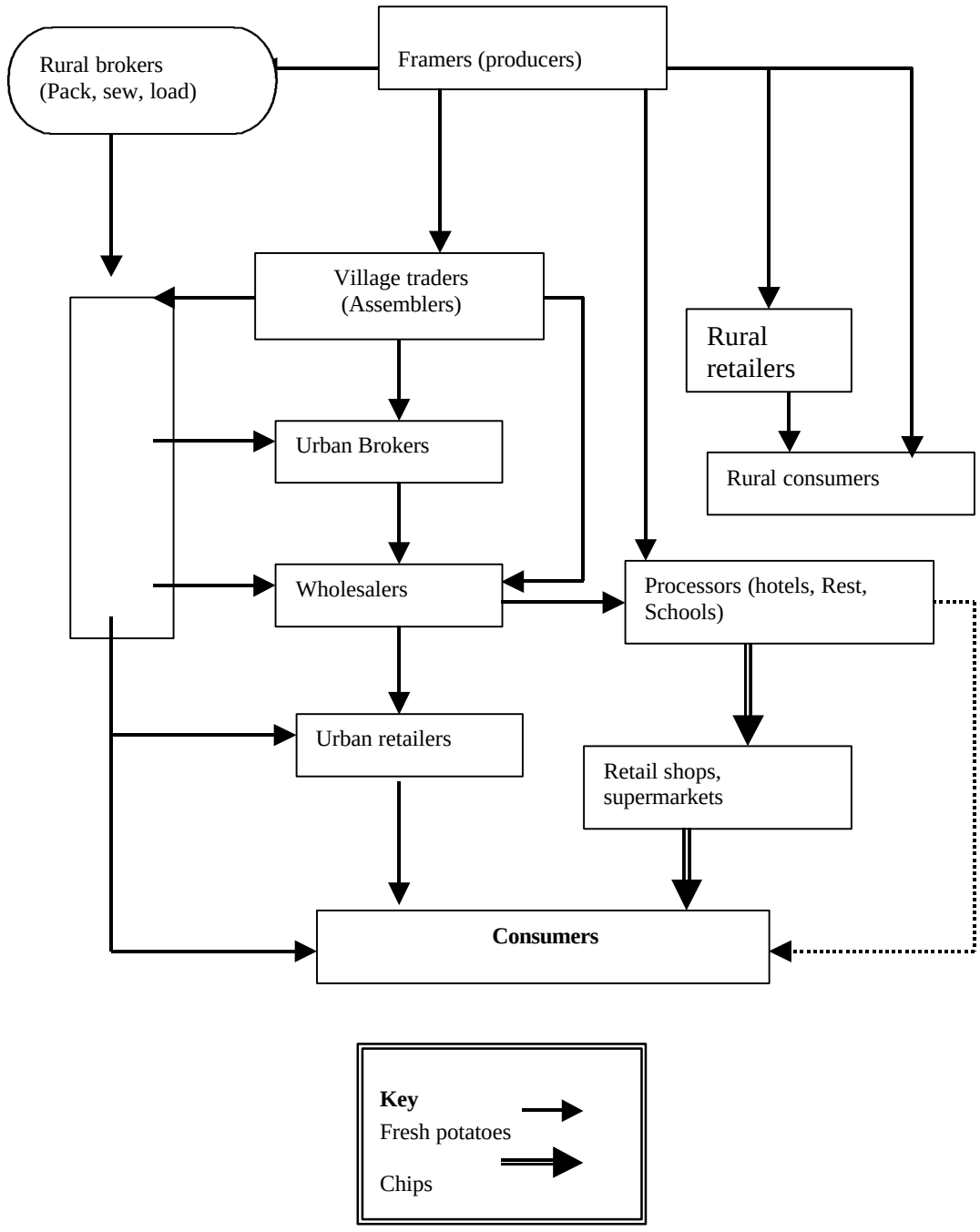
Farmers we interviewed in Tigoni, near Tigoni National potato Research Centre (NPRC) were of the view that Nyayo and Asante are currently the most popular high yielding varieties grown by farmers in their province. However J.N. Kabira, the director of NPRC-Tigoni revealed that these varieties popular because the are high yielding (100-130 bags/Ha), early maturing especially Nyayo, somewhat tolerant to late blight (LB) and the market potential is good. Asante is a variety similar to Victoria in Uganda good for making chips but Nyayo and Roslin Tana are considered excellent for chips because of their oblong tubers.

Kerr's pink and Dutch Robyjn varieties are a highly recognised for making of crisps and as such farmers of these varieties receive a premium price from processors for the rapidly growing crisps market.

Potato marketing in Kenya

Although women dominate potato cultivation in Kenya, men mainly handle the marketing beyond the farm-gate. Potato marketing in Kenya is also follows the seasonal supply pattern brought about by varied weather patterns in the provinces.
The chain of potato trade is illustrated in figure 2. The principle player in Kenya potato trade is the travelling trader who moves supplies from the production area to the market in Nairobi.

Figure 2: Kenya Irish potato sub sector market chain



Producers: Farmers from the highlands (Map 1) are the major producers of potatoes both for food and sell. Farmers in the eastern (Meru, Embu, Machakos) and Rift valley (Nakuru, Narok, Laikipia, Kajiado etc.) provinces that are near Nairobi have gone commercial as over 60% of their potato output is sold. In Nairobi wholesale markets, potatoes from Meru are distinct and sell fast. Farmers mainly sell their potatoes directly to travelling traders through village brokers. However, a few farmers do sell to rural assemblers or directly supply institutions such as hotels, schools and of recent, processing plants that require potatoes of a specific quality.

Rural brokers: rural brokers are commission agents who mostly work for travelling traders to identify sources of supply. Since they contact the farmers to get them buyers, the brokers also sometimes get a commission from the farmers or from the transaction difference betweens the farmers and traders offer prices. Brokers are common market participants in the potato marketing chain unlike in cereal trade. The reason relates to the perishability and storability of potatoes compared to grains.

Travelling traders/transporters: Travelling traders are highly organised in Kenya especially those from Nairobi. During the fieldwork for this study, farmers interviewed said that traders from Nairobi are so influential to the extent that they impose the buying price with little bargain from the farmers. Joseph Muranga, a member of Nairobi Irish potato traders and transporters, an informal but highly organised group in Wakulima market informed this study group that their group meets every day after close of the day's business to review the day's activities and to plan their course of action for the next day. In their meetings, among other issues, they agree on the price they are to pay the farmers for a given variety of potatoes and allocate the Location or Sub-location[1] member will go to buy from.

In Nairobi potato markets, intra-regional/travelling traders sell potatoes to well established permanent wholesalers through brokers. By Midday all the tonnes of potatoes are sold out. Travelling traders bringing supplies from any given district within Kenya to Nairobi are conveniently referred to as intra-regional traders in this study because there is another category of travelling traders whom we have called inter-regional traders who supply potatoes from Tanzania to Nairobi market. inter-regional traders use 40 feet trailer truck to bring potatoes from Arusha to Nairobi. The traders normally hire trucks from the drivers returning after delivering merchandise from Nairobi to Tanzania.

Wholesalers: Wholesalers in Kenya operate at two levels. There are resident market wholesalers who get stock directly from travelling traders and sell it in the same form (no sorting, repacking) to secondary wholesalers who may come from other markets. Secondary wholesalers add value to the product by sorting, grading and repacking into appropriate units of 50 kg bags. Travelling traders bring potatoes from farmers in any size of bags ranging from 100-150kgs. Wholesalers generally sell retailers and processors but secondary wholesalers can also sell to consumers.

[1] A Location is equivalent to a County and a Sub-location to Sub-county.

Processors: Kenya's fast expanding cities have greatly increased the demand for chips and crisps. All streets in Nairobi are lined with all kinds of fast food restaurants serving chips as a principal product. Small-scale food processing industries have sprung up from all corners of Nairobi to process potatoes into crisps. An interview with Jerry a small-scale food processor in East Lands, a suburb of Nairobi declared that the market for French fries (chips) and crisps is there, the raw materials are abundant and industry is booming. A visitor of Nairobi, the researcher also found chips and fries as the most convenient kind of food available for average income tourists and urban dwellers. Processors of crisps sell their products through supermarkets that are now common in all towns of Kenya. Surveys on the shelves of various supermarkets revealed more than ten different companies processing crisps.

During the fieldwork, Nandos and Steers, South African based fast food giants were found in Nairobi, Nakuru and Eldoret. This further attests to increased demand for chips by the urban population in Kenya. This study group was informed that in the rift valley province in Narok district, an entrepreneur had set up a factory to process potatoes into frozen French fries to supply the increasing demand in Nairobi and for export.

To compete favourably in saturated market, crisps processors have to be steady on quality. Good quality chips and crisps require specific potato varieties. Most of these varieties (Nyayo, Kerr's pink and Dutch Robyjin) are susceptible to Late Blight (LB) hence their output is low and sell at premium price.

Consumers: our informal survey in Nairobi found out that young working people ranked chips over all other types of food. During lunchtime consumers practically queue in most restaurants to get services. The reason is that chips are the cheapest and most convenient food in Nairobi.
Potato crisps also popular in Kenya and attract a sizeable demand from the young population.

Potato wholesale market in Nairobi

There are three major wholesale markets in Nairobi. These are Wakulima market, Agakhan market and Karenget market.
Of the three, Wakulima (Farmers) market that lies within the business centre is the busiest of all. It attracts suppliers from almost potato production provinces in the country. Wakulima market is a specialised food market opening as early 5AM and closes midday. All potato imports from Tanzania are sold in this market. This market also serves as a distribution centre to other wholesale markets and distant towns in the coastal province such as Mombasa and Malindi.

Potato prices and transaction costs.

Our survey of potato marketing in Kenya was not exhaustive due to the time factor. Therefore it was not possible to gather all the prices and transaction costs along the trading chain. Potato prices in Kenya also vary significantly according to season (supply and demand). In the market, potato prices also varied according to the quality (sorting, grading, repacking) and variety. In Wakulima and Aga-khan markets,

varieties known for making quality crisps (Dutch Robyjin and Kerr's pink) sold at a higher (premium) price than those for chips (Nyayo, Asante,Tigoni).

Table 3: Price and associated marketing costs for potatoes in Nairobi markets

Variety	**Wholesale price Kshs.**	**Unit**
Dutch Robyjin and Kerr's pink	1,400/= when plenty 1,600/= when scarce	1 bag ~ 130-150kg
Nyayo, Asante,Tigon	1,200/= when plenty 1,300/= when scarce	1 bag ~ 130-150kg
Retail price Kshs		
Dutch Robyjin and Kerr's pink	250/=	15-17kg packs
Nyayo, Asante,Tigon	200/=	15-17kg packs
Marketing costs K shs		
Transport costs	300-400/= per bag	Molo/meru-Nairobi markets
	600/= per bag	Nairobi-Mombasa
Market fees	100/=	1 bag ~ 130-150kg
Off-loading and carry	40-50/=	1 bag ~ 130-150kg

Imports and Exports

Through out our study, we did not get any information indicating potato exports from Kenya to other countries in the region. During fieldwork in Wakulima market, we got a trailer offloading potatoes from Tanzania. The traders in the market estimated that about 10 trucks offload 40 feet trailer loads of potatoes weekly from Tanzania. Traders from Nairobi travel to Arusha by bus, buy potatoes through their contacts then hire trailers returning to Nairobi after delivering merchandise to transport potatoes at subsidized fares.

This indicates that either there is a potato deficit in Nairobi market from local supply due to high demand and can only be supplemented for imports or the cost of production and transportation of potatoes from Tanzania is low and the quality is good to allow for favourable competition in the market.

Kenya's population is estimated at 30 million people with 30% residing in urban areas compared to Uganda with a population estimated at 22 million with less than 20% residing in urban areas. FAO 2000 estimates indicate that Kenya produced only 360,000 Mt in year 2000 compared to 478,000 Mt produced by Uganda. Further it is a recognised fact that Kenya has a higher per capita consumption of potato products in urban areas than Uganda. All these statistics positively illustrate that local potato production in Kenya cannot adequately support its increasing demand.

Therefore there is need for further investigation to quantify the market potential for other countries (Uganda and Rwanda) within the region to supply the lucrative potato market of Kenya in general and Nairobi in particular.

The Potato production and marketing in Tanzania and the market opportunities for Rwanda

Report highlights

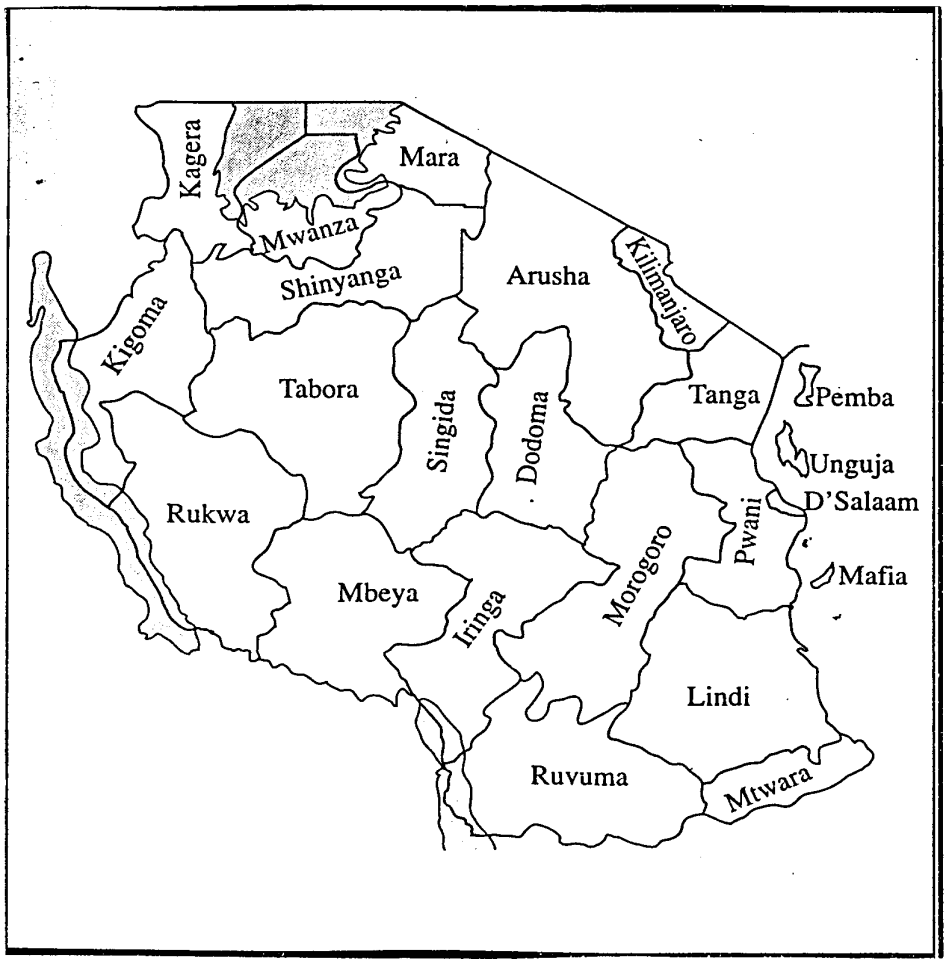
- Agro-ecological conditions do not permit potato cultivation in most parts of Northern Tanzania.
- Tanzania produces a lower tonnage of potatoes compared to its E. African neighbours, Uganda and Kenya.
- Maize grain, cassava, sorghum and millet are the major staple foods for much of the population. Potatoes are mainly consumed in urban areas in the form of chips.
- Mwanza, the commercial city of northern Tanzania gets most of its potato requirements from Kenya. Bad road network does not permit the traders to get supplies locally.
- Social insecurity along the main road to Rwanda, transport costs and potato quality are the reasons given by traders in Mwanza for not sourcing potato supplies from Rwanda.
- Dar es Salaam city gets most of its potatoes from southern Tanzania.
- Potato market both in Mwanza and Dar es Salaam is growing rapidly.
- Main form of potato consumption is as chips. Other forms are marginal.
- Comparative analysis of Rwanda's potato competitiveness on Tanzanian market indicates that it may not be competitive.

POTATO PRODUCTION AND MARKETING IN TANZANIA

General overview

The principal food crop of Tanzania is maize; covering 58% of the farmers' land cultivation of major food crops in 1998/99, table, figure 1. Households in all regions of the country (Map 1) generally cultivate maize. Another important food staple particularly in lake regions (Mwanza, Kagera and Mara) of northern Tanzania is cassava, Table 2. Together, the three lake regions accounted for over 43% hectares under cassava cultivation in 1995/96. Rice is also another important food crop in the diet of Tanzanians, followed by sweet potatoes, millet and sorghum, taking 10%, 5%, 5% and 4% of the farmers' land resource respectively.

Map of Tanzania showing political regions of the country



Table, Figure 1: Planted area for major Food crops in Tanzania, 1998/99

Crop	Planted area (Ha)
Maize	3,010,631
Rice	503,533
Sorghum	207,671
Millet	256,800
Wheat	35,812
Cassava	848,126
S/ Potatoes	266,884
Irish Potatoes	28,421
Total	5,157,878

Data source: National Bureau of statistics, Dar es Salaam, Tanzania

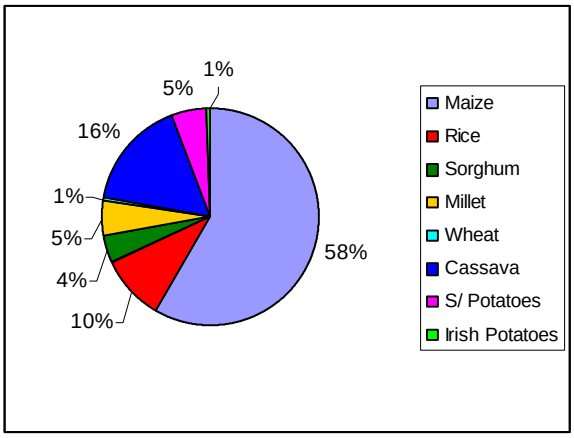


Table 2 indicates that in 1995/96 over 73% of potato cultivation was done in southern Tanzania (Iringa and Mbeya regions), 14% in Meru - Kilimanjaro (Arusha, Kilimanjaro and Tanga) belt and less than 8% in the lake regions.

Table 2: Planted area for Roots and Tubers by region in Tanzania, 1995/96

	C r o p					
Region	**Cassava**		**S/potatoes**		**Irish potatoes**	
	Area (Ha)	**% of total**	**Area (Ha)**	**% of total**	**Area (Ha)**	**% of total**
Dodoma	783.72	0.22	25.36	0.03	86.89	1.38
Arusha	969.21	0.27	73.03	0.10	262.71	4.18
Kilimanjaro	1,206.84	0.34	36.97	0.05	-	0.00
Tanga	6,785.55	1.92	110.96	0.15	639.88	10.18
Morogoro	883.74	0.25	82.87	0.11	43.12	0.69
Pwani/D'Salaam	34,527.73	9.77	496.30	0.66	-	0.00
Lindi	17,198.48	4.86	-	0.00	-	0.00
Mtwara	39,857.32	11.27	49.87	0.07	-	0.00
Ruvuma	33,103.98	9.36	1,279.05	1.71	-	0.00
Iringa	2,514.94	0.71	45.94	0.06	3,459.96	55.05
Mbeya	2,216.29	0.63	1,207.60	1.61	1,165.57	18.55
Singida	967.21	0.27	2,571.60	3.43	-	0.00
Tabora	6,529.85	1.85	5,665.35	7.56	54.82	0.87

Rukwa	12,989.44	3.67	-	0.00	-	0.00
Kigoma	34,431.44	9.74	1,689.85	2.25	14.16	0.23
Shinyanga	3,783.46	1.07	22,378.29	29.85	103.88	1.65
Kagera	45,535.71	12.88	9,839.31	13.12	402.76	6.41
Mwanza	43,319.85	12.25	22,143.02	29.54	-	0.00
Mara	65,918.02	18.65	7,273.57	9.70	51.02	0.81
Total	**353,522.76**	100	**74,968.93**	100	**6,284.78**	100.0

Although planted area have increased 4-fold between 1995 and 1999 with production estimated at 0.2 million metric tonnes as indicated in Table 3, there appear to be structural changes in potato cultivation. Southern Tanzania (Iringa and Mbeya regions) that dominated potato cultivation has reduced acreage to 58% while Meru - Kilimanjaro (Arusha, Kilimanjaro and Tanga) belt has increased to over 35% and other areas such as the lake regions have shown modest interest in potato cultivation.

Table 3: Area planted, estimated production and percentage of production by Region, 1998/99

Region	Area (Ha)	Yield (Mt/Ha)	Production (Mt)	%age of Total prod
Dodoma	284.49	7.00	1,991.43	1.00
Arusha	605.33	7.00	4,237.31	2.13
Kilimanjaro	1,136.28	7.00	7,953.96	4.00
Tanga	8,317.69	7.00	58,223.83	29.27
Morogoro	106.14	7.00	742.98	0.37
Pwani/D'Salaam	-	7.00	-	0.00
Lindi	-	7.00	-	0.00
Mtwara	-	7.00	-	0.00
Ruvuma	2,698.96	7.00	18,892.72	9.50
Iringa	11,204.45	7.00	78,431.15	39.42
Mbeya	2,558.45	7.00	17,909.15	9.00
Singida	22.58	7.00	158.06	0.08
Tabora	43.12	7.00	301.84	0.15
Rukwa	149.37	7.00	1,045.59	0.53
Kigoma	108.96	7.00	762.72	0.38
Shinyanga	37.95	7.00	265.65	0.13
Kagera	403.14	7.00	2,821.98	1.42
Mwanza	15.35	7.00	107.45	0.05
Mara	728.48	7.00	5,099.36	2.56
Total	**28,420.74**	7.00	**198,945.18**	100

Data source: National Bureau of statistics & Min. of Agric. & Co-op, Dar es Salaam, Tanzania

Although potatoes do not feature as an important food staple in the diet rural dwellers they are prominent on the menu in hotels and restaurants in most urban areas in Tanzania. The food balance sheet for Tanzania, Table 4 indicates that the food requirements of the country greatly depend on grains (maize, sorghum, millet) and cassava. The table further indicates that though Tanzania produced less than 0.8 million tonnes of potatoes (Irish and sweet potatoes), the country required only 619,000 Mt. On the row of imports the table shows that Tanzania is a net importer of grains but not roots and tubers.

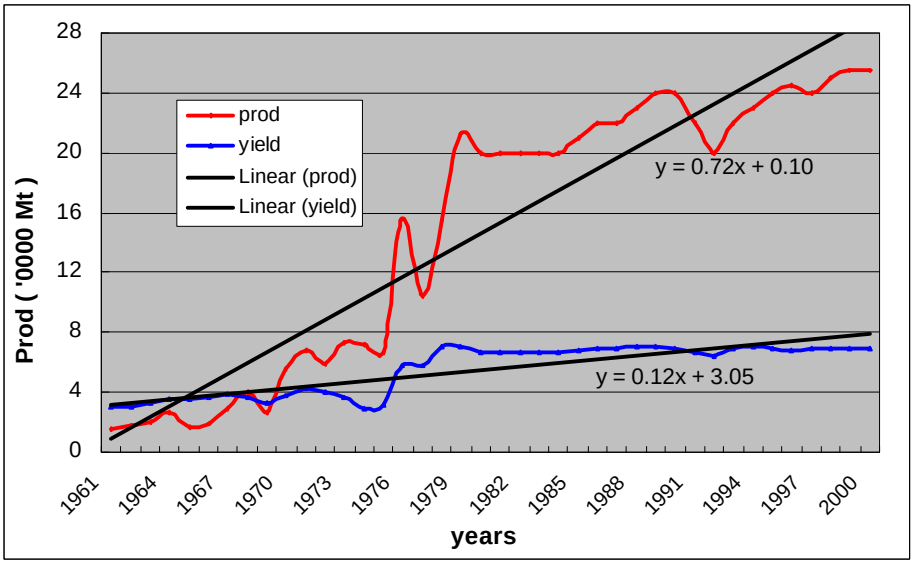
Table 4: Tanzania Food Balance Sheet, June 2000-May 2001 ('000 tonnes)

	Maize	Sorghum Millets	Rice	Wheat	Total Cereals	Pulses	Cassava	Banana	Potatoes	Non-cereal	Total Food
A. Total Domestic food availability	2,240	817	595	118	3,771	674	1,781	703	798	3,955	7,725
B.Total Annual food requirements	3,033	1,199	542	164	4,938	437	1,452	581	619	3,089	8,027
C. Domestic food Balance (A-B)	-793	-382	54	-46	-1167	237	329	121	179	866	-302
D. Commodity Cross Substitution	491	382	-54	46	866	-237	-329	-121	-179	-866	0
E. Shortfall [-] /Surplus[+] (C+D)	-302				-302						-302
F. Imports	48		139	299	486						486
F.1 Received	48		126	291	464						464
F. 1.1 Commercial	39		109	291	439						439
F.1.2 Aid	9		17		26						26
F.2 Expected			14	8	22						22
F.2.1 Commercial			14	8	22						22
F.2.2 Aid											
G. Exports	3		1	3	8	2				2	10
H. Import gap											

Source: Tanzania food security Bulletin No. 6.2001

Figure 2 shows production and yield trends of potatoes in Tanzania. While the linear production trend illustrates a remarkable increase in output, the yield has nearly remained constant implying that output increased mainly due to increased acreage under cultivation.

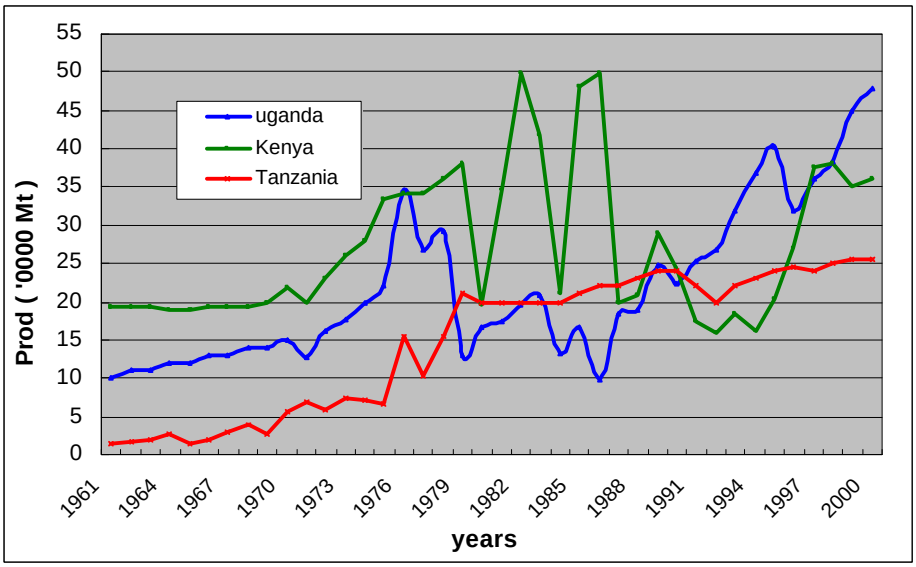
Figure 2: Potato production and yield in Tanzania, 1961 - 2000



Data source: FAO country statistics

Country comparison of production trend illustrated in Figure 3 indicates that Tanzania has perpetually lagged behind Uganda and Kenya in potato production in East Africa.

Figure 3: Trend of potato production in Uganda, Kenya and Tanzania: 1961-2000



Data source: FAO country statistics

In summary, limited agro-ecological conditions favourable for potato cultivation in Tanzania have greatly hampered production in many regions thereby influencing the food diet of the population. Very high demand for maize meal by natives both in rural and urban areas proportionately affects per capita income allocation to other foodstuffs including potatoes.

Potato marketing in Mwanza

Introduction

Mwanza is the regional political and commercial city of the Lake/Mwanza region in Northern Tanzania. It also serves a commercial centre for surrounding regions such as Shinyanga, Kagera and Mara. The city's population is estimated to be more than 0.2 million people.

Much of Mwanza and the surrounding lake regions of Kagera, Mara and Shinyanga lie between 1000-1500 metres of altitude. Most of these regions have one season (unimodal) of rain falling between November and May. However, the eastern section of Kagera region bordering Rwanda and the Bukoba area next to lake Victoria, have two rainfall seasons. The mean annual rainfall in Mwanza is below 800 mm while the mean annual temperature is above 24^{o}C. Therefore, climatic conditions of northern Tanzania in general and Mwanza in particular are unfavourable for Irish potato production.

The major economic activity of the local population in Mwanza is fishing and farming. There are five factories in the town, located along the shores of lake Victoria, processing fish for export.

The major food crops cultivated in this region are maize, cassava and sweet potatoes. In the rural areas, food staple consumption pattern closely follows the production trend; i.e. maize meal is number one food staple. Cassava and sweet potatoes are also highly consumed in the rural areas of northern Tanzania. In the urban areas, particularly Mwanza, maize meal ranks first on the food list, closely followed by rice and then Irish potatoes. Cooking bananas brought from Bukoba district are also eaten but as a snack.

Potato production

There is very little potato cultivation in Mwanza region, Tables 2 &3. Low rainfall, high temperatures, poor sandy soils and relatively low altitude, Mwanza region is clearly unfavourable for potato production. Magdalena William, an agronomist heading the legumes crop section, and also assigned to handle potato activities in Maruku agricultural research institute in Bukoba revealed that scanty production for home consumption occurs in some areas of Kagera region particularly in Karagwe and Bukoba districts with bi-modal rainfall patterns and higher altitudes of over1500m. In Mara region, Tarime district is also known to produce limited quantities for home consumption. Magdalena further said that due to its commercial insignificancy, the government of Tanzania does not fund potato research activities in the agricultural research institutes of Northern Tanzania.

Potato supply to Mwanza and neighbouring towns.

Before discovering alternative good quality and cheaper potatoes from Kenya, traders from Mwanza were sourcing their supplies from Arusha, Mbeya and occasionally from Rwanda. Traders from Mwanza now buy potatoes directly from Kenyan farmers in Nakuru district through a broker. The traders travel by bus from Mwanza to the Sirali, a border township between Tanzania and Kenya. After immigration clearance in Kenya, traders board another vehicle that takes them to Molo location in Nakuru district. Molo and Meru areas are well known for growing high quality red potatoes in Kenya just like Kabale and Kisoro is for Uganda.

The major reasons cited by Mwanza traders for not buying potatoes from Arusha and Mbeya are high transport costs and quality of potatoes. Similar reasons are given for not buying from Rwanda. It takes only one day to travel from Mwanza to Molo location in Kenya, three days from Mwanza to Mbeya and two-three days from Mwanza to Arusha-Moshi depending on the route used. If traders use a Kenya route that goes through Nairobi then Moshi before entering Arusha, they take less time – two days, but if they use an internal route passing through

Shinyanga-Nzega-Singida-Babati-Arusha, they take three days. This highlights the pathetic the roads and the general road transport system in Tanzania. Traders in Mwanza find it cheaper both in financial outlay and time to travel through a neighbouring country, Kenya in order to source potato supplies in Arusha.

Traders in Mwanza are particular about quality (dry matter content of potatoes) because it directly affects the storage period and quality of chips. Not only is the road transport system awful, the quality of potatoes from Mbeya and Arusha is not comparable to those from Molo, Kenya. The traders said that potatoes from Sanya Juu, a location on the slopes of Mt. Kilimanjaro in Moshi district is the only variety they have come across that is similar to that in Molo, Kenya. The traders in Mwanza further lleged that potatoes from Rwanda of poor quality (rot and wither easily) due to heavy use of fertilizers by farmers. Apparently the traders' revelation suggests that there is a relation between the level of fertilizer use and dry matter content of potatoes. An area that needs further research.

Increasing insecurity on the road section between Nyakanazi in Kigoma region and Nyakahura in Kagera region caused by the Hutu refugees in camps has adversely retarded trade between northern Tanzania and Rwanda. To cross that road section, all vehicles to and from Rwanda, Burundi and Democratic Republic of Congo move in a convoy escorted by the armed forces. Therefore, not only is the potato quality from Rwanda unappealing to traders from Mwanza, increased thuggery along the Isaka - Rusumo road has diminished any major prospect in potato trading between Tanzania and Rwanda.

Mwanza is the commercial hub of northern Tanzania and as far as potatoes are concerned, Mwanza town is the distribution point to other urban centres in Mwanza and Shinyanga regions. Some of the centres that buy potatoes from Mwanza market include Shinyanga, Geita, Ukerewe, Sengerema, Nzega, etc. It is Isaka trading centre, that known to get its supply of potatoes from Rwanda brought by truck drivers plying Kigali - Isaka route.

Potato wholesale market

Mwanza town has one central market called Soko Kuu (Main Market) in the midst of the town. 99% of potato wholesalers have stalls and sell potatoes through this market. Some of the wholesalers are travelling traders who source potatoes from Nakuru, Kenya or Arusha while others are sedentary traders who buy from travelling traders. Prominent travelling traders bring between 100-200 bags of potatoes from Kenya to distribute to sedentary wholesalers and a multitude of retailers in urban centres both in Mwanza and Shinyanga regions. An average potato bag from Kenya weighs 280kg.

Potato retailers are found mainly in Soko Kuu market and out lying retail market outlets. Food retail shops and supermarkets do not sell potatoes. An innovative attempt by a supermarket to retail potatoes in Mwanza town only led to a financial loss to the proprietor as buyers preferred open air markets.

The level of potato out put in Nakuru, Kenya, directly affects supply in Mwnaza region. I.e. when production is high and the price is low (~ T shs.12,000/ 280kg) in Nakuru between November and June then the supply is also high in Mwanza and the retail price is T shs.100/kg. The reverse is also true, when output is low and price is high (~ T shs.22,000/ 280kg) in Nakuru, supply is low and the retail price is high (~ T shs.250/kg) in Mwanza. Apparently, potato traders and consumers in northern Tanzania have little/no option other than getting potatoes from Kenya. Internal sources of Mbeya, Arusha and Moshi are hindered by a bad road transport system while a possible supply from Rwanda has also been disrupted by insecurity along the Isaka-Rusumo road.

The potato market of northern Tanzania is rapidly growing with a major concentration in urban areas, requiring high quality potatoes for chips. The market structure has the characteristics of a monopolistically competitive market (few sellers, many buyers, limited information) and can best be explained as that.

Potato consumption

Potato consumption in Mwanza and other urban centres in northern Tanzania is rapidly picking up as evidenced by the mushrooming chips' kiosks even in bus parks. In bus parks, potato chips with roast meat are a popular snack for travellers.

Potato chips are the principal product of potatoes that is universally consumed in all urban areas of northern Tanzania. Since potatoes are not a native staple food, very few people know and appreciate other forms in which potatoes can be prepared such as mashed or mixed with beans. However, a few people do consume potatoes in beef stew while others specially Indians make crisps for a very limited (Indians) market with no quick prospect of expansion. Therefore the major buyers of potatoes in Mwanza are hotel, restaurant and take-away operators. Other buyers particularly for household consumption are marginal.

Marketing costs and margins

Travelling and sedentary wholesalers of potatoes are few in Mwanza but it is rather surprising that these traders do not make excessive profits from their relatively monopolistic situation, table 5. While a net profit of T.shs. 2,400 per 280kg bag may seem low but given that the turn over is high, a wholesaler selling

50 bags a week X 4 weeks X 2,400 = T.shs. 480,000, ~US $ 545 net return per month.

Table 5 also show that from a gross margin of 56%, over 51% goes to wholesale marketing costs particularly on transport.

Table 5: Potato marketing costs and margins for Mwanza

	T Shs./280kg bag	% of selling price
Farmer (Molo-Kenya)		
Farm-gate price	22,000	
Wholesale travelling trader		
Purchase price (Molo-Kenya)	**22,000**	**44**
Selling price (Soko Kuu-Mz.)	50,000	
Gross margin	28,000	56
Costs		
Transport (Bus)-Mwanza -Sirali Border	3,000	6
Transport Sirali to Molo (Kenya)	2,200	4.4
Accomodation & meals - 2 days	5,000	10
Commission (Rural broker)	1,000	2
Packing bags	300	0.6
Sorting, packing & loadings	1,000	2
Transport (Lorry) Molo-Sirali	4,500	9
TZ Gov,t. Tax	2,600	5.2
Transport (Lorry) Sirali - Mwanza	4,500	9
Off-load – Mwanza (Soko Kuu)	800	1.6
Market fee	600	1.2
Over heads (stall rent, others)	100	0.2
Total costs	**25,600**	**51.2**
Net Margin	**2,400**	**4.8**
Retailer (Soko Kuu-Mz)		

Purchase price	50,000	89.3
Selling price	56,000	
Gross margin	6,000	10.7
Costs		
Miscellaneous costs (stall rent, other)	200	0.4
Total costs	**200**	**0.4**
Net Margin	**5,800**	**10.4**

Basic facts

- 1 bag of potatoes weighs 280kgs
- Retail price of potatoes in Mwanza is Tshs. 200-250/=
- Current exchange rate: K. shs.1 = T. shs.2, US $1 = T. shs.875
- Traders may take 1-5 days to get required tonnage of potatoes in Molo location of Nakuru district in Kenya. A broker plays a major role in assembling required supply
- Traders may take 1-2 days to get lorry for Sirali-Mwanza journey.
- Potatoes from Molo, Kenya are considered to be of best quality by traders both in Kenya and Tanzania.
- Traders reportedly incur negligible post harvest loss (rotting, withering) from potatoes brought from Molo compared to those brought from Arusha or Rwanda.

Although the retailers seem to get high net margin per 280kg bag sold, their turnover is low (10 bags a month) hence limiting their net turnover.

Isaka rail terminal

Isaka rail terminal is the gateway for the land locked countries of Rwanda, Burundi and eastern Congo provinces to the Tanzanian seaport of Dar es salam. The terminal has a recently built and modern inland dry port operated by Tanzania Railways Corporation. Rashid Juma is the terminal manager.

Isaka rail terminal is located in Shinyanga region, about 360 km east of Rusumo, Tanzania-Rwanda border point and 230 km south of Mwanza town. The port has attracted a number of local and international freight clearing and forwarding companies such as Transmi SDV and Walford Meadows. Two mobile companies (Mobitel and Vodacom) and Tanzania Telecommunications Corporation Ltd connect Isaka to the rest of the world and also the road out of Isaka to the Tanzania-Rwanda and Tanzania-Burundi borders is bituminised. Thus, Isaka rail terminal is well serviced with the necessary infrastructure for a modern inland port.

Rashid Juma, Isaka rail terminal manager claimed that no imports/exports of potatoes from Rwanda have ever passed through the terminal. However, he said that the terminal receives coffee exports from Rwanda and imports of petrol, grains (rice, wheat flour, maize etc.) and other manufactured goods.

Freight and handling costs

The freight and handling charges sheet of Tanzania Railways Corporation classify potatoes as general goods. Freight and handling costs are charged per wagon for any destination in Tanzania. One wagon is equivalent to 1-40 feet or 2-20 feet container(s) and 1-40 feet container can hold between 38-40 metric tonnes of cargo, equivalence table below.

Table 6: Approximate equivalent units in one wagon

Item	Equivalent	Equivalent

1 wagon	One 40 feet container	38-40 Metric tonnes
	Two 20 feet container	1-20ft equals 18-20 metric tonnes.

Table 7: Freight and handling costs of potatoes per metric tonne.

From - To	Rail transport charges per wagon by TRC, (T.Shs.).			Total per tonne 1wagon ~ 38 Mt. T. Shs.	US $ per Mt
	Freight	Handling	Total		
Isaka-Dar	1,535,520	70	1,535,590	40,410	US $ 46
Isaka-Mwanza	783,480	70	783,550	20,620	US $ 24
Charges for Kigali-Isaka below is by private transport companies and is in US dollars					
Kigali-Isaka					US $ 30-40

Exchange rate: US $ 1 = T Shs. 875.

The freight charges include government taxes such as Value Added Tax that are charged on services provided. 70 shillings charged for handling is a token fee for using a crane to transfer the containers from a truck to the rail engine. The terminal manager said that Isaka terminal does not charge customers for storage of containers in the inland port because it is the corporation's responsibility to transport the customers cargo soon after all due freight and handling charges have been settled.

Dar es Salaam Potato market

Dar es Salaam, the commercial city of Tanzania with a population estimated at over 2 million is the major market of potatoes in the country. Consumption of potato products particularly chips competes favourably with grain staples such as rice and maize meal in city hotels and restaurants. Potatoes are also increasingly used in preparation of soups. Therefore the demand for potatoes in Dar es Salaam is high and increasing.

In Kariako market (major food market in Dar es Salaam), James Mgeni, a prominent wholesaler estimated that daily, the market receives more than 130 Mt (1,000 bags of 130kg) of potatoes. Iringa and Mbeya are the major supply regions.
All the traders interviewed in Kariako market said the have never brought (imported) out Tanzania to sell in the market. Most of the traders were of view that what they get from Iringa and Mbeya was sufficient.

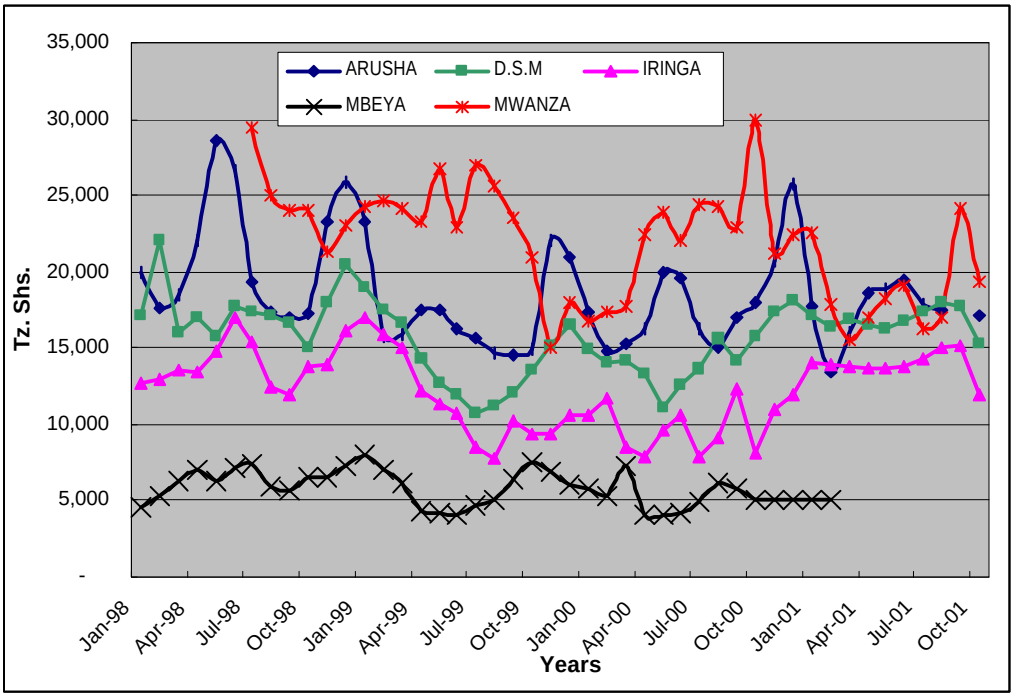
Most wholesalers in Kariako market are sedentary traders who buy their potato stock off-lorry at T. shs.15,000 from travelling traders and organised farmers. The average weight potato bags bought off-lorry is 130kg. These traders sell their potato stocks in the same form they received from the lorry, therefore very limited value is added (sorting, grading and repacking). Between December and June when production is high in southern Tanzania, the average wholesale price for 130kg bag is T.shs.15,000 while between July and October when there is low output the average price is T. shs.18,000. Retailers and processors (Hotels and restaurants) are the main buyers.

Wholesale Price trend of Potatoes in Tanzania

Figure 4 illustrates the pattern of potato wholesale price movement for the selected regions in Tanzania. Mbeya and Iringa are selected to show the price trend in the major production areas, Dar es Salaam and Mwanza to illustrate the situation for a non-production but

consumption centre while Arusha illustrates price movements in production and consumption region. The wholesale price is for 100kg bags.
Important to note is that potato prices in Mbeya and Iringa the lowest followed by Dar es Salaam. Dar es Salaam prices are relatively lower because it gets supplies from the cheap from areas of Mbeya and Iringa; and road connection is good hence reducing the transport costs. The figure shows that Mwanza prices are the highest because of high transaction cost that are involved get potatoes from the production areas (Kenya) to the market.

Figure 4: Trend of Wholesale price of potatoes in select Regions in Tanzania: 1998-2001.



Analysis of the competitiveness of Rwanda potatoes on Tanzania market.

Table 8 show estimates of the expected off-lorry price (column F) of potatoes from Rwanda on Mwanza and Dar es Salaam markets compared to the current prices (column G) in those markets. Table 8 illustrates that, setting other factors (e.g. quality) constant; Rwanda potatoes may not be very competitive on Mwanza market compared to those from Kenya particularly between November and June when it is harvest season in Kenya.
Between July to October, there is low potato output in Kenya especially in Nakuru and as a result, wholesale prices rise directly affecting the supply and price trend in Mwanza wholesale market. During this period, potato wholesale prices in Soko Kuu range from T. shs.150 – 170/kg while the retail price range is T. shs.200 – 250/kg. This is the prospective period in which Rwanda potatoes can sell in this market if the variety/quality problem is fixed and the off-lorry price of Rwanda potatoes on Mwanza market does not exceed T. shs.140/kg.

Table 8: Competition of Rwanda potatoes on Mwanza and Dar-es-Salaam markets.

	A	B	C	D	E	F	G

	Purchase price per Mt.- Kigali	Taxes at border	Transp. KGL-MZ, KGL-DAR	Misc. cost (mkt fees etc)	Total A+B+C+D	Off-lorry Price per kg Mz market	Current W/S Price per kg
Mwanza (Tz. Shs).	70,000	9,285	56,620	22,145	158,050	158	158
Dar (Tz. Shs)	70,000	9,285	76,410	22,145	178,050	178	150

Assumptions

- Wholesale/assembly price of potatoes in Kigali = RFr. 30,000/Mt, RFr. 30/kg
- Exchange rate: RFr. 1 = T. shs.2.3.
- Commodity taxes at all borders similar i.e. 280kg = T shs.2,600 at Sirali Tz-Kenya border
- Transport costs in table 3 used
- Miscellaneous costs include Soko Kuu market fee of 280kg = T shs.600 (T.shs 2,145/mt) and transport cost from Mwanza rail terminal 1Mt = T. shs.20,000

The prospect of selling Rwanda potatoes in Dar es Salaam is very minimal given the high transaction costs involved in moving a consignment from Kigali to Dar es Salaam, table 8. The framers from southern Tanzania have a high comparative advantage producing good quality potatoes for Dar es Salaam market than any other region in Tanzania.

Foodnet Project 9
Progress Report 12th April – 6th July 2001

1. An Undergraduate student from Department of Economics Moi University was hired and is currently doing data entry for the Foodnet project. He is also sharpening his enumerating skills with the retailers and the wholesalers' survey component.

2. Routine price / quantity data collection for farmers in Njabini and Retailers and Wholesalers in Nairobi was done on a weekly basis. Below is a table showing the average price received by the different market players that were active in each week

Table 1: Average weekly prices received by the different market players over the reporting period, April 12th (week 15) to July (Week 27)

Week	Farmers (Ksh/Kg)	Wholesalers (Ksh/Kg)	Retailers (Ksh/Kg)
15	2.69	5.58	8.76
16	2.94	5.37	8.77
17	2.77	5.35	8.71
18	2.83	5.92	8.83
19	2.91	5.67	9.03
20	2.93	6.19	9.02
21	3.17	6.23	9.13
22	3.07	6.49	9.37
23	3.56	6.43	9.36
24	4.07	6.59	9.85
25	4.57	6.64	9.92
26	4.32	6.45	10.92
27	4.39	6.45	10.82

3. By week 25, most of the farmers were getting Ksh 50-100 or more per bag. Some of the farmers were under the impression that brokers were also packing better ie. They packed smaller bags comprising of 7 instead of 8 buckets / debes. Prices began to fall in the next week due to what the farmers thought was over supply from another area in Nyandarua District called Ol Jorok.

4. From the farmers we interviewed, it appeared that their potatoes go to two main markets.

Nairobi

a. Wholesalers / Wholesaling which is the main market. Brokers play a great role in this channel. They determine how much to pay a farmer, the pack the bags and sew them. They then deliver the packed potatoes to the buyer at an agreed upon location. The buyer then transports them to Nairobi. Most brokers are men and we haven't seen any women in this channel.
b. However, women dominate the Agha Khan Market. The women come into the area, contact the farmer and agree on the price. These women tend to pay Ksh 100 more per bag than the brokers' prevalent price but the also do a more thorough tuber selection. They don't take damaged or very small tubers unlike brokers who take every thing. The women put their potatoes in half filled bags that they tie with a string. The women hire trucks that collect al their potatoes then they are transported to Aga Khan / City Park area.

Muranga in Central Kenya

a. The potatoes in this market are packed with leaves as sopposed to the one s in Nairobi that are packed with a sisal string net. Brokers whoa are mainly men, play a dominant role in this market.
b. Some potatoes also go to Machakos, Namanga, Wangige and other such places but this is a small market for this area.

5. The farmer receives the lowest price obtainable Ksh 1.67 per Kg while the highest received Ksh 5.71 per Kg.
6. Retailers in different markets received different prices over the reporting period.

Market	Individual Lowest Price	Highest individual Price	Lowest individual Price	Highest weekly Average	Average weekly price
City Park	3.89	20.00	13.58	15.28	14.2
Gikomba	4.52	8.13	5.12	7	6.06
Kangemi	3.50	15.63	5.03	8.49	6.26
Wangige	3.89	20.00	6.53	8.78	7.62

7. There was one retailer in the wholesale markets of Kawangware.

8. Two riot occurred during the reporting period.

Future Prospects

1. Continue routine price / quantity data collection on a weekly basis from the different market players
2. Determine more accurately the weight of the different bags being sold by farmers
3. Determine more accurately the importance of the different markets to this area or to specific sub areas.

Foodnet Project No:10

Technical Progress Report

1. Introduction

The general goal of the project is to investigate a viable business or market driven interventional strategy to enhance Irish potato production in Kenya and East Africa. Irish potatoes are second to maize in Kenya as energy food and are potentially viable Food commodities for alleviation of chronic food insecurity, associated with frequent maize crop failure due to the frequent drought conditions. The project seeks to investigate the viability of the establishment and operation of a National Potatoes storage structure similar to the National Cereals and Produce Board, but operated commercially with similar operational objectives, namely

a. Element of strategic reserve and
b. Prices stabilization for the benefit of producers, (mainly in order to increase production) but also consumers for purposes of improving consumption as an alternative to the staple maize.

The project's **deliverables** are:

a. Market research studies on potatoes
b. Pilot plant investigations on the storage and utilization quality behavior of the popular local potato varieties and
c. The economic viability analysis of establishment and operation of large-scale potato storage facilities operated under the prevailing conditions.

The market research studies are meant to illuminate the market conditions influencing Irish potatoes, and particularly determine factors that fuel price fluctuations, the role of potatoes storage and its potential as an interventional strategy in stabilizing prices, given the prevailing market dynamics. The studies on the potato cultivars are meant to examine the storability of the available popular varieties, with reference to delaying setting or elimination of spoilage characteristics for purposes of reducing wastage on storage, and conserving the utilization qualities.

The economic analysis of commercial potato storage is expected to provide data to enable develop a feasibility report on the viability of large-scale commercial potatoes storages, given the expected investment, operational costs, and different prices offered to producers for potatoes that should provide farmers with sufficient incentives to produce more potatoes.

2. The Study Design and Methodology

2.1 Market Studies On Potatoes

The activities here involved:

a. Extensive literature review meant to retrieve secondary data on national Irish Potato production, prices fluctuation and contributing factors. Data on other constraining factors to production of Irish potatoes were also examined.

b. A field study using an interview guide was carried out in Nyandarua district as well as at the market destination points in such urban centres like Nairobi, Naivasha and Nakuru. This exercise was meant to document and characterise the potatoes marketing channels as well as the agents involved, for potatoes grown in Nyandarua, a major potato growing area in Kenya. The marketing functions for various agents were examined as well as the varieties and quantities handled, supply pattern, extent of storage, wastage in the chains, prices changes in the chains and the mechanisms for prices determination by the agents. Annexure 1 indicates the instruments used to gather the market data in Nyandarua and market consumer outlets in the urban areas.

2.2 Storage Behaviour and Utilisation

The varieties under study for the storability and which are popular and traded commercially are:

Variety	*Utilisation*
Dutch (Ngorof/Bomet)	**Crisps**
Tana, Nyayo and Tigoni	Chips
Kerrs Pink (Meru)	Stew and mashing

Each variety was washed to remove soil dirt, dipped in 50 to 60 per cent ethanol solution to dry them or harden or make the skin firm, dusted with Propham, a germination suppressant and packed in small wooden crates. About 50kg were put in each crate for each variety and put in different environmentally controlled cabinets. The storage conditions set for all the five cabinets are as follows:

- Light proofed (No light, day or artificial) with black polythene sheet.
- Humidity set at 95 per cent.
- Temperature at 50 degrees F =10 degrees C.

The quality parameters that were monitored with time are:

a. Deteriorative.

- Weight loss
- Time sprouting began from the eyes and length of sprout with time
- Greening development
- Storage rot
- Shrivelling—development of softness and compression.

b. Utilisation Quality

- **Crisps—**Brown colour development on deep-frying in oil
  ---Sugars (sweetness development)
  ---Taste (Bitterness development)
- **Chips**—Colour development
  ---Sugars
  ---Oil absorption (sogginess).
- **Stew/mashing**—Flouriness check and development of translucence (mashing)
  ----Taste in comparison to the fresh control.

Annexure II shows the experimental design for the storage study

2.3 Economic Viability of Potato Storage

Data gathering towards the goal under this output has been initiated with the largest potato Storage Company in Holland, namely Netagco Tolsma B.V, which has branches in Germany, France and Russia. A questionnaire of Netagco Tolsma B.V, annexure III, indicates the basis and type of data being exchanged to facilitate compilation of relevant technical and financial data for the feasibility study.

The data obtained so far from outputs 1& 2 are proving invaluable in synthesising the necessary information for the questionnaire. Data derived from this questionnaire, plus supplementary data to be derived from a visit to the Netagco potato storage facility and

subsequent assessment of investment costs related to buildings and other fixed costs will assist in putting together the necessary economic statistics appropriate to our local situation, for the purpose of viability analysis for a commercially operated potato storage in Kenya.

3.0 Results

3.1 Potatoes Market Structure in Kenya

Table I shows production statistics for potatoes in five provinces in Kenya for the years 1997 to 2000. Central province leads both in hacterage and tonnage production accounting for 40-60%of the total national potato production. Over the four years central province produced an average of 412,700 metric tonnes per year from an average of 57,650 hectares. Rift Valley followed this with an annual average production of 228230 metric tonnes from 27,138 hectares, and Eastern province, producing annual average of 160,725 metric tonnes from 22315 hectares. In total annual potato production in Kenya ranged from 670,000 metric tonnes in 1998 and 2000 to 1,050,000 metric tonnes in 1999. Such drastic fluctuations in production can be explained by the rainfall precipitation pattern, which has been erratic, with intervening dry spells. Fluctuations in yields are also weather or rainfall dependent. In general, rainfall has been higher in the Western Kenya, and that explains why yields are on average higher in Western and Riftvalley provinces. However, production in RiftValley, Western and Nyanza provinces has remained depressed in both cultivated area and potato production despite the relatively better weather conditions. Such discrepancy can be attributed to the market. The major market for potatoes is in large urban areas such as Nairobi, Mombasa and Nakuru. Accordingly, Central and Eastern provinces benefit from being near these markets, given the high transport costs involved in transporting bulky and high moisture commodities such as potatoes.

Tables 2 a, b, c and d show the detailed potatoes production statistics for the years 1997, 1998, 1999 and 2000 respectively by districts in the provinces of Kenya, in acreage and tonnage, according to long and short rain seasons of their production.
Tables 3 a, b, c, d and e present the recorded monthly prices for red and white potato varieties for the years 1995 to 2000. Previous similar studies on potato prices by Durr and Lorenzl in 1980 lumped together potato varieties on the basis of whether red or white and found a very significant difference in prices between red or white varieties based on colour grouping. Figures1 a and b present the yearly price and production averages for the five most productive districts in potatoes in a graphic form for the period 1995-2000.

Table 1: Total Annual Potato Production and Yields In Hacterage and Metric Tonnes; 1997—2000

Province	1997		1998		1999		2000	
	Ha	MT	**Ha**	MT	Ha	MT	Ha	MT
Central	76,283	**501,454**(7)	**52,335**	395,948**(7.5)**	53,325	**475,722**(9)	**48,670**	277,729**(5.7)**
Coast	25	**250**(10)	**--**	**--**	15	**154**(10)	**--**	--
Eastern	20,172	**125,762**(6)	**14,064**	69,298**(5)**	32,718	**314,403**(9.5)	**22,310**	133,440**(6)**
R. Valley	21,666	**203,177**(9)	**22,851**	204,730**(9)**	27,591	**251,904**(9)	**36,442**	253,118**(7)**
Western	450	**4,565**(10)	**362**	3,609**(10)**	468	**5,075**(11)	**609**	5,704**(9.5)**
Total	**118,596**	**835,208(7)**	**89,612**	**673,58(7.5)**	**114,117**	**1,047,260(9)**	**108,031**	**669,991(6)**

Ha=Hectares MT=Metric tonnes Figures in brackets = Yield per hectare

Table 2a **Irish Potatoes 1997**
Annual Production

Central

District	Ha	Tons/ha	Tons
Kirinyaga	21,500	0.45	9,750
Muranga	2,380	4	10,210
Nyeri	16,450	5	83,850
Kiambu	10,834	9	94,364
Thika	5,480	5	24,934
Nyandarua	15,139	17	263,721
Maragua	4,500	3	14,625
Total	**76,283**	**7**	**501,454**

Coast

District	Ha	Tons/ha	Tons
T/Taveta	25	0.45	9,750
Total	25	4	10,210

Eastern

District	Ha	Tons/ha	Tons
Embu	1,750	10	17,100
Machakos	380	0	85
Mbeere	37	3	121
Meru	16,225	6	97,350
Nyambene	1,360	8	10,880
T/Nithi	420	1	226
Total	**20,172**	**6**	**125,762**

Rift Valley

District	Ha	Tons/ha	Tons
Baringo	54	11	602
Bomet	291	12	3,492
Kajiado	1,068	1	961
Keiyo	400	9	3,400
Kericho	850	10	8,500
Koibatek	842	12	10,104
Laikipia	3,236	9	29,124
Marakwet	1,800	9	16,200
Nakuru	7,843	8	62,117
Nandi	325	18	630
Narok	3,000	14	40,500
Samburu	8	5	40
TransMara	104	14	1,497

Trans Nzoia	460	9	4,140
Uasin Gishu	1,180	14	15,930
West Pokot	495	12	5,940
Total	21,666	**9**	**203,177**

Western

District	**Ha**	**Tons/ha**	**Tons**
Kakamega	35	9	315
M-Lugari	64	12	768
Mt. Elgon	337	10	3,370
Vihiga	14	8	112
Total	450	10	4,565

Summary

Province	**Ha**	**Tons/ha**	**Tons**
Central	76,283	7	501,454
Coast	25	10	250
Eastern	20,172	6	125,762
Rift Valley	21,666	9	203,177
Western	450	10	4,565
Total	**118,596**	**7**	**835,208**

Table 2b Irish Potatoes 1998

Central

	Long rains		**Short rains**		**total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Kirinyaga	741	5,705	975	1,072	1,716	6,777
Muranga	400	1,100	400	880	800	1,980
Nyeri	7,235	71,626	8,880	48,840	16,115	120,466
Kiambu	5,695	15,3,340	3,340	11,935	9,035	27,598
Thika	3,795	18,367	2,254	5,372	6,049	23,739
Nyandarua	13,000	185,900	3,700	24,420	16,700	210,320
Maragua	960	2,956	960	2,112	1,920	5,068
Total	**31,826**	**301,317**	**20,509**	**94,631**	**52,335**	**395,948**

Coast

	Long rains	**Short rains**	**total**

District	Ha	Tons	Ha	Tons	Ha	Tons
T/Taveta	13	130	-	-	13	130
Total	**13**	**130**	**-**	**-**	**13**	**130**

Eastern

	Long rains		Short rains		total	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Embu	750	4,500	500	40	1,250	4,540
Mbeere	14	98	-	-	14	98
Meru Central	4,600	23,000	7,250	36,250	11,850	59,250
Meru North	250	2,500	250	2,500	500	5,000
Meru South	200	160	250	250	450	410
Total	**5,814**	**30,258**	**8,250**	**39,040**	**14,064**	**69,298**

Rift Valley

	Long rains		Short rains		total	
District		**Ha**			**Tons**	**Tons**
Baringo	53	367	-	-	53	367
Bomet	150	1,200	406	3,250	556	4,450
Kajiado	700	1,830	432	1,670	1,132	3,500
Keiyo	190	3,420	90	1,620	280	5,040
Kericho	1,200	14,400	-	-	1,200	14,400
Koibatek	1,023	12,300	-	-	1,023	12,300
Laikipia	2,435	21,900	800	3,235	22.700	
Marakwet	1,800	16,200	450	4,500	2,250	20,700
Nakuru	7,864	60,195	-	-	7,864	60,195
Nandi	30	288	-	-	30	288
Narok	2,000	18,000	700	4,000	2,700	22,000
TransMara	70	700	18	180	88	880
Trans Nzoia	656	9,470	-	-	656	9,470
U/Gishu	1,204	23,800	-	-	1,204	23,800
W/Pokot	580	4,640	-	-	580	4,640
Total	**19,955**	**188,710**	**2,896**	**16,020**	**22,851**	**204,730**

Western

	Long rains		Short rains		total	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
B/Mumias	1	9	0	0	1	9
Kakamega	11	110	18	180	29	290
Malava-Lugari	53	530	-	-	53	530

Mt. Elgon	109	1,090	160	1,600	269	2,690
Vihiga	5	45	5	45	10	90
Total	**179**	**1,748**	**183**	**1,825**	**362**	**3,609**

Nairobi

	Long rains		**Short rains**		**total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
	220	862	125	177	345	1,039
Total	**220**	**862**	**125**	**177**	**345**	**1,039**

Nyanza

	Long rains		**Short rains**		**total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Gucha	34	510	25	375	59	885
Kisii	100	200	80	1,600	180	1,800
Migori	22	220	4	32	26	252
Nyamira	43	64	140	2,100	183	2,164
Total	**199**	994	249	4,107	448	5,101

Summary

	Long rains		**Short rains**		**total**	
Province	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Central	31,826	301,317	20,509	94,631	52,335	395,948
Coast	13	13	-	-	13	13
Eastern	5,814	30,258	8,250	39,040	14,064	69,298
Rift Valley	19,955	188,710	2,896	16,020	22,851	204,730
Western	179	1,784	183	1,825	362	3,609
Nairobi	220	862	125	177	345	1,039
Nyanza	199	994	249	4,107	448	5,101
Total	**58,206**	**523,938**	**32,212**	**155,800**	**90,418**	**679,738**

Table 2c Irish Potatoes 1999

Central

	Long rains		Short rains		Total	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Kirinyaga	800	7,200	900	7,560	1,700	14,760
Muranga	300	1,296	480	1,728	780	3,024
Nyeri	7,545	63,378	8,280	59,616	15,825	122,994
Kiambu	4,830	46,368	6,320	56,880	11,150	103,248
Thika	4,300	25,800	2,650	19,080	6,950	44,880
Nyandarua	12,260	147,120	2,580	30,960	14,840	178,080
Maragua	890	3,738	1,190	4,998	2,080	8,736
Total	**30,925**	**294,900**	**22,400**	**180,822**	**53,325**	**475,722**

Coast

	Long rains		Short rains		Total	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
T/Taveta	15	154	0	0	15	154
Total	**15**	**154**	**0**	**0**	**15**	**154**

Eastern

	Long rains		Short rains		Total	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Embu	750	4,500	7,500	58,500	8,250	63,000
Mbeere	20	140	650	43,050	670	43,190
Meru Central	8,750	87,500	400	3,200	9,150	90,700
Meru North	95	855	1,700	12,600	1,795	13,455
Meru South	103	2,060	12,750	102,000	12,853	134,060
Total	**9,718**	**95,055**	**23,000**	**219,350**	**32,718**	**314,405**

Rift Valley

	Long rains		Short rains		Total	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**

Baringo	23	258	0	0	23	258
Bomet	300	2,400	660	5,280	960	7,680
Buret	200	22,200	300	3,330	500	25,530
Kajiado	824	2,472	800	2,400	1,624	4,872
Keiyo	80	1,280	0	0	80	1,280
Kericho	602	4,334	90	586	692	4,920
Koibatek	836	12,540	0	0	836	12,540
Laikipia	2,000	16,000	600	4,800	2,600	20,800
Marakwet	2,000	20,000	1,460	14,600	3,460	34,600
Nakuru	6,098	40,244	4,672	30,784	10,770	71,028
Nandi	200	1,600	100	800	300	2,400
Narok	2,650	23,850	0	0	2,650	23,850
Samburu	8	0	0	0	8	0
TransMara	52	416	0	0	52	416
Trans Nzoia	564	6,768	0	0	564	6,768
U/Gishu	1,852	30,002	0	0	1,852	30,002
W/Pokot	400	3,200	220	1,760	620	4,960
Total	**18,689**	**187,564**	**8,902**	**64,340**	**27,591**	**251,904**

Western

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
B/Mumias	8	96	0	0	8	96
Bungoma	46	230	0	0	46	230
Mt. Elgon	150	1,800	200	2,400	350	4,200
Vihiga	10	100	13	130	23	230
Kakamega	6	54	10	90	16	144
Malava/Lugari	11	77	14	98	25	175
Total	**231**	**2,357**	**237**	**2,718**	**468**	**5,075**

Nairobi

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
	290	248	195	64	485	312
Total	**290**	**248**	**195**	**64**	**485**	**312**

Summary

	Long rains		**Short rains**		**Total**	
Province	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Central	30,925	294,900	22,400	180,822	53,325	475,722
Coast	15	154	0	0	15	154

Eastern	9,718	95,055	23,000	219,350	32,718	314,405
Rift Valley	18,689	187,564	8,902	64,340	27,591	251,904
Western	231	2,357	237	2,718	468	5,075
Nairobi	290	248	195	64	485	312
Total	**59,868**	**580,278**	**54,734**	**467,294**	**114,602**	**1,047,572**

Table 2d Irish Potatoes 2000

Central

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Kiambu	4,730	39,220	5,050	40,400	9,780	76,620
Kirinyaga	800	880	1,200	4,200	2000	5,080
Maragua	1,170	18	1,100	4,000	2,270	4,018
Muranga	390	195	370	370	760	565
Nyandarua	7,780	74,688	2,380	17,850	10,160	92,538
Nyeri	8,100	24,300	8,500	68,000	16,600	92,300
Thika	4,300	3,440	2,800	168	7,100	3,608
Total	**27,270**	**142,741**	**21,400**	**134,988**	**48,670**	**277,729**

Eastern

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Embu	800	800	1,200	6,000	2,000	6,800
Meru Central	7,000	7,000	8,530	85,300	15,530	92,300
Meru North	1,880	6,540	2,500	25,000	4,380	31,540
Meru South	120	0	280	2,800	400	2,800
Total	**9,800**	**14,340**	**12,510**	**119,100**	**22,310**	**133,440**

Rift Valley

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Bomet	9,000	7,200	200	1,600	9,200	8,800
Buret	150	12,000	200	20,000	350	32,000
Kajiado	750	0	900	6,300	1,650	6,300
Keiyo	200	4,000	120	1,920	320	5,920
Kericho	210	1,890	200	1,800	410	3,690
Koibatek	900	10,800	360	4,320	1,260	15,120
Laikipia	2,420	12,100	900	7,200	3,320	19,300
Marakwet	2,800	28,000	1,950	19,500	4,750	47,500
Nakuru	6,285	31,400	1,560	12,350	7,845	43,750

Nandi	227	1,816	425	3,400	652	5,216
Narok	2,500	13,750	644	3,542	3,144	17,292
Samburu	15	60	0	0	15	60
TransMara	56	560	0	0	56	560
Trans Nzoia	600	900	0	0	600	900
U/Gishu	2,320	41,760	0	0	2,320	41,760
W/Pokot	370	3,330	180	1,620	550	4,950
Total	**28,803**	**169,566**	**7,639**	**83,552**	**36,442**	**253,118**

Western

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
B/Mumias	5	50	2	20	7	70
Bungoma	41	246	0	0	41	246
Kakamega	8	64	3	24	11	88
Malava/Lugari	120	960	0	0	120	960
Mt.Elgon	214	2,996	204	1,224	418	4,220
Vihiga	6	60	6	60	12	120
Total	**394**	**4,376**	**215**	**1,328**	**609**	**5,704**

Nairobi

	Long rains		**Short rains**		**Total**	
District	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
	290	248	195	64	485	312
Total	**290**	**248**	**195**	**64**	**485**	**312**

Summary

	Long rains		**Short rains**		**Total**	
Province	**Ha**	**Tons**	**Ha**	**Tons**	**Ha**	**Tons**
Central	27,270	142,741	21,400	134,988	48,670	277,729
Eastern	9,800	14,340	12,510	119,100	22,310	133,440
Nairobi	290	248	195	64	485	312
Rift Valley	28,803	169,566	7,639	83,552	36,442	253,118
Western	394	4,376	215	1,328	609	5,704
Total	**66,557**	**331,271**	**41,959**	**339,032**	**108,516**	**670,303**

Tables 3 a, b, c, d and e present the recorded monthly prices for red and white potato varieties for the years 1995 to 2000. Previous similar studies on potato prices by Durr and Lorenzl in 1980 lumped together potato varieties on the basis of whether red or white and found a very significant difference in prices between red or white varieties

based on colour grouping. Figures 1 a and b present the yearly price and production averages for the five most productive districts in potatoes in a graphic form for the period 1995—2000.

The drastic fluctuation in production tonnage indicates the effects by drought. In 1996, production was very low due to the prolonged drought from 1995, which was followed by a bumper crop in 1997 as a result of El nino. Nyeri, one of the highest potato producer districts in the republic illustrates the production trend very well as influenced by the drought and rain patterns. The yields of 1997 came down slowly to levels in 2000, lower than those in 1996, again due to drought conditions. Examination of the prices trend over the same period shows that prices fluctuations over the years are not 100% dependent on production as would be expected. Only the pattern of change from 1999 to 2000 in both production and prices that reflect the normal inverse change relationship.

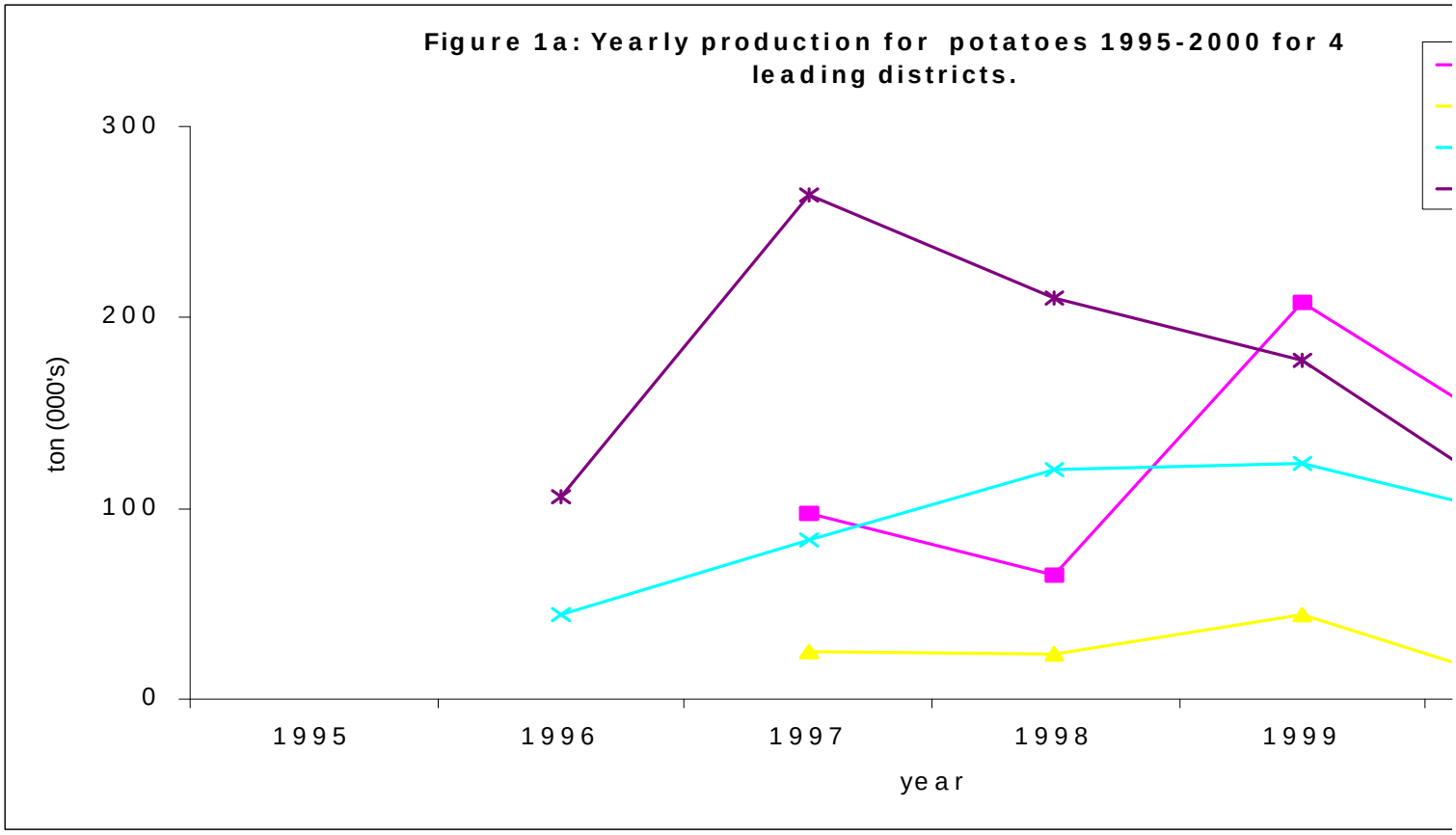


Figure 1a: Yearly production for potatoes 1995-2000 for 4 leading districts.
300
200
100
0
ton (000's)
1995
1996
1997
1998
1999
year

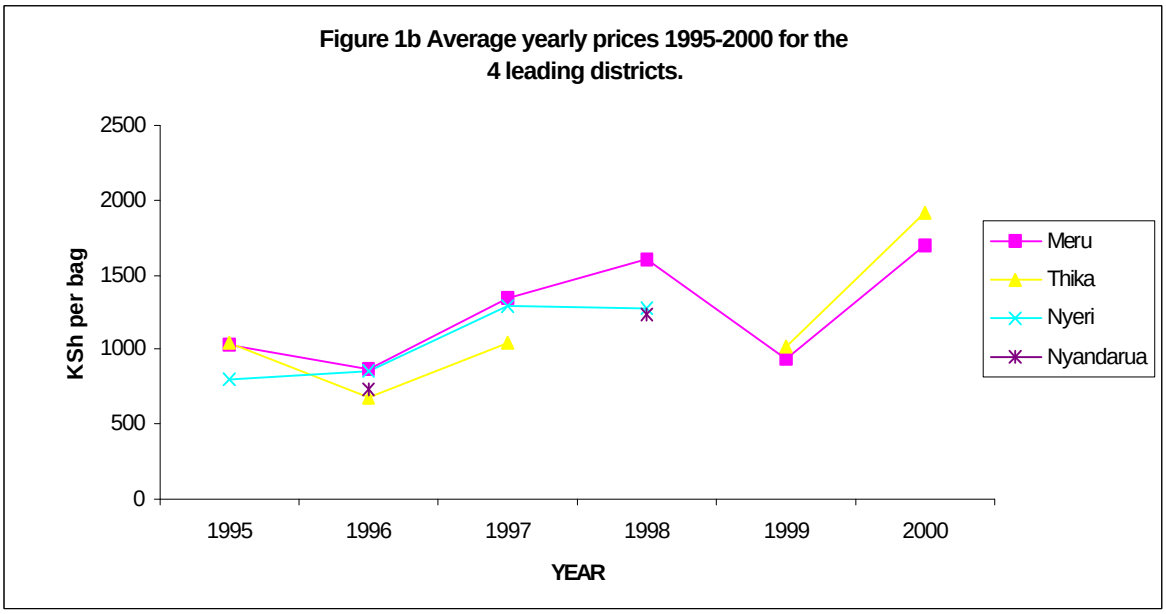


Figure 1b Average yearly prices 1995-2000 for the 4 leading districts.
2500
2000
1500
1000
500
0
KSh per bag
1995
1996
1997
1998
1999
2000
YEAR
Meru
Thika
Nyeri
Nyandarua

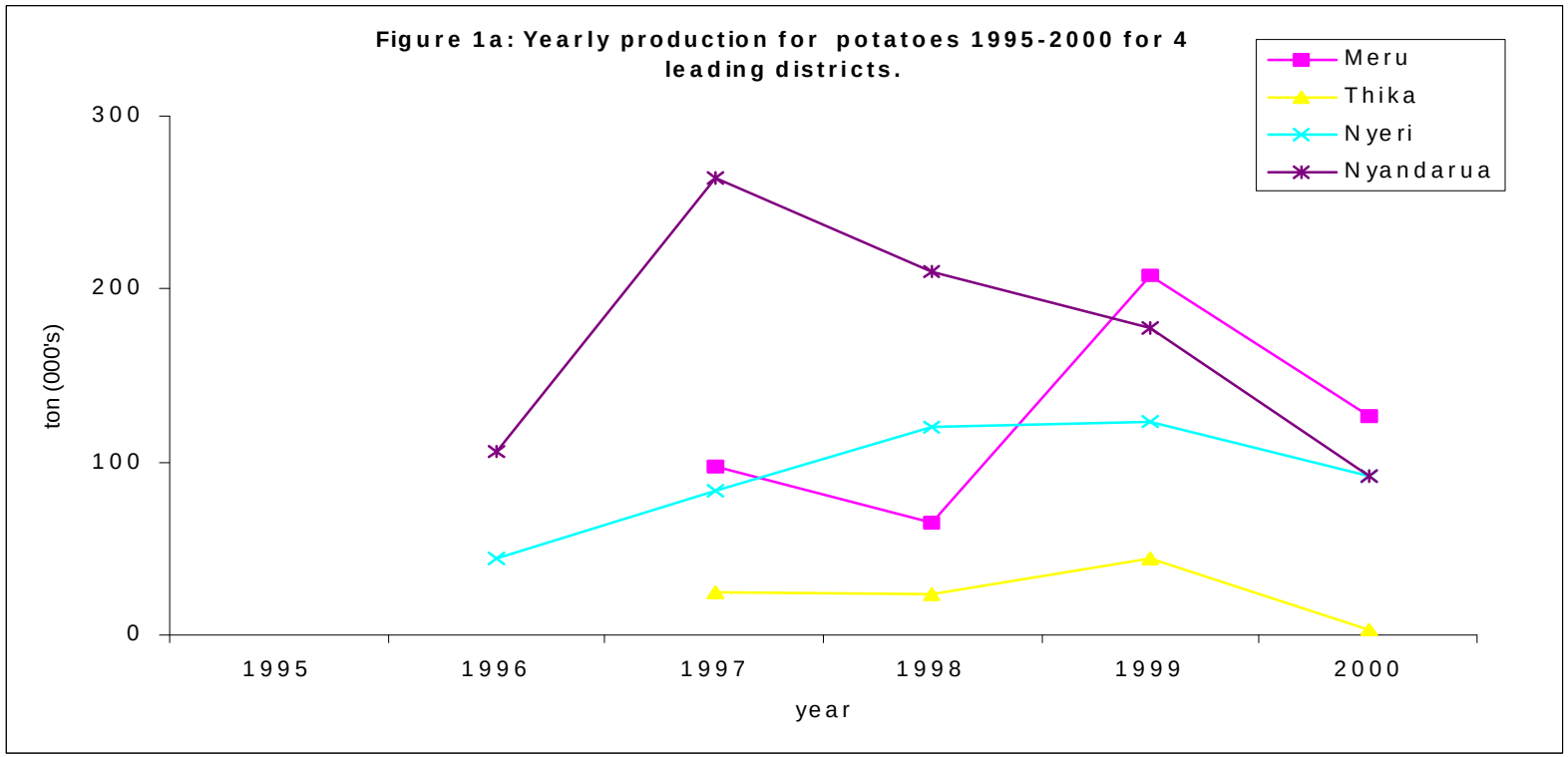


Figure 1a: Yearly production for potatoes 1995-2000 for 4 leading districts.
Meru
Thika
Nyeri
Nyandarua
300
200
100
0
ton (000's)
1995
1996
1997
1998
1999
2000
year

Figure 1b Average yearly prices 1995-2000 for the 4 leading districts.

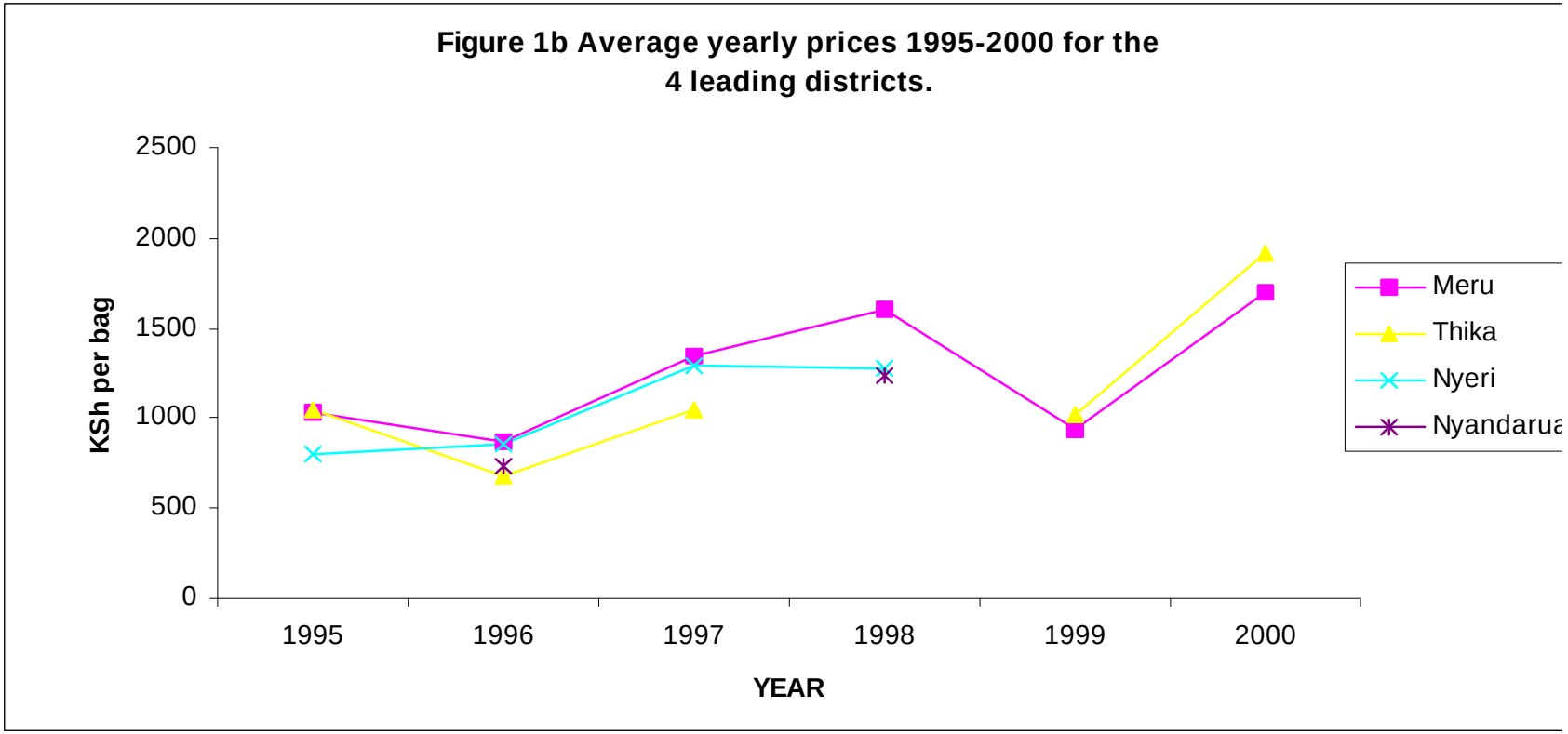
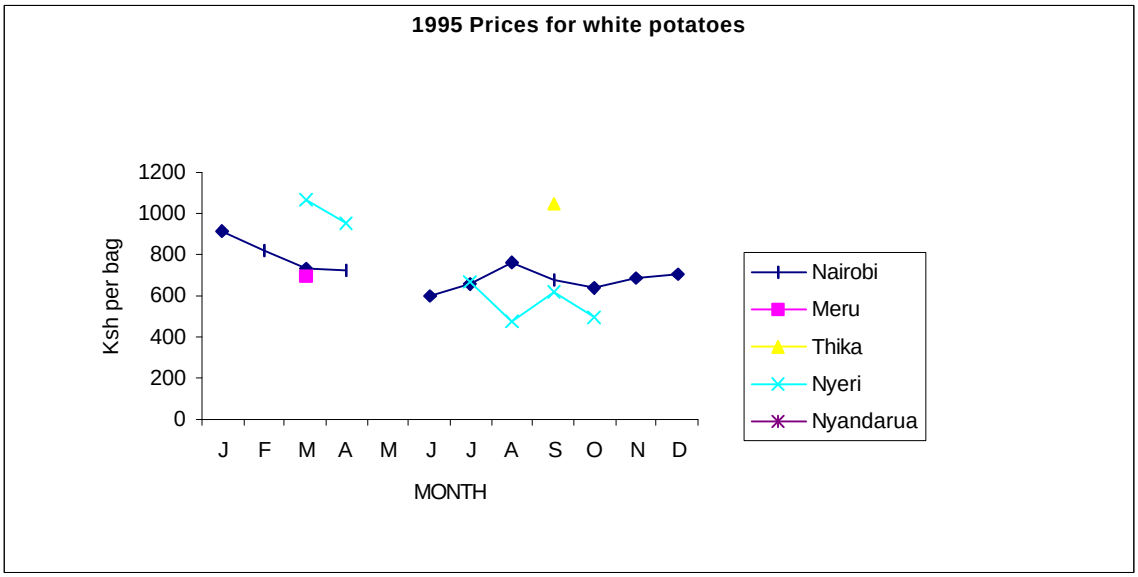


Fig 2 a, b, c, d, e and f shows the prices change trend for the white potatoes on monthly basis for the years 1995-2000 in the 5 high potato producing districts. Again typical bimodal peaked production is obvious only in 1997, and in Nairobi only in 1996 where commercial potatoes from most production areas in the country is destined. The same trend follows for the red potatoes, with an elaborate bimodal peakedness for prices in Nyeri in 1996. The mean monthly prices for the years 1995-2000 however show the typical bimodal seasonal effect, where the prices peak in the months of April and May, then dropping significantly thereafter to the lowest in August and September as potato crop is harvested following the long rains (Fig.3). Plotting the total potato production for 1995-2000 in the 4 districts versus the prices at Wakulima market Nairobi, the major destination market for potatoes from these districts, shows that droughts effects aside, the market is still distorted, indicating an imperfect market situation (Fig.4). Similar plots for potato production figures on Meru, Thika, Nyeri and Nyandarua versus prices at Wakulima market Nairobi show that only in Meru and Thika where near perfect market situation is implied, (but still with some distortional trends), where production can be said to have some direct effect on potato prices. (Fig.5 a and b).

Fig.6 shows the monthly potato buying prices in Nyandarua for the years 1997 to 2000. On the local situation, the prices indicate very much the typical production seasonality effect, with some significant distortional effect. The data for 1997 were unfortunately not all available, but as usual prices started high increasing to 1650/= per bag in March. The El nino rains set in during 1997 and it would be interesting to find out how the prices trends were affected by El nino. It has been established that despite improved potatoes supply during rainy season, producers prices are known to decline while those at the market outlets steeply increase due to muddy roads, which make it impossible to ferry the potatoes to the market. In 1998 prices remained above shs.700/= through out the year mainly because of the shortage in the country due to drought, and the same trend was maintained in 1999 except after June 1999 when prices dropped drastically to below shs.500/= until October. After October prices increased moderately, to December 1999, then dipping to below 500/= only to increase almost 4 fold in April, and remained so until after July 2000. These erratic and rather unpredictable prices fluctuations appear to be influenced not only by the drought conditions but also the potato production and supply from other parts of the country including the effect of road conditions in rainy seasons. The potato supply from different parts of the country to particularly Nairobi plus other towns such as Nakuru, Naivasha, Thika and Nyeri appear to be the main price setters for buying prices in Nyandarua and other major potato growing areas.

Figure 2 a Prices fluctuations 1995/96 - White potatoes



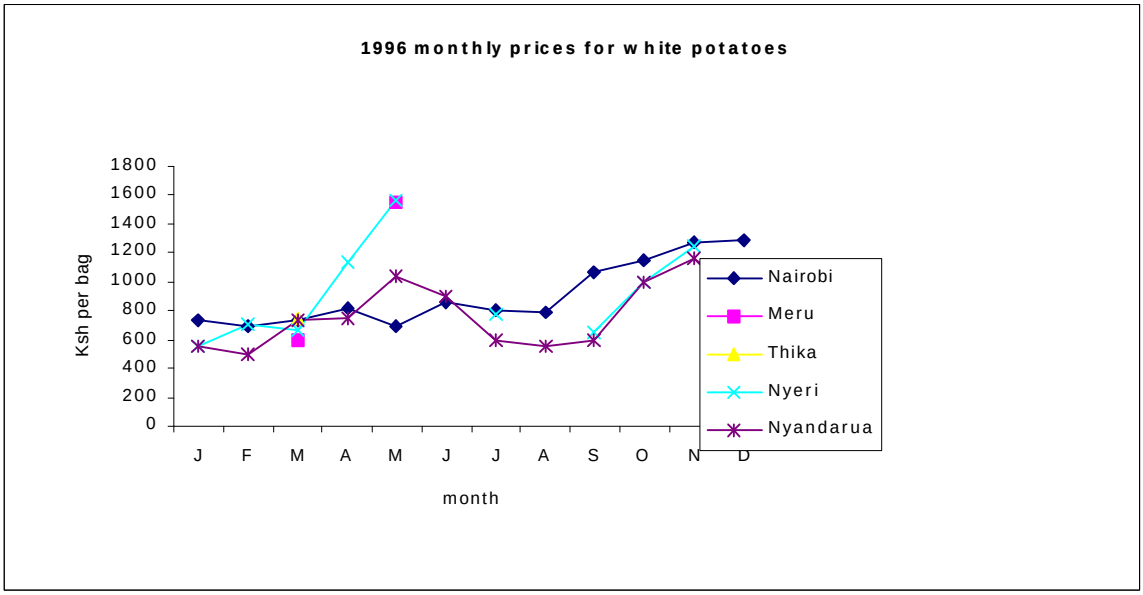
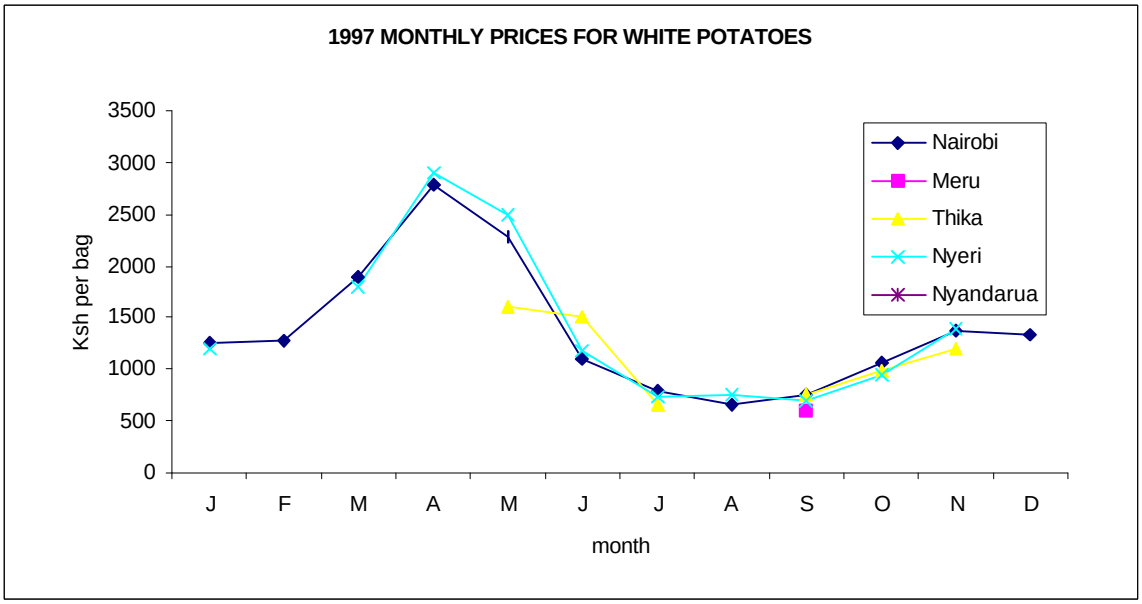


Figure 2b Price fluctuations 1997/98 - White potatoes



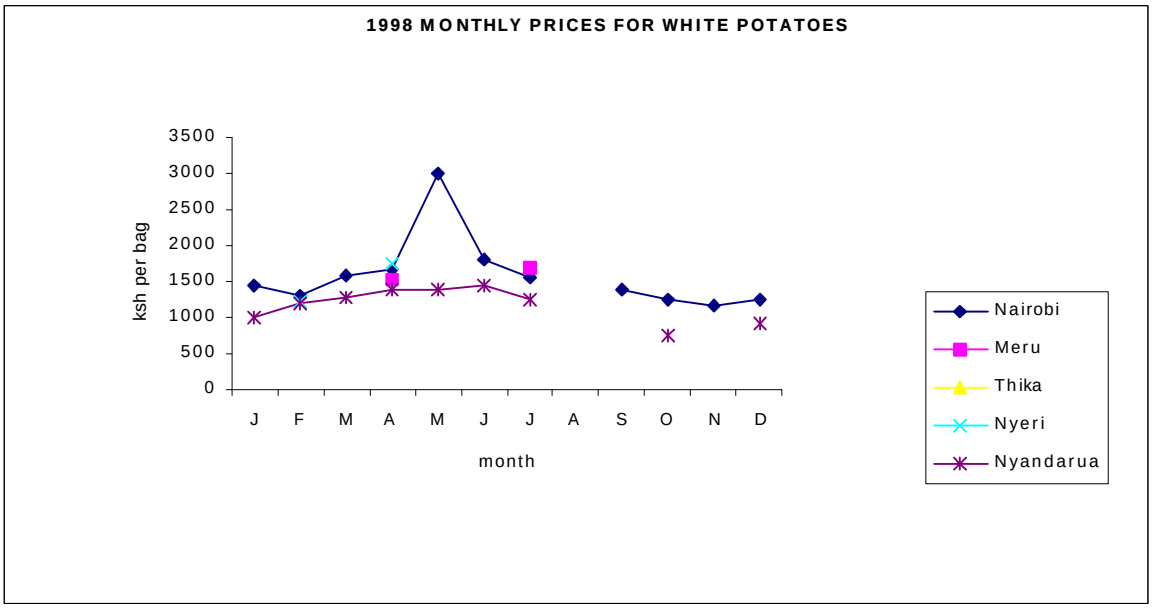
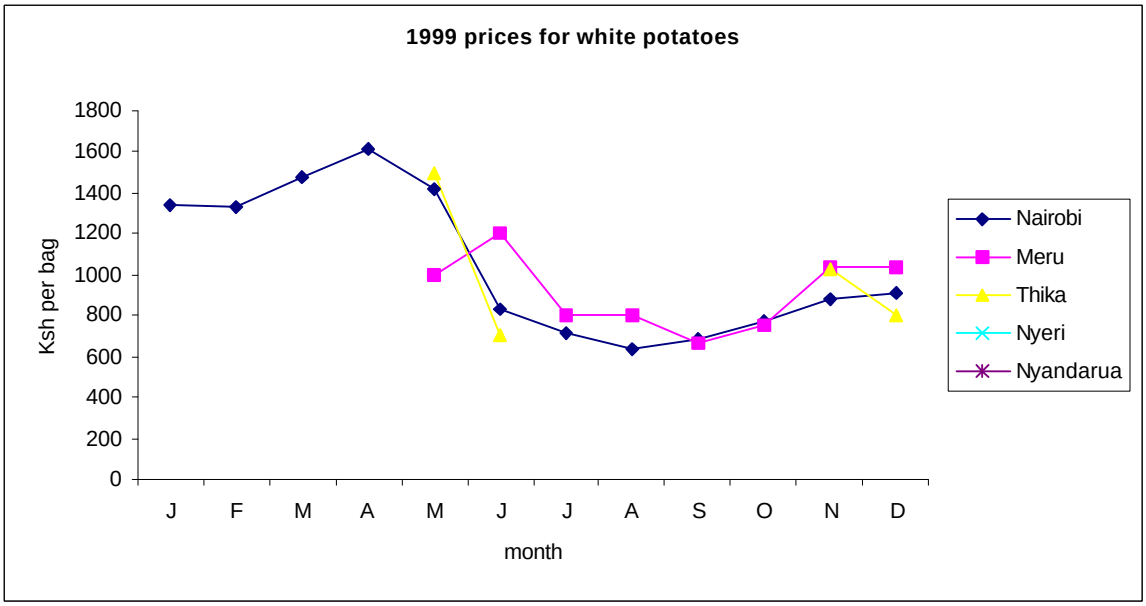


Figure 2c Price Fluctuations 1999/2000- White potatoes



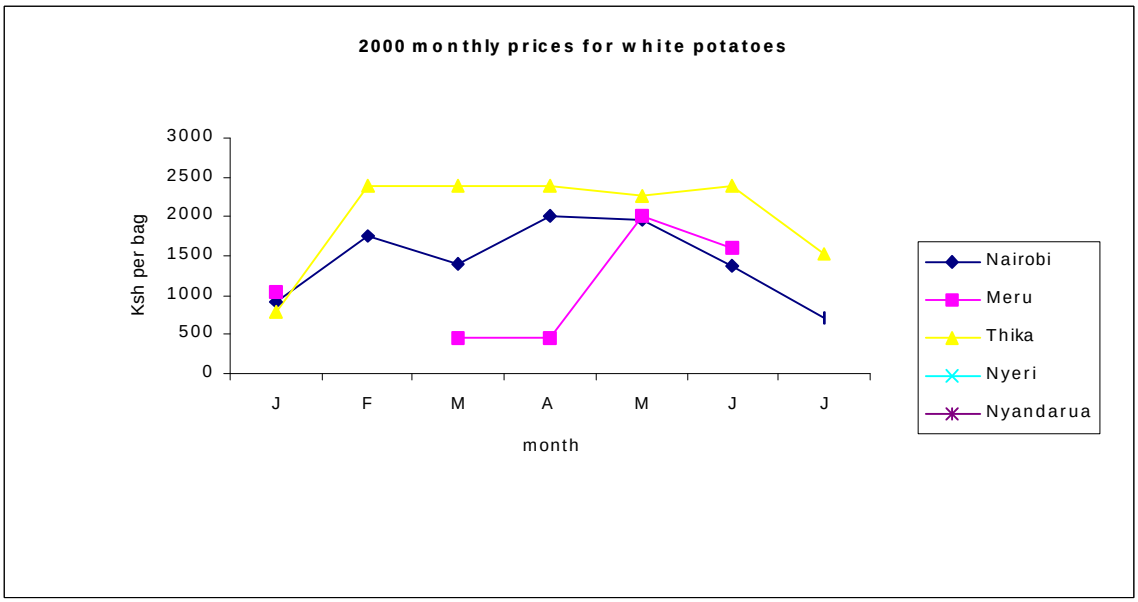
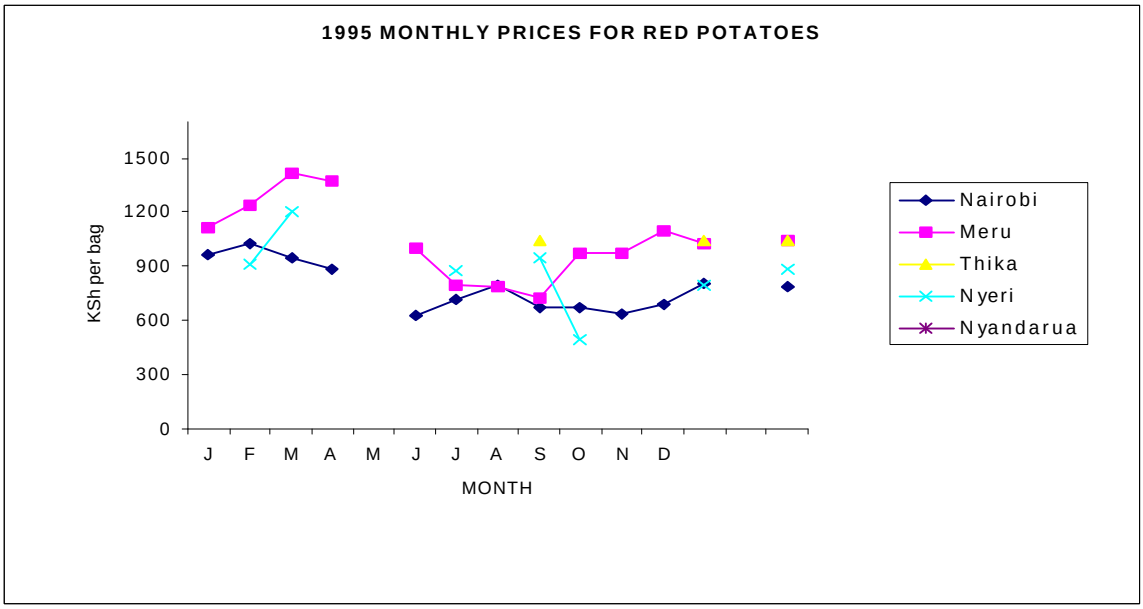


Figure 2 d Price fluctuations 1995-96 red potatoes



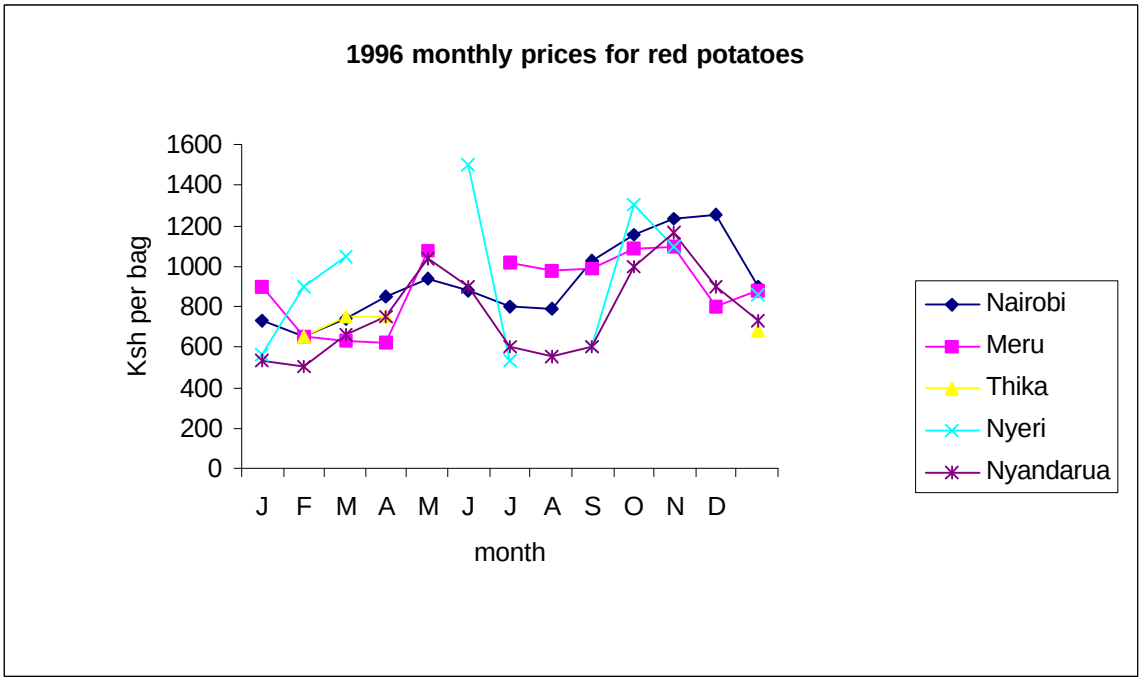
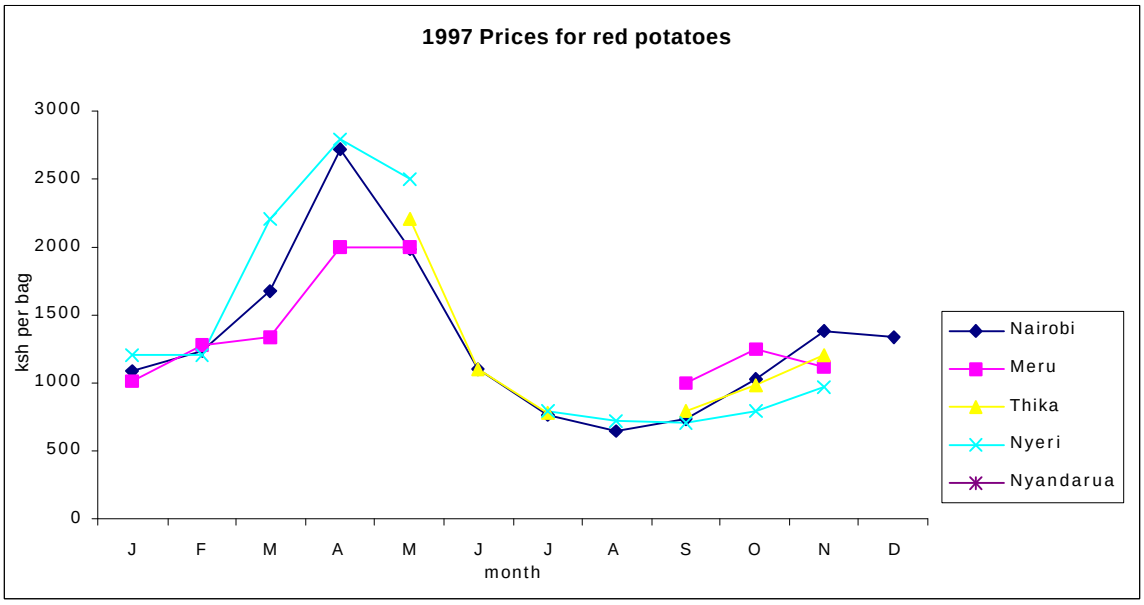


Figure 2 e price fluctuations 1997-98 - red potatoes


1997 Prices for red potatoes
3000
2500
2000
1500
1000
500
0
ksh per bag
J
F
M
A
M
J
J
A
S
O
N
D
month
Nairobi
Meru
Thika
Nyeri
Nyandarua

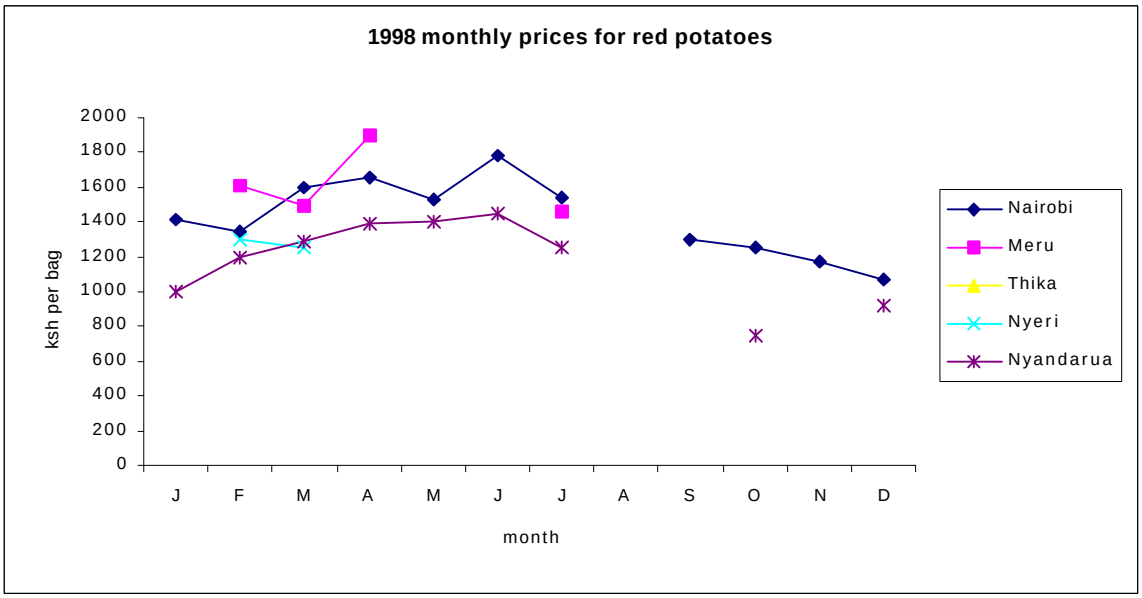

1998 monthly prices for red potatoes
2000
1800
1600
1400
1200
1000
800
600
400
200
0
ksh per bag
J
F
M
A
M
J
J
A
S
O
N
D
month
Nairobi
Meru
Thika
Nyeri
Nyandarua

Figure 2f Price fluctuations 1999/2000 - red potatoes

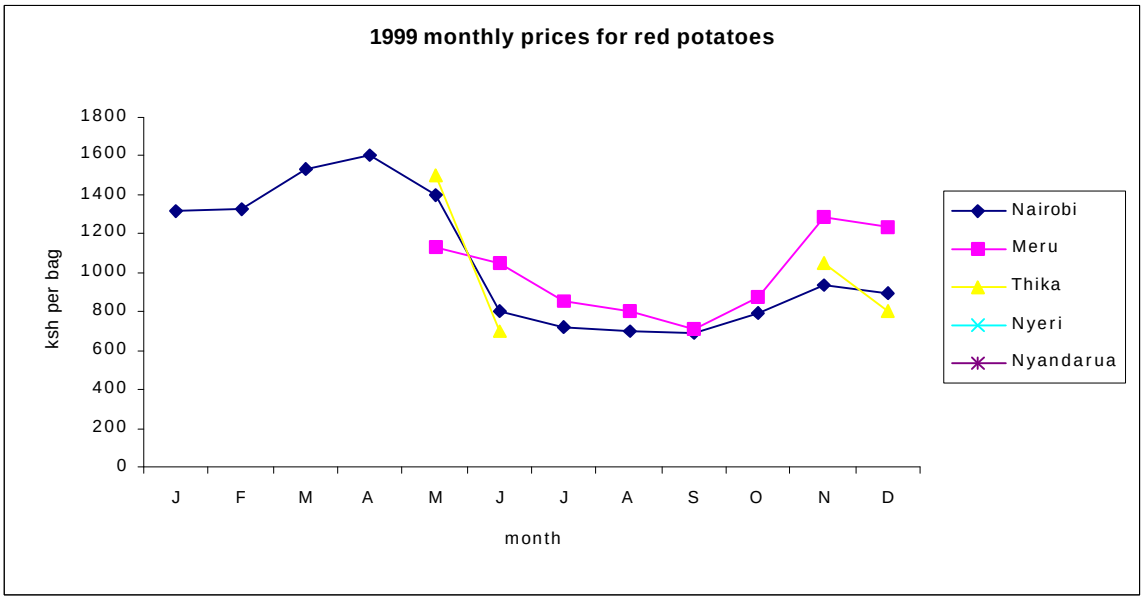


Figure 3: Mean monthly prices fluctuations 1995-2000

Figure 4: Total production in the 4 districts Vs prices at Wakulima

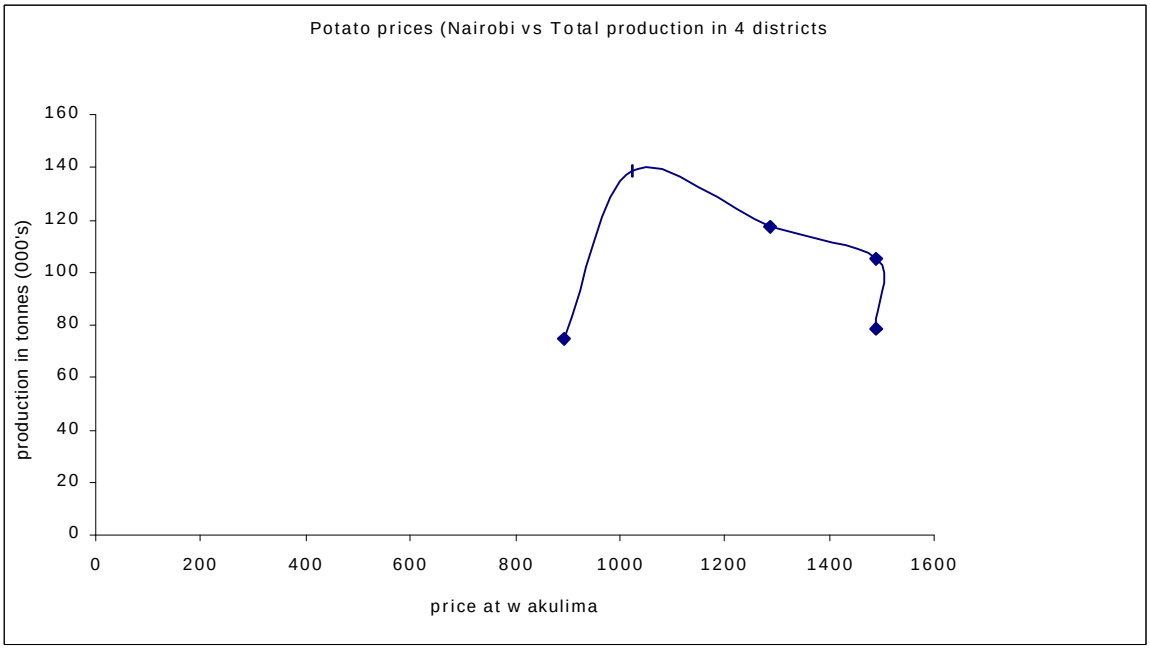
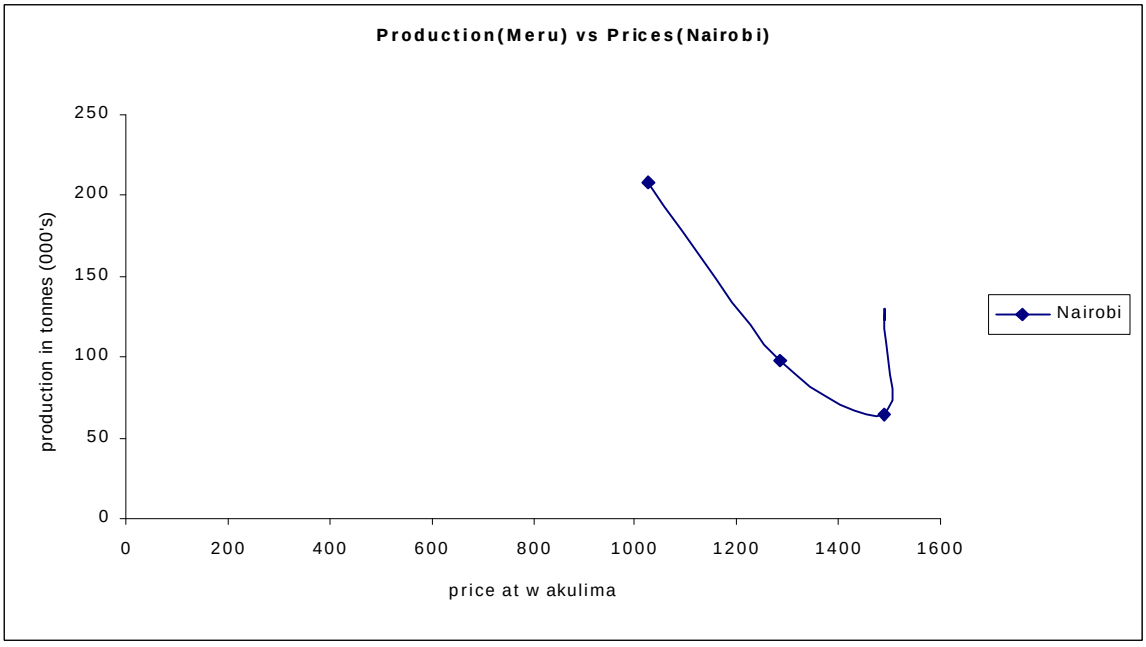


Figure 5a Potatoes prices in Nairobi vs Production in Meru and Thika



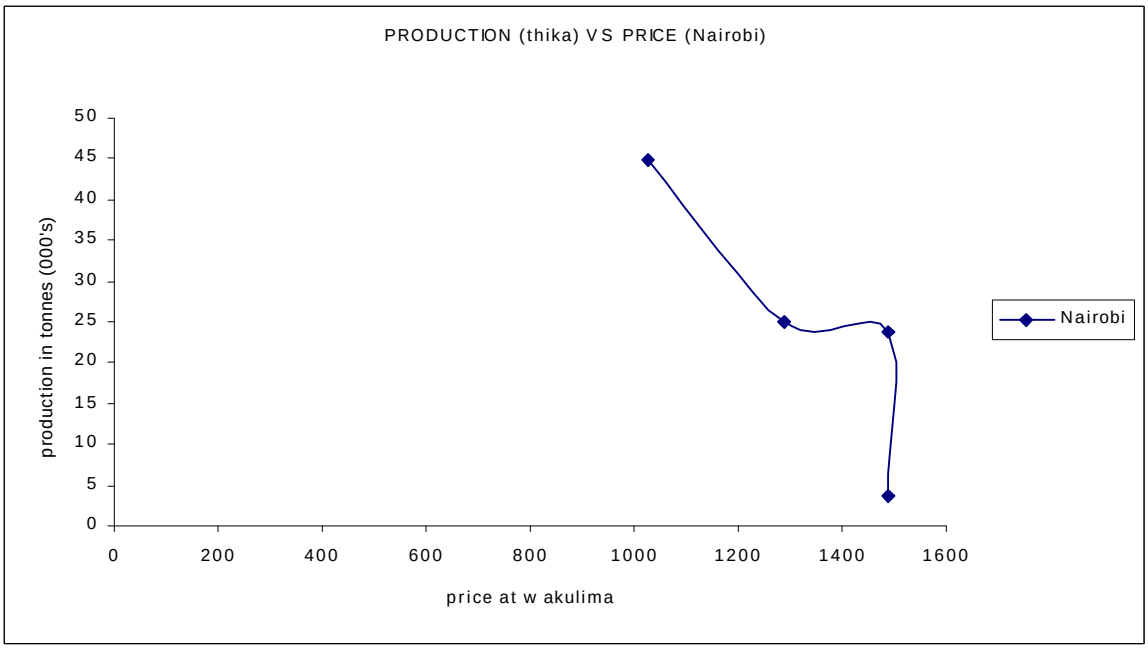
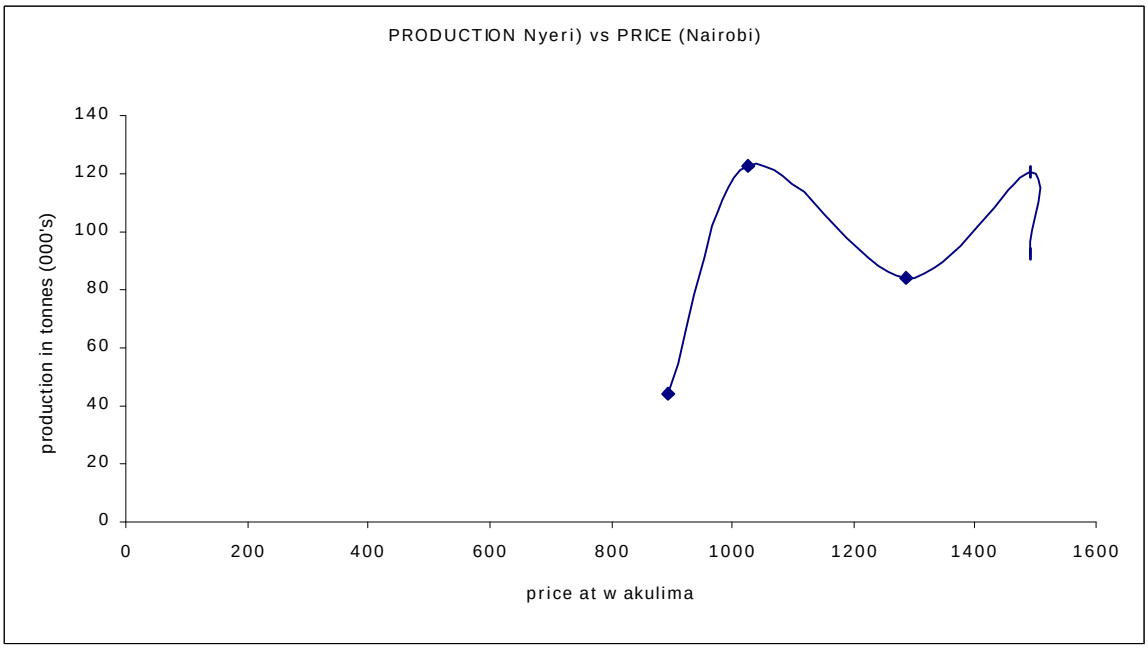
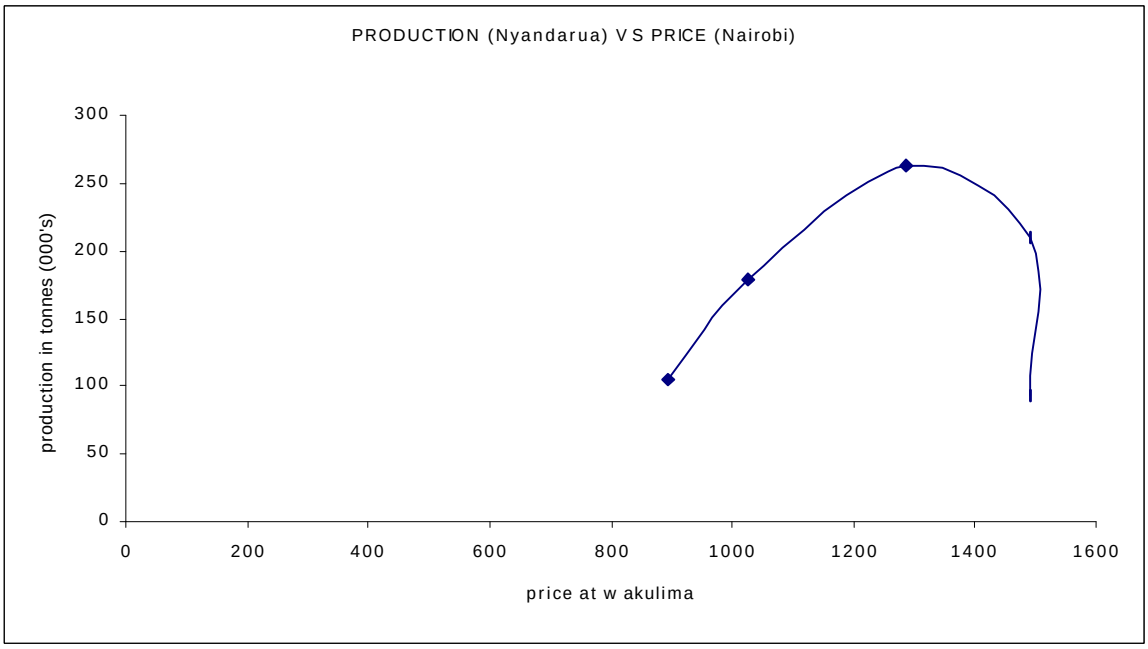


Figure 5b Potato prices in Nairobi vs production in Nyeri and Nyandarua




PRODUCTION (Nyandarua) V S PRICE (Nairobi)
production in tonnes (000's)
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
1400
1600
price at w akulima

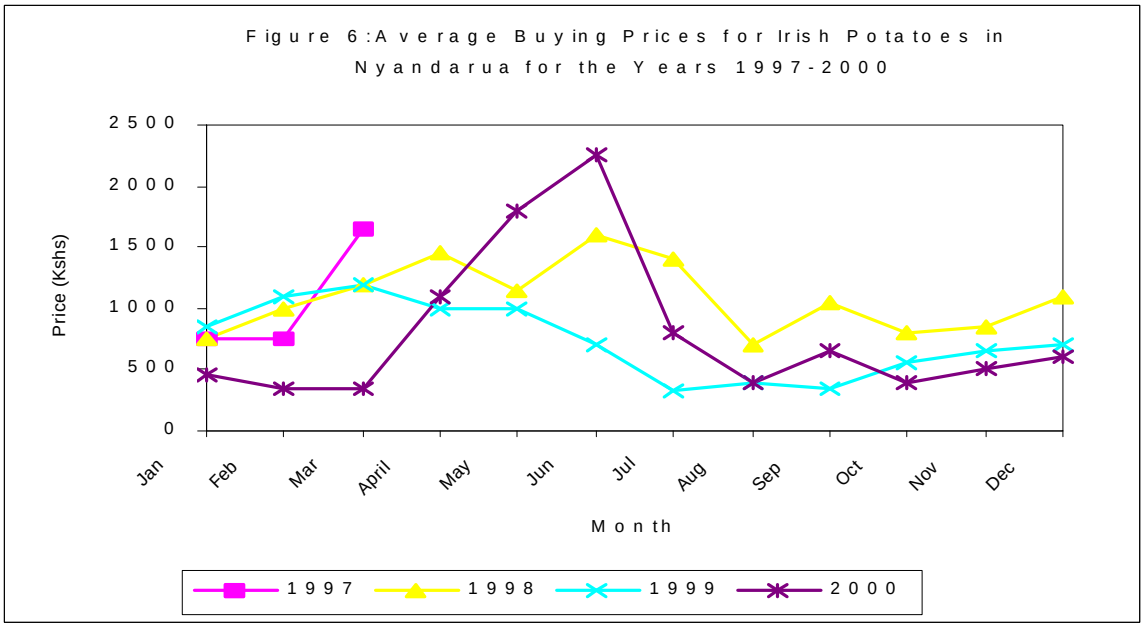


Figure 6: Average buying prices for Irish Potatoes in Nyandarua for the years 1997-2000

The implications of these findings are:

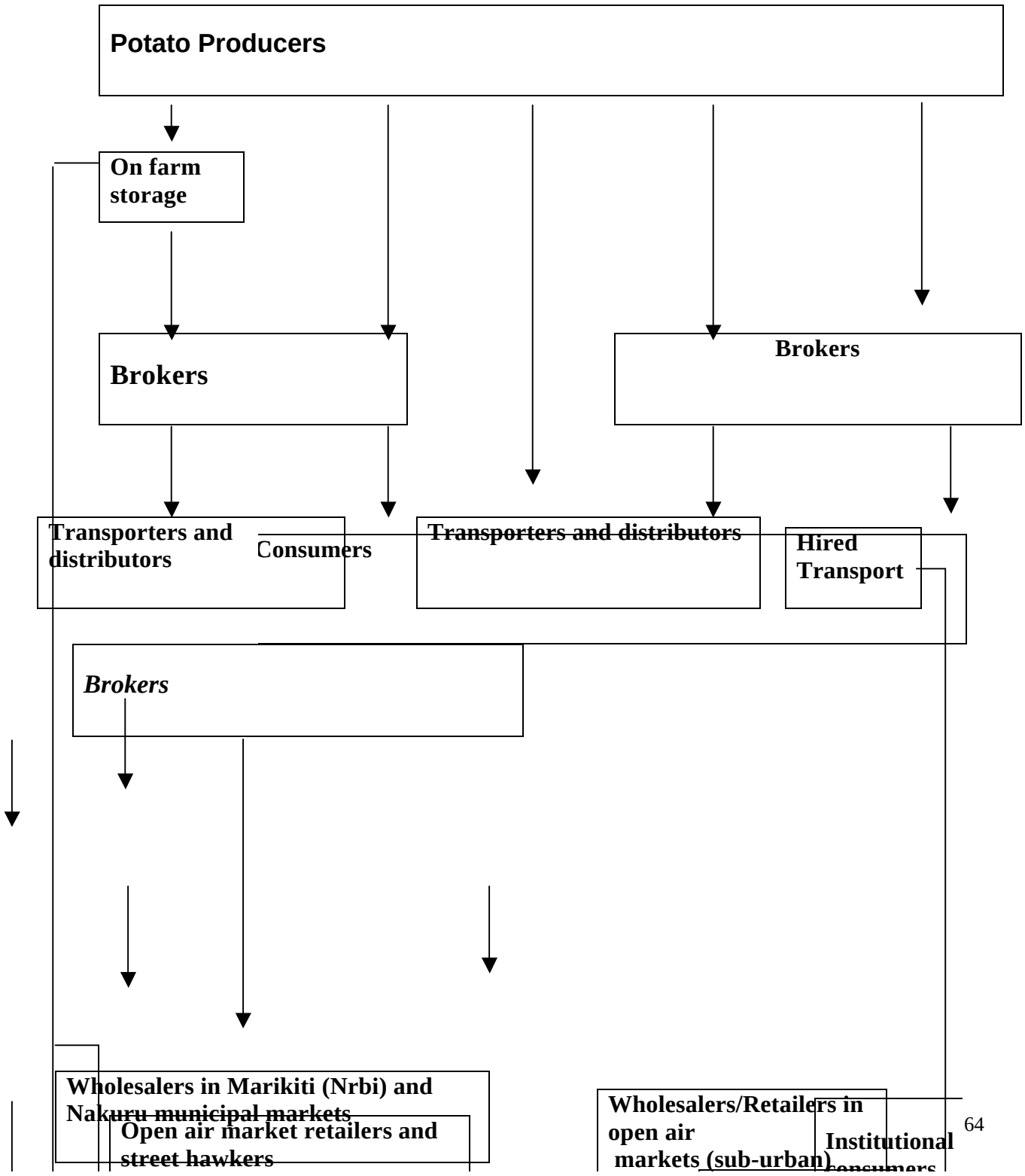
a. The potato supply at the local production areas is not a direct determinant of the selling or buying prices for potatoes in the area.
b. The potato producers in the growing areas lack the ability and mechanism to set or influence selling prices for their potatoes.
c. The market forces responsible for determining the producer selling prices for the farmer are based in the marketing chains and operational efficiency by the market agents, prices prevailing at the major urban market outlets, and the supply of potatoes from other areas in the country, whose supply seasonality differ due to climate variation and specifically differences in the rainfall pattern.
d. Accordingly, on-farm potato storage by farmers under the current potatoes market structure is unlikely to be viable in terms of availing better prices to the farmer, due to the unpredictable prices and lack of control of the prices by the potatoes producers.

Fig.7 presents the potatoes marketing channels in Nyandarua. In total 8 marketing channels for potatoes to the consumers exist. The consumers of potatoes include rural producers & consumers, urban consumers and institutional consumers namely Hotels/Restaurants, schools, hospitals, Processors and the army. A significant change from the marketing channel as identified twenty years ago by Durr and Lorenzl in 1980, is the creation of brokers as agents in the chain, at both producers and consumer levels. Over 80% of commercially marketed potatoes can be estimated to go through brokers at both ends of the marketing channels where they are involved. The little that does not go through brokers is either marketed directly to consumers (mainly institutions on contracts) by producers or producers /traders with on- farm storages or by transporters /distributors particularly those supplying sub-urban markets where there are no brokers.

Table 4 gives a summarized description of the marketing channels' agents in terms of their activities in the chain. From the data, it is clear that only producers are involved in some storage of potatoes on Farm. It was estimated that less than 10% of producers held on potatoes in form of" storage". The kind of storage ranged from simply covering heaps of harvested potatoes with grass and then soil to simple mud plastered wooden structures for a potato store. Part of doing this was as a matter of fact not deliberately meant to store potatoes but rather hold potatoes while awaiting brokers or buyers. 20 years ago Durr and Lorenzl (1980) reported lack of potato storage for speculative purposes, but instead gathering of large quantities in the field, enough to fill a lorry according to order or in fulfillment of a large contract. Producers said to store potatoes for speculative purposes reported storing potatoes for periods ranging from 2-6 months. However they pointed out that storage of potatoes was not preferred because of

a. The need for cash
b. High labour costs involved
c. New harvest in other areas arrived before selling the crop, and storing did not guarantee better prices and
d. A lot of wastage.

Figure 7: The Potatoes Marketing Channels in Nyandarua



Those who did not store potatoes also cited lack of a guarantee for better prices on storing potatoes, and preferred to feed potatoes to cattle if they were unable to dispose them off during the glut season. The level of wastage cited ranged from 40 % and involved rotting, greening, loss of flouriness and watery development, germination plus shrinkage and weight loss. It was however pointed out that consumers did not object to germination in potatoes for consumption, and the potatoes, which developed greening, were set aside for seeds. The production yields per acre varied widely among the producers namely 20-120 bags, reflecting varied agronomic practices and use of agronomic inputs. This translated to drastic variable quantities handled per producer, ranging from 500-2000 bags per year depending on the acreage cultivated. Such data indicate the vast potential in increasing potato production by both acreage and yields, provided the necessary incentives are given to the farmers. In Nyandarua, producers reported that they could produce potatoes 2 to 3 times a year depending on weather patterns. Such incentives are best in form of prices that can guarantee the farmers' return for their investment, which should also be predictable. The prices fluctuations in terms of highest and lowest fits in within the reported pattern in Fig. 5. However the lowest prices reported in 2001 were significantly lower ranging from shs.150-300/= per bag compared to those in Fig 5. The difference of course is due to the bumper crop in 2001compared to the poor harvest during the drought years following El-nino to the year 2000. The highest prices occurred during the months of November to May and early in the year 2001, then were depressed again because of the bumper crop to averaging shs.500 per bag. The sale unit bag is not standard and ranges in weight from 130 - 180 kg. The broker, who is responsible to bagging and loading transport vehicles, determines the weight. According to producers, the ideal price for their potatoes should range from shs.600- 800 /= in order to make profit. There is also need to standardize the bag size to say 90kg like in maize, or stick to the accepted size 130kg. The producer however has no say in this, and is under the buyer or broker's mercy so to speak.

As one moves up the channel, the prices increase due to the costs and operational margins for the marketing agents involved. The brokers charged shs.100- 120/= per bag for their services namely identification of suppliers, prices negotiation, potatoes bagging and loading. Depending on the prevailing producer prices, this amounts up to between 20-60 % of the prices offered to the producers. It was difficult to establish the exact margins for other agents although retailers reported that their target was making shs. 100 per bag. The wholesalers targeted shs.100- 150/= per bag. Various agents also paid various statutory fees in their marketing operations, namely county council cess, open air market space rent, cost of empty bags, and sewing sisal ropes. Most of the agents interviewed reported their

business as being 100% based on potatoes. Only a few transporters reported being involved rarely in transportation of cabbages of even building sand. This is an indication that operations by the marketing channels agents for potatoes is a full time business for the agents involved. Towards the consumer level, the prices thus increase as expected. The lowest and highest price ranges reported by transporters /distributors are shs.150- 350/= and shs.500-1500/= respectively, during the corresponding peak and low supply seasons. At the wholesaler level the lowest prices recorded ranged from 400-500/= while the highest ranged from shs. 1000-1500/=. At the retailer level, lowest buying price of shs.350/= versus highest buying price of shs.1500 and above were reported.

Table 4:Descriptive characteristics of agents in the marketing channels for Potatoes in Nyandarua.

	Description Item	**Producers**	**Brokers**	**Transporters / Distributors**	**Wholesalers**	**Retailers**
1.	Marketing functions	Potatoes production and harvesting	• Producers/suppliers identification. • Buying and prices negotiation. • Bagging and loading	• Buy through broker. • Transport to market. • Sell through broker.	• Buying from farmer direct or lorry via broker. • Bagging. • Hire transport. • Sell to retailers	• Buying in bags from lorry or transporters cum distributors. • Repackage in buckets, display and sell to consumers or traders.
2.	Storage	By less than 10 per % of producers for 2-6 months. Problems: • Germination	None	None	None	None

		• Rotting • "Kugacha " • Shrinkage + weightloss • Greening • Better prices not guaranteed				
3.	Wastage	10-40%	None	0-5bags/40 bags(truck load)	0-10%	0-5%
4.	Quantity handled	500-2000 bags per year depending on acreage	Organises for 4-5 buyers per week at 40 bags per truck	Approx. 80 bags per week	10-60 bags per week	6-18 bags per week
5.	Varieties: • Tana • Tana(K) • Tigoni • Nyayo	• For sale mainly • For sale mainly • For sale mainly • Household consumption	Commercial and household consumption	Mainly for chips and stew	Mainly Nyayo and Tana for stew and Chips	Mainly for stew and chips
6.	Prices fluctuation	• Highest price: 500-1000(Nov-May) • Lowest price: 150-300(April-Nov) • Best price: 600-800	Charges 100/=per bag but usually can negotiate	• Lowest price: 150-350 (April-Nov) • Highest price:500-1500(Dec-April)	• Highest Buying Price: 1000-1500 • Lowest Buying Price:400-500	• Highest Buying Price: 1500/= (Dec-Mar) • Lowest Buying Price: 350/= (Dec-Mar)
7.	Supply seasonality	Production seasons: 2-3 times per year	Move to different production	• Lowest season: Nov-May	• Lowest • Season(Nov-April)	• Lowest Season (Jan-

			areas	• Highest season: (April-Nov)	• Highest Season(May-Sept)	May) • Highest Season (May-July)
8.	Marketing Problems	• Low prices determined by brokers • Sale bag unit too big(130-180kg) • High production cost. • Fewer buyers and over supply. • Diseases (blight and rotting) • Poor roads. • Drought.	Buyers may reject potatoes after bagging if price is unfavourable.	• Poor roads. • High vehicle operation costs. • Erratic selling price hence losses. • No problem in buying price. • Insecurity during travel.	• Poor erratic selling prices. • High council charges. • Perishability.	• Lack of buyers. • Price fluctuation. • Rotting and wastage

Over the years various marketing agents reported occasional high spiky prices rising between 2000 and 6000 per bag during severe shortage times. These prices of course are negotiable and also depend on whether the purchase is direct from the farmer or not.

The bottom line is that: It is the marketing agents who control, determine and set the buying prices for the producer as well as the selling prices for the consumer. The consumer prices at the major urban market outlets are however subject to supply and demand forces due to competition among suppliers from different production areas of the country. Whatever prices are set at for example, Wakulima in Nairobi, they form the basis for setting buying prices for the producers in the production areas, via down the market chains. Only when there is severe potato shortages at the major urban markets followed by sharp increases in prices, is this effect likely to reach the producers, and only when the shortage is prolonged for example during droughts. If such prices spiky or short-lived then the producers miss the opportunity. During the drought situation, the farmer is unable to bag- in the opportunity since potato production in Kenya is 100% rainfed, unless one is lucky and benefits from the rainfall usually irregularly distributed over the country, during the prolonged drought periods. The producers thus find themselves in gambling situations where he produces potatoes first for home consumption and secondly for sale, and only make profit if they are lucky, else they feed them to the cattle. On being asked why the producers grow commercial potatoes without profit anticipation, the answer by most producers was that there was no other opportunity cost for the utilization of the land free from other enterprises, and in any case, there are times or years when they have been lucky and made some money.

The marketing problems encountered by the producers are:

- Unpredictable low prices determined by the brokers that make the producer even unable to break even in the potato production enterprise.
- The sale bag unit, which is too big and unstandardised (130 -180 kg) is exploitive and further depresses the real price for their potatoes.
- High production cost due to expensive inputs.
- Fewer buyers and over supply.
- Potato diseases mainly blight and rotting.
- Poor roads.
- Drought

Those encountered by brokers include buyers or transporters rejecting potatoes after they have procured and bagged them from the farmer, if prices change unfavorably at the market outlets.
The transporters faced the problems of poor roads, high vehicle breakdown and operational costs, erratic selling price hence losses, and insecurity on the roads

when transporting potatoes to the market. They expressed having no problems with the buying prices. The wholesalers on the other hand indicated having problems with erratic selling prices, high statutory council charges and losses due to potatoes perishability. The retailers complained of lack of buyers, again prices fluctuations, wastage and losses due to rotting of potatoes.

The results above show that the potatoes market in Kenya operates at near perfect conditions only at the level of major urban market outlets due to supply competition offered by potatoes from different production districts of the country. At the producer's level the market is imperfect with the prices determination and control being done by the marketing chain agents and in particular brokers. This is apparently done without consideration for the producers' economic performance in their potatoes production enterprises. Accordingly there is a strong need to restructure the market such that the producers can be empowered to repossess ownership of their potatoes which they lose once they have harvested their crops. Then they can have some control over determination of prices for their potatoes on a predictable basis; to enable them break even and make some profits with their potatoes. They would then increase production according to market demand. The on-farm storage has been shown to be ineffective given the different harvesting seasons in different parts of the country, and the variable erratic distribution of rainfall in the potatoes growing areas in the country. The only potential effective market restructuring that would incorporate the above element is having a national potatoes storage, preferably owned partially or fully by producers, and operated commercially as a private company, unlike the similar structure in marketing of cereals, where National Cereals and Produce Board is government owned. The Potato Storage Company would purchase and market the potatoes from the producers in competition with the existing market channels at prices favourable to both the producers and consumers, and even possibly in collaboration with the existing marketing channels agents. In this way the favourable prices offered to the producers would enable them produce more potatoes thus contribute towards evening out of prices fluctuation and amelioration of Food Insecurity in the country, particularly during times of maize crop failures.

3.2 Irish Potatoes Changes during Storage

The potatoes were set up for the storage experimentation on 6th July 2001, and have been tested starting from 6/07, 26/07, 16/08, 18/09and 15/10, in total, after 120 days. The last evaluation tests are due to be done on 14th Nov and 14th Dec, thereby completing the storage period of six months as planned. The storability experimentation was carried out on 4 potato varieties namely Tana for chips, Dutch for crisps, Meru for mashing &stew and Nyayo for chips.

Results:

a. Sprouting:

After 51 days, sprouting was evident in the Dutch variety only. After 141 days Nyayo had shown slight signs of sprouting, but Tana and Meru have not yet shown any signs of sprouting. Also Tana and Meru have shown no change in their physical appearance. The Dutch variety has also not changed much by way of physical appearance except sprouting. Nyayo has however shown relatively more change in physical appearance than the rest.

b. Weight Loss.

Table 5 shows the average weight loss for the 4 varieties.

Storage Days	**Varieties**			
	Tana	**Nyayo**	**Dutch**	**Meru**
Fresh	514.55	411.73	538.35	468.30
21	514.50	411.70	558.30	468.00
51	506.78	397.74	552.18	451.12
81	499.83	388.69	546.00	438.39
111	490.44	377.91	540.90	416.29
141	483.70	370.19	522.70	401.26
% Weight Loss	**6**	**10**	**6.6**	**14.3**

Meru appears so far to have lost the greatest weight of 14.3% compared to Tana, which has lost 6% less than half of the loss in Meru. Interestingly enough there is apparently no association between changes in physical appearance and loss in weight.Weight loss would be expected to be associated with shrivelling.

c. Sugar development

Table 6 shows the sugar development with storage by the varieties studied.

Table 6: Development of Sugars on storage

Storage Days	**Sugars Developed in %**		
	Dutch	**Tana**	**Nyayo**
81	2	5	1
111	5	6	3
141	7	6	5

Development of sugars is only expected to cause problems in varieties used for crisps and chips because of browning or colour change on deep-frying. Table 7 shows the colour development for the products made from the 3 varieties.

Table 7: Browning colour development on deep-frying with oil

Storage Days	Colour development in absorbance units at 420nm		
	Dutch(Crisps)	**Tana(Chips)**	**Nyayo(Chips)**
Fresh	0.126	0.114	0.084
21	0.140	0.147	0.103
51	0.366	0.366	0.140
81	0.490	0.864	0.323
111	0.792	1.338	0.561
141	1.992	1.506	0.858

From the results it is clear that Dutch variety which showed significantly more germination than others by as early as 51 days showed considerable colour development by 141 days. The sugars development pattern in the 3 varieties however appear not to be significantly different. It is difficult to standardise the cooking method to avoid errors due to temperature variation. Crisps however on account of their thin shapes are likely to achieve much higher temperatures for the same period
they are exposed to hot oil with chips. Accordingly one cannot draw from the data, a direct relationship between variable degrees of germination plus sugar development and browning colour development on cooking. However it was apparent that crisps from the Dutch variety developed bitterness after 81 days of storage.

From the results so far, one can conclude that except for the Dutch variety, all the others can be stored for the days so far experimented without compromise on the utilisation quality. It is significant to also note that contrary to what one would expect, acceptability improved with sweet taste development on storage of the varieties, (with the exception of bitterness imparted to crisps from Dutch variety) and in particular with Meru used for mashing and stew.

3.3 Viability of large-scale potato storage

With the collaboration with Netagco Tolsma, the necessary data is being collected for a feasibility analysis, according to annexture (III) questionnaire. This information plus a visit meant to gain an appraisal on the fixed Capital Investment, plus the up-to-date operational technology, will enable putting together all the necessary economic parameters for viability analysis of a commercially operated large scale potato storage facility in Kenya or for East Africa in general.

1. Materials

1.1 Irish potato varieties as under:

Product	**Variety**
Crisps	Dutch (Ngorof /Bomet)
Chips	Tana or Nyayo or Tigoni

Cooking Kerrs pink (Meru)

1.2 Germination suppressant : Prophan 1%CIPC dust

2. Storage Conditions in Environmental controlled Cabinets.

- Each variety in its own cabinet.
- No light (day or artificial) in all cabinets thus must be light proofed.
- Humidity maintained at 95%.
- Storage temperature 50^0 F ≡ 10^0C.
- Potatoes are washed to remove soil and dipped into 50 - 60% ethanol solution to dry them off, and harden the skin. They are then dusted with Propham.
- Potatoes are packed in small crates and put into cabinets.

3. Quality evaluation during storage.

3.1 Quality evaluation regime:

a) 1st one when freshly put in the cabinets.
b) 2nd one after 3 weeks.
c) 3rd one after 30 days.
d) Thereafter analysis after 60, 90, 120, 150 and 180 days.

3.2(a) Analytical Parameters:

- Weight loss - to discuss method.
- Note time when sprouting from the eyes begins.
- Length of the sprout (average)
- Greening.
- Examination for storage rot.
- Shrivelling - development of softness and compression.

(b) Utilisation evaluation.

- Crisps - Colour development
  - Sugars development
  - Taste (bitterness)

- Chips - Colour
  - Sugars
  - Oil uptake
- Cooking - Flouriness check and mashy/ translucence development.
  - Taste compare with fresh control.

Annexure 1

INTERVIEW GUIDE ON POTATO COMMERCIALISATION AGENTS IN NYANDARUA DISTRICT

Name and Address (Physical and Residential)

_____

_____

_____

(a) Describe the type of agent in the chain (according to the list below by ticking one of the descriptions).

(i) Producers/Storage - warehousing/Traders

(ii) Transporters/Distributors/Wholesalers/Retailers

(iii) Organizations

- Producer to Retailer (institutions/consumer)
- Producer to wholesalers (stores) to traders to consumers
- Producer to trader / transporter to wholesalers (Indians) to Traders to Consumers.
- Producers to Traders to Institutions.
- Importers/Exporters
- Open air market
- Others (name)

(b) No. of agents in (a) above (self assessment)

(c) Marketing functions of agents in (a). What functions do you perform?

(d) Quantity percentages of product flow in the chain and distribution channels (self assessment)

(e) What is the quantity of wastage at the various levels of the chain?

(f) What varieties are quite commonly traded and for what use?

USE	VARIETY
CRISPS	
CHIPS	
MASHING FOOD OR MAKING STEWS	

(g) What no. of competitors do you have?

(h) No. of suppliers/sellers.

(i) How does price change within the year? What are the highest and lowest prices that you purchase and sell at within the year? (Price per kg).

Price change	PURCHASES (price per bag in Kshs)	SALES (price per bag in Kshs)

Lowest price		
Average price		
Highest price		

(j) Monthly price changes per kg/bag in the past year.

(k) Price elasticity of supply (by calculation).

(l) How do you identify your market and how do you determine your prices.

(m) What are the constraints and problems you face during marketing?

(n) What are the credit facilities available to you?

(o) Do you market any other products/commodities?

-
-

•

(p) Do you have an all year round supply of your potatoes?

(p) During which months do you obtain your highest and lowest supply of potatoes?

Any other comment/observation: ……

……..

…….

…….

NOTES FROM PILOT TESTING:

It was noted that the most commonly traded potatoes at Kinangop region were:

Nyayo- multipurpose
Mugaruro- for cooking
Tigoni- for chips
Tana-Kimande- they last longer and are more storigible.

It is very difficult to get a constant pattern of monthly changes in the price of potatoes since in most of the cases, it is not the farmer who determines the price of the potatoes at any one point. In most cases, the price is determined by the outlet markets, and also the quantity of potatoes brought into the market from other regions. The price also varies depending on the variety.

No specific agent has specific competitors. For them, any agent automatically becomes a potential competitor. This, to some extent is due to the fact that the farmers do not have specific agents to whom they always go to.

Prof. S.K. Mbugua
DFT&N.

Foodnet Project No: 11

Technical report for Project 11

Introduction

A participatory rural appraisal (PRA) was conducted by a multidisciplinary team in some major potato producing areas of the central highlands of Ethiopia. The PRA included secondary data collection, discussions with individual groups of farmers, key informants and direct observation of the critical stages of production and marketing. The team visited the potato producing fields around Shashamane, Awasa Zurie Weredas and participated in the Shashamane potato market through interviewing farmers, middlemen and traders. The purpose of the informal survey was to gain a preliminary understanding of potato production and marketing practices in the study.

Preliminary Results

2.1 Resources Ownership

Land, oxen, fertilizer, farm implements and pesticides are considered as the most important farm implements and pesticides are considered as the most important farm resource required for crop production in general and potato production in particular. Land is considered to be the single most important resource in farming. Land is generally scarce and unequal access to land is believed to be the basis for socio differentiation. Farm sizes vary considerably from location to location and even among peasant associations (PAs[1]) within a location depending on land household ratio and family size. The higher the land to household ratio the higher the farm size and vice versa. In general farm sizes vary from0.25 to 1.5 ha. A considerable number of newly formed households estimated to be 10 - 25 % do not own land at all. Some of the households may have 0.25 – 0.50 ha of land which they got from their parents for building residential units and for producing garden crops such as enset, potato and maize. Farmers claim that their landholdings are too small to support their families. Most of them engage in off farm activities to get supplemental income.

2.2 Cropping Seasons

The study area enjoys two cropping seasons namely Belg, which extends from January to June and Meher from July to December allowing double cropping. Potatoes could be produced successfully in both seasons. Although the onset of rain in the Belg season is less certain, the belg season is by far more suitable for potato production due to less late blight pressures. In some years, the Belg rains may commence as early as the first week of January and continue unabated. Most frequently, however, the reliable rains, which could support crop production, start in February. In some years, onset of the belg rains could be delayed till March pausing a greater risk on potato production. Inn most years, the crops potatoes, wheat and barley could be grown more successfully. Maize could also be planted

in the Belg season for green harvest to be followed by potato, wheat or barley in *Meher* season.
2.3 Ppotato production in the Belg season. The major crops in the Belg season in the Shashamane area and its vicinity include; potatoes, maize, teff and haricot beans. In recent years, potatoes have become the leading crop both in terms of households growing the crop and the area due t its role as a hunger reliever harvested in 90 days and as a cash crop.

Potato is the first crop planted in the belg season immediately following the onset of the Belg rains from February to April. Early planting is recommended to escape late blight pressure, which comes towards the end of the belg season as the intensity of the rainfall increase, and humidity rises. Potato planted late in the season from March to April needs frequent fungicide spraying to control late blight thereby increasing production costs and jeopardizing the second cereal crop. Following potato, maize is usually planted in February to March for home consumption and the market. Teff and Haricot beans are also planted at the same time following maize.

Land preparation for potato in the belg season commences in January. Three plowings using oxen drawn ploughs is usually done before planting. Potato is planted early on the season immediately after the onset of the belg rains. At planting, furrows are opened in a straight-line fashion using oxen plough. Sprouted potato seeds are then placed at about 10 – 15cm spacing behind the plough. Intra row spacing varying from 40-60cm is used and fertilizer spread in the furrow and then closed by a second pass of the local plough as it forms a second furrow.

Farmers reported that the use of chemical fertilise is indispensable for potato production. The rate varies from 20-75kg of Di-ammonium Phosphate (DAP) per timad depending on soil fertility, fertilizer availability and the financial position of the farmer in question. Few well to do farmers use a rate higher than 75kg/timad DAP, the majority of the households apply a moderate 50kg/timad or a mixture of urea and DAP at a rate of 25kg Urea and 25kg DAP per timad while the cash constrained apply a rate lower than 25kg / timad DAP or a mixture of Urea and DAP. None of the farmers in the area have planted potatoes without fertilizer. At full plant emergence, about 21 days after planting, when potato seedlings reach 2-3 leaf stages, potato fields may either be hoed by hand or using oxen drawn marsha locally known as *shilshalo*. S*hilshalo* consitists of criss cross ploughing using oxen drawn *maresha* in order to loosen the soil for better aeration and root development. A similar practice is applied to maize. The secondary hoeing and earthing up is practiced when the plant attains 4-5 branches, about the third week after the first hoeing. The soil around the root zone is loosened and hipped around the lower part of the stem in order to facilitate aeration and encourage better tuber development.

Late blight is the most important disease, which causes significant losses in potato production. The impact of late blight on depends on planting time which is in turn influenced by on set of rainfall, distribution, intensity, temperature and humidity. Under normal conditions, the impact pf late blight on early planted potato crop is minimal. In some years when the rainfall intensity is higher than average, 1-2 sprayings may be required for a better crop. Fungicide use is crucial for late-planted potato April to May, yo

control the late blight. The number of sprayings required for late planted potato for effective control ranged between 3 to 7 depending on the weather conditions, which dictates the intensity of late blight and the typical chemical available. The farmers' strength in the control of late blight is early planting supplemented with minimal chemical usage. In most cases, two sprayings are considered to be effective for early-planted potato when blight comes late at a lower intensity. Redimol and Mancozeb are the two common fungicides known and currently in use for control of late blight. The rate of use across farm is similar, 4 cups of either chemical each dissolved in 16 liters of water is sprayed on 1 timad. Redimol is said to be more effective than Mancozeb. For effective control, Redimol needs to be sprayed every 15 days while Mancozeb is sprayed every 7 days once the disease appears.

Harvest time of potato depends on the planting date, which in turn is governed by the onset of rainfall. Potato could be harvested within 90 to 105 days. Potatoes planted using irrigation, often planted in January are harvested in April while potatoes planted in the belg season February to March are harvested during mid July to mid August. Harvesting may be done in bulk at once or piece-by-piece depending on the market situation. Bulk harvesting is done when potato farmers think the price is reasonable and further price increase is unlikely. Otherwise, harvesting may be delayed until mid July. By the end of July the remaining portion of potato field is harvested, ploughed and cropped to cereals. Under normal conditions, potato may be sold on the field before harvest and transported immediately to the nearest market for sale. In some cases, when the prices are too low, households are forced to sell part of the produce in order to meet immediate cash needs and store the rest until prices improve. Potato may be stored as ware potato for family consumption and are to be sold in small quantities in the local market or for seed purposes. Potato growers reported that in times of low late blight attack, if the potato is harvested on a dry sunny day, it could be stored for 2 months without losing its quality for human consumption.

A number of potato varieties are grown in the area namely; white flower, red flower, *Agea, Durame, Awash* and *Genet*. Of these varieties, white flower is the most dominant grown by most producers. Genet and Awash are improved varieties released by the national research system for general cultivation while the rest are either imported or local. The variety *agea* and *Durame* have declined and are currently grown by few farmers for domestic consumption and local market.

Potato meant for seed is planted on the best piece of land on isolated fields. Harvesting is done selectively by hand. Most farmers store in the traditional *gotera* while few households have started using diffused light stores (DLS) introduced to the area by the National research program in cooperation with the Wereda agricultural development office. According to farmers, potatoes using DLS could be stored up to 6 months without major losses.

The major potato production constraints raised by farmers include:

- Unavailability of improved varieties, particularly, Genet
- High fertilizer and fungicide costs

- Late blight, the varieties at the farmers' hand are highly susceptible to late blight. The varieties could not produce without chemicals.
- Bacterial Wilt: This problem has become important in recent years particularly in Shashamane and Wondo Genet areas.
- Unavailability and high process of fungicides for controlling late blight. It was also reported that chemicals a available in the market have become less effective. This is attributed to excessive storage.
- Traders agree and fix process of fungicides and in most cases the prices are unattractive to the farmers
- Low Fertility of the soil
- Climatic Variability

2.4 Marketing Practices

In Ethiopia in general and in the central highlands inn particular, small holders holding less than 2 ha of land produce the bulk of potatoes both as a cash crop and for domestic consumption. Among the potential potato producing areas in the country, the highlands of Shashamane *Wereda* and its vicinity, the largest potato producing areas are supplying much of the ware potato to Addis Ababa and other regional markets in eastern and southern Ethiopia. Shashamane, located about 250 km from Addis Ababa along a major weather asphalt road, connects most of the major potato producing areas of Kofele area in Arsi zone, Shashamane wereda, in the East Shewa zone, Awasa zuria wereda and Waloyita sodo area. Collecting or their agents based at Shashamane are responsible for marketing potato to the major towns situated along the Shashamane Addis Ababa highway such as Nazareth, Modjo, Akaki and Addis Ababa.

Almost all of the potatoes produced in the afore mentioned areas are collected from producers and distributed to consumers by private traders. The marketing channels of potato operating in the central highlands in many respects are similar to the horticulture marketing system in other sub Saharan countries.

Farmers in the study area follow three marketing strategies to move their produce from production areas to the consumption points.

i) Selling the produce at farm gate
ii) Selling the produce in the local market
iii) Selling the produce in the nearby towns such as Meke, Nazareth and Mojo

Most of the farmers choose the first strategy and sell their produce right at the farm before harvest. This strategy according to the farmers has a number of advantages

- Provide a good opportunity to farmers located in remote areas. The middlemen referred to as *dellala* are aware of the production activities and approach farmers when potato fields are ready for harvest. The brokers, upon consultation of the producers, inspect the field and take samples of the tubers to traders in the Shashamane market. The traders, upon inspecting may show interest to purchase the potatoes and to travel to the fields to negotiate prices and type of bags to be

used. After some negotiation and arbitrage of the broker, the trader and the producers may agree on a certain price and upon agreement of a price and type of package to be used, the middleman takes the responsibility of overseeing the harvest and bagging of the produce. The potato is harvested by daily laborers, packed and is transported to its final destination.

- Allows the farmer to negotiate position by decreasing the risk of quality deterioration. Potato once harvested has to be sold as soon as possible due to its high perishability.
- It decreases marketing costs for the farmer. The marketing costs of the farmer are related to the marketing functions that have to be performed such as transporting, packaging, physical handling, storage, financing, risk taking and negotiating with outsiders. All costs related with harvesting and the traders meet marketing.
- Lower marketing costs to the collecting potato traders. Traders do not pay taxes when they buy directly from farmers in the field. In the Shashamane market, traders are supposed to pay 2% of the total value of potatoes to the local municipality and 5% to the domestic revenue authority. In reality however, the taxes are liable to negotiation and are based on the total value of the produced.
- Lower risk to collecting traders; potatoes purchased directly from farms could reach the terminal market at most in 24 hours without major loss in quality. Thus reduce the risk of quality deterioration which would otherwise increase costs due to spoilage

The second strategy is adopted when the produce is too small which may not attract traders or when faced with immediate cash needs. In such situations, the farmer harvest part of his field, whether large or small and transports to the local market either by cart, or donkey or horse or by human beings. Potato process in the local market are too volatile depending on the supply and demand manifested by the number of traders willing to buy potatoes. Often, process varies considerably within a day, depending on supply and demand irrespective of the process in the terminal market. Farmers could sell their produce directly to consumers, brokers or collecting traders.

Few enlightened farmers involved in trading as a part time job adopt the third strategy. The major obstacles forced the farmer-traders to give up potato marketing include

- High marketing costs
- Discriminatory practices by traders
- Lack of capital

Packaging and Physical Handling

Unlike grain, potato prices are set based on volume. The farmer and the trader have to agree on the type of package before they start to negotiate prices. Once agreed on the price and the packaging to be used, the potato is harvested and packed. The total revenue the farmer gets is a function of the price negotiated prior to harvest and the number of bags of potatoes that will be harvested from the field. The farmer remains unsure of the revenue he / she is likely to get until the bagging has been done.

About 6 types of bagging are used in the Shashamane area and its vicinity. Each type of bag has a local name identified by the shape; bulkiness or the terminal market the bag is destined for. The retailers in various markets are accustomed to a specific type of package and are not willing to accept others. Both retailers and the brokers at the terminal markets could tell the approximate weight of their preferred package and could anticipate their profit once they have hints on the starting price of potato early in the morning.

Marketing problems raised by farmers

- Nature of produce: Potatoes are highly perishable and must be marketed immediately. The prices also drop dramatically following the pick harvest.
- Lack of information on market prices at the major markets. Farmers do not have access to the major markets that influence market prices in the local market. The traders on the other hand are well informed about the prices in the major markets and could negotiate accordingly.
- The number of buyers / traders in each locality is limited, leaving producers with very little choice to negotiate.
- Potato prices are set on unstandardised volumetric units. Packages such as *timbo* according to farmers are a means of exploitation.

Work Plan

Informal surveys are under way in some selected areas of *West Shewa* zone to collect information on *meher* potato production, marketing and consumption practices during July and August. Following the informal survey, a detailed questionnaire based formal survey shall be carried out in September to October 2001 to collect quantitative data and verify the informal survey findings.

Project 12
Just started

Project 13 previous project on bananas was terminated and replaced by Sweet potato marketing in DRC

1st Technical Report for Project 13

Grantee Institution: Inera Mulungu

Reporting Period: July 2001 to October 2001

1. **Specific tasks, responsibilities and contribution by partners active in the project**

- Inera Mulungu was the main player on the ground. It has provided researchers, technicians and logistics for the survey. The project coordinator is also a scientist from Inera Mulungu. The scientists and technicians from Inera Mulungu conducted the 1st phase of the survey.
- The *Service National de Vulgarisation* played an important role for the strategy on the ground and to provide facilitators in the villages.
- The *Service National de Statistiques Agricoles* was important for technical advice. It is expected to play an important role in training the investigators for the second phase.
- Collaboration with some local leaders, NGOs and market authorities has already been established.

2. Major Technical Outputs, problems and lessons learned.

- Despite of some problems encountered, the 1st phase was successfully completed. Some training of investigators was done to help the investigators be more efficient on the ground.
- Heavy rains were experienced during end of September and in October hence making the job too hard. However, interviews proceeded as planned though the interviewees were a bit suspicious of the intentions of the questions asked.

3. Further work for the coming two months

For the next two months, the team will do all its best to finish the survey. A small training is planned to help the investigators become more efficient on the ground.

Report by:
Phemba Phezo
Inera Mulungu
DR.Congo
31st October 2001

Project 14

PROJECT NO. 14

PROGRESS REPORT (NO. 1)

Foodnet Project: No. 14

Title: " Development of Convenient Foods from traditionally Sorghum Flour".

Project Leader: Dr. Muna Mohammed Mustafa

Funds: The delivery of the funds is delayed to March due to some restrictions in the Banking system in the Sudan.

Activity 1: March 2001

1. Random samples of traditionally fermented sorghum dough were collected from different households in Khartoum State for microbiological analysis on purpose of selection of the appropriate species of lactic acid bacteria involved in fermentation process of sorghum batter. All the strains of lactobacillus being isolated purified and kept in slopes of MRS Agar. Sub culturing was carried out at monthly intervals.

2. The organisms were tested for their ability to ferment fresh sorghum flour. They proved to have good performance with regard to acid production, pH …etc. For sustainability of these characteristics, the isolates need to be maintained at the stock as freeze-dried cultures to overcome any risk of mutation within isolated bacteria.

3. Since the funds cannot cover the freeze dryer cost, it will be difficult to maintain the cultures without risk of mutation. There is no suitable freeze-drying system for this purpose in the Sudan.

Dr. Muna Mohammed Mustafa

Project 15

Foodnet Project 15

Project Title: Pigeon pea Processing Utilization
Project Leader: Prof Paul Ladu Bureng
Food Research Center, Sudan

Progress Report 1: 22.05.2001-05-26

Project Funds: The funds were delayed due to the difficulty in the Sudan Bank Transaction system with other banks. The funds arrived Sudan in March 2001. The internal transfer was completed in May 1,2001.

Activity 1: Fabrication of Processing Unit

A contract has been signed on 17.05.2001 by Technology Workshop, Khartoum North, Industrial Area, to fabricate five processing units for the project. N There has been a

mutual agreement between food Research Center and Technological Workshop to product processing equipment locally (See Project Document) .

The processing units are:

1**. Cleaning Unit and Grading**: This equipment has been designed to clean the raw materials by vibrating sieves / screens. The same unit is to be used for grading the products, splits (dhal) (electrical).

2 Treatment Tank Unit: The tank is used for washing the raw material, steeping, conditioning and other pre-treatment stages.

3 Drying Beds Unit: Sun drying using movable trays equipped with screens.

4. Two dehulling units are being fabricated.

1. Dehuller with horizontal emery/ carborandum stones with a pneumatic system to remove hulls (electrical motorized).
2. Stone mill in vertical position (electrically driven)

This equipment is to be completed in six weeks (1,5 months) from the 17.01 when first payment was received.
The purchasing of raw materials (pigeon pea) will be on 01.06.01. The quality assessment and preliminary processing tests will start.
The marketing and consumption surveys will start on June 1,2001.

Prof. Paul Ladu Bureng

List of companies visited

No	Company Name	Sector
1	A-Z Animal Feeds	Animal Feed Milling
2	Golden Mills	Animal Feed Milling
3	Igo Animal Feeds	Animal Feed Milling
4	Interchick	Animal Feed Milling
5	Jadide Enterprises	Animal Feed Milling
6	Kibaha Educational Centre	Animal Feed Milling
7	Mkuza Chicks	Animal Feed Milling
8	Riamia Millers	Animal Feed Milling
9	Top Millers	Animal Feed Milling
10	Dar Brew; Kibuko	Brewery
11	Kibo Breweries	Brewery
12	Sergenti Brew	Brewery
13	TBL	Brewery
14	OK Plast	Biscuits
15	Soza Plast	Biscuits
16	Tabisco	Biscuits
17	Bahresa/Azam	Bread/Biscuits
18	Asante Dar Bakery	Bread
19	Asha Bakery	Bread
20	Esam Bakery	Bread
21	Qooch Bakery	Bread
22	Royal Bakery	Bread
23	Saasi Bakery	Bread
24	Supa Loaf	Bread
25	Top Bakery	Bread
26	Yombo Bakery	Bread
27	Henkel Chemicals	Chemicals
28	MCC Products	Flour/Biscuits
29	Power Foods	Flour
30	Solile Products	Flour
31	Tanzania-China Textile	Textile
32	TBS	Food inspection

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET	Next steps	General remarks
A-Z Animal Feeds Location: Kimara Mwihso Morogoro Road P.O. Box 78336, DSM Mr. Revo Mbuya and wife Vistited: 28/2/01 Lekule, Buitrago and Laswai	Firm in business since 1998 Owner is businessman while wife is veterinarian 10 major feeds including (50 Kg): Layers (Ths 7000/=) Broilers (Tsh 7000/=) Growers (5,900) Dairy Meal (4,500) Pigemeal (4,500) Broiler starter (7,700) Chick starter (7,700) Concentrates (25 kg) : Broiler (6000). Layers : (5,800) Growers (5000) Formulations given though keeps on changing depending on the availability of raw materials	• Does not use any cassava as ingredient	• The company stocks processed feeds and sales both mixed feeds as well as ingredients to customers • Selling of products is influenced by season depending on chicken production • Selling average per week: 100 bags/week • Some clients come with their own formulae and ingredients, asking for mixing services	• Facing problems with high moisture content in some ingredients e.g. maize bran (would like to get a solution)	• Invited to Animal feed meting	

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET	Next steps	General remarks
Gold Mills Contact person: Jaque Met 2 collegeus at the town office (dealing in cotton belts export) Visted: 26 Feb 2001 Shaun, Sicco and Lekule	• Company established 3 months ago • Makes layer and broiler mash feeds • Formulation is available • Business contacts with family contacts • Supplying small-scale farmers ie with less than 150 birds. These people buy the mix and actually supplies most people with premixed feeds. • Some larger clients will come to the mill with their own ingredients and then ask for the formulation to be made on site.	• Non e	• Just started the business and is learning the trade • Main clients are family friends and some of their partners • Main point of interest from family friends is access to credit from Gold Mills • Selling 10 t / month	• Needs information on formulations • Would like further training on computer usage and internet	• Invited to Animal feed meting • Would like further training in use of computers for animal feed	• Main requirements are business support. First requirement How to find a Market for produce? • Would like training and access to information • Would come to an information centre if also trained in use of computer and formulation software.

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Igo Animal feeds Co. Ltd Location: Old Bagamoyo Rd Mikocheni Tel:72045 C/o Mr Kinabo G. Manager Visited: 27/2/01 John, Nicolas Mlingi	Manufacture poultry feeds	none	Produce 24 tonnes of feeds per day and are operating at 60% capacity	Mr. Kinabo is a founder member of TAFMA (Tanzanian Animal Feed Millers Association) hence it would be important to work closely with him.	Invitation to workshop on Friday	This company is a key player among the local feed manufacturers in Tz. Further links sh'd be developed. The ower , Mr. Godfred A. Lema, is the chairman of the Tanzanian Animal Feed Millers Association Phone: 0744-293237 P.O. Box 4087, DSM

Organization & Key	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Interchick Co Ltd. Po Box 5774 Dar es Salaam Tanzania Managing Director Mr. N. Nambiar Dr. Ralph Pinto Veterinarian Email: Interchick@twiga.com Visited: 26 Feb 2001 Shaun, Sicco and Lekule	• Animal Feed merchants supplying 7 products but focussed on layers and broiler feeds. • Currently hatch 70,000 1 day chicks for broilers per week • Hatching 12-15,000 layers on own farm • Use of Soya (imported from India)	• None, were aware that cassava had been used, but do not consider that cassava will be a commercial option. Particularly with the current cost of Maize at 80 Tz S / kg from Food Reserve Depot. Currently buying 400 tonnes / month IC were involved in a research study with UNIDO on the feasibility of using cassava as a component in animal feed. Study results showed that cassava could be used in small quantities ie 5% of mix if the chips were available at approx 30 Tsh/kg.	• Interchick is a key player in the Tanzanian Animal Feed Association. IC are also providing farmer associations with technical advise. Focus is on quality products through quality feed and high standards of hygiene. • Selling 10-12,000 50kg bags of feed per month. Also using another 12,000 50 kg to Interchick farm for poultry production. • 50 sales agents around the country to sell the feed. • Market Share for chicks is 60%. • Market share for feed is 25%. It was higher up to 40% but prices of feed have increased due to introduction of 20% VAT market is now more competitive, with a larger number of small companies and farmers are also milling their own feed.	• Would be interested to meet with CLAYUCA people. • Would be interested in ideas of information sharing	• Invited to Animal feed meeting. • Would like separate meeting with B.Ospina and J. Buitrago	• Interchick are interested in working with SARRNET, aspects of most interest are:- • Policy issues include: • Reduction in tax on animal feed so that do not have to pass this cost onto clients. • High costs of electricity to industrialists, which means that use of equipment is restricted • Standards • IC future strategies • Tanzania is experiencing a large influx of SA companies in the fast food and retailing sector. IC intends to supply these industries with high quality products, ie processed chickens. • Note that several small feed mills and farmers are using non sterilised food stuffs such as bone meal and blood products which cause disease problems such as salmonella. • Interested in information on extruders for feed, have analysed the situation but was US$200,000 – 250,000 to adopt extrusion technology but deemed too expensive.

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET	Next steps	General remarks
Jadide Enterprises Corner junction of Ubungo / Kibaha road Mr Mligi Accountant Tel 0744 310602 Visted: 26 Feb 2001 Shaun, Sicco and Lekule	• Company has been operating for past 6 years. • Produces 4 main feeds including • Layer mash 7800 • Broiler mash 7800 • Chick mash 7800 • Grower mash 6800 • Formulations given in annex 1	• Do not use cassava and are unlikely to do so.	• Small company producing both mixed feeds and selling ingredients to clients for them to make their own formulations • Sales pattern, no clear figure at hand, but figures from one day?? (check) sold as follows:- • 26 bags Broiler • 104 bags layer mash • 11 bags grower • 10 bags chick feed • 7.5 tonnes of premixed feed, plus estimated 23 tonnes of ingredients, therefore selling 30 tonnes per day.	• Would be interested to get information on formulations • Would like access to software which could work out formulation options given lack of key ingredients • Would like access to business software and accountancy software to develop figures. • Would like access to internet but does not know how to do this. • Would be interested to buy a computer at low return loan.	• Invited to animal feed workshop. • Can SARRNET set up an office with computers to train Feed merchants in use of formulation software • Can SARRNET FOODNET set up projects to supply information technologies • Can SARRNET / FOODNET set up a loan scheme to supply business partners with computers.	• Wants to know how to gain access to larger markets • How to access cheap raw materials • How to reduce labour costs • How to analyse the business more effectively • How to use computer software to make the business financial operations more effective.

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Kibaha Educ. Center Feed Mill. (KEC) Morogoro Rd. P.O. Box 30131 Kibaha Mr. Kinenekoje Mill Manager Tel: 2402282 (off) Tel: 2402610 (Res) Visited: 1/3/01 Laswai, John, Julian, Kiddo	-This mill was purposely set up to produce feeds for the animal units at the KEC -At present feeds are sold to the various poultry farmers in the neighbourhood. Prices in Tsh. per 50Kg for products are; Chic mash @ 8,200 Br Mash @ 8,000 Layer mash @ 7,600 Growers mash @ 6,800 Breeders mash @ 8,200 They make egg trays and sell them @ 80/-	-None has been used before -if cassava is to be used, a sieve of screen size >16mm should be used to avoid dust in the mash	-The mill produces about 14 tonnes of feed per week and of this is the broiler and layers mash -The raw materials used are; Maize bran 45-50/- per Kg Maize flour 120-150/- per Kg Cotton S.cake at 90/-per Kg Sunflower 75-80/- per Kg Fish meal 350-400/- per Kg Bone meal 150-180/- per Kg Molasses 45-50/- per litre -some clients come with their own formulae	The mill manager has shown willingness to conduct joint trials with cassava There is need for further training in feed formulations	Manager invited for the feed millers workshop on Friday.	Major constraint is working capital deficiency Feed analyses are very costly

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Mkuza Chicks Ltd. Location: Mandela Rd. near TAZARA Rose Binagi Marketing manager Tel: 2139246 Tel: 2139248 Visited: 27/2/01 John, Nicholas	Makes poultry feeds and imports fertilised eggs from Uganda, S.Africa, The have the following products sold in 50Kg Bags Broiler Starter @ 8,400/= Broiler Finisher @ 8,000/= Chick starter @ 8,000/- Growers mash @ 6,500/- Layers mash @ 7,500/- The feed formulations are done with the aid of software packages.	None	25–30Tonnes of feeds are produced per day energy source; maize, Proteins source; Fish meal, seed cake Vitamin; premix from RSA Minerals & salts	It is important to link up with the proprietor who is also a director with TAFMA	Invited for the workshop but won't make it because they are in Zimbabwe on a tour of farms	This company is a key player among the local feed manufacturers in Tanzania. Further links should be developed.

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET	Next steps	General remarks
Riami Millers Mr. Mansoor Ubungo Opposite western entrance gate of University of DAR **Visited:** 26 Feb 2001 Shaun, Sicco and Lekule	• Established within the past 6 months. • Making poultry feeds for layers and broilers • Production 2 tonnes / day • Ingredients maize, maize bran, cotton cake, fish meal • Sunflower cake	• None	• New establishment,	• None	• Not invited for the workshop (2.3.2001)	• Has just started the business and may need time to become more established before we can assist or develop a useful relationship • Owner only speaks understands Swahili, • A fish meal supplier is located in the same compound (buying bigger, smaller fish from Lake Victoria region). Prices: Small Fishes: 300-350 Tsh/Kg (buying at 200-250 Tsh/Kg in Mwanza) Bigger fishes: (slightly lower prices) Milled Nile Perch waste: 180 Tsh/kg

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET	Next steps	General remarks
Top Miller Location: Kimara Mwisho Morogoro Road Mr. Shihab Salim Phone: 022-42-174 P.O. Box: 71673 DSM **Visited**: 28 Feb 2001 Lekule, Buitrago and G. Laswai	• Started in 1998, produces 4 main feeds • Price (50 Kg): Broiler 7,700 Layer 7,150 Chick Starter 7,700 Growers 6,500 • Produces feeds only on order and most customers come with their own formula • Also sells ingredients to farmers	• Not used before and scared of the problem of dust in the mash	Small companies produce both mixed feeds and sell ingredients to clients who come with their own formulae. Prices of ingredients vary from season and place to place This companies sells 5 MT per week Has a consultant to helps with formulas	• Access to information on availability of raw materials	• Invited for workshop on friday	• Seller of day old chicks

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET	Next steps	General remarks
Dar Brew Kibuko Brewer Production Manager: Mr. Sichillima M. Kazonda (Brewery Process Manager) Morogoro Road Box 21251 Dar Phone:0741-264024 Office: 2450382 **Visted:** 22 Feb 2001 Shaun, Sicco, Berte and John	• Only industrial source of Kibuko (formerly Chibuko Beer) • Company owned by Lonhro up to 1976, then nationalised and then sold recently to SAB (TZ government still 40 % stakeholder) • Beer is sold in returnable brown plastic yarns • Price of beer: 150 Tsh/bottle (180 Tsh retail) • **Brewing technique:** 8 hours mix at 60 degrees Add yeast and brewed up to 30 hours at 25 Degrees Bottled, distributed and consumed within 72 hours Alcohol content increased approx. 5%	• None; never considered	Product (Kibuko) is 80 % maize and 20% sorghum Production: 8 tonne per day Two products: Kibuko (40-50.000 Liters/day) Sorghum beer: 3 – 4.000 liters/day By production of maize beer is sold as animal feed for 5 Tsh/kg to cattle/dairy farmers Company buys maize at peak/harvest period and stores in its own godowns at the premises or outside	• Like to test one batch of cassava chips for analysis in their own company lab	• Provide test sample for analysis	• Launched recently a new product (fruit flavoured cold maize porridge) but this failed and production has stopped. • This beer is consumed by the lower urban income group • Manager suggested that sales were increasing as some people were shifting from lager beers to maize beer

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Kibo Breweries Ltd. Head office Tel: 2153416 Dar es Salaam Factory Tel 027 2754735 Moshi Mr Muftau Oshodi Purchasing Manager Visited: John, Berta,	-Produces beer and the bi-products are sold to animal feed industry -it is among the two leading beer manufacturers in TZ with market share of 20% - The Factory is situated at Moshi and owned by S. Africans.	None	-utilises 420MT of maize starch per year. It is purchased from CPC in Eldoret at a cost of $500 per MT (del. factory) - utilises starch as an adjunct. Other raw materials used include malt at a cost of $400 per MT and Sugar at a cost of $370 per MT (del at Factory)	Could hold further discussions on cassava starch properties. -there is a possibility of using cassava starch as an adjunct	-A sample of 10 Kg could be availed	Cost and availability of cassava are crucial issues to consider

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Associated Breweries Ltd. (Serengeti) Tel: Mr Shah Visited: John, Berta,	-Probably the 3rd largest beer manufacturer in Tanzania with probably <10% of the market share		There is no starch usage at all. The formations used do not allow for the usage of adjuncts.	none		- Since the use of adjuncts is heavily discouraged as per the German beer formulations that are followed

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Tanzania Breweries Ltd Uhuru Rd. Ulala Mr G. Mkolwe Brewing Manager Tel:2182779/81 Mob: 0741 266734 Visited: John, Berta,	-The company is owned by S. Africans under SABC -They hold 60% of the market share for beer in Tz	Not used before	-At present the factory utilises 600MT of Maize starch p.a and this is mostly from RSA at a cost of TSh 450 per Kg. (cif Dar) -Occasionally starch is purchased from CPC Kenya and from UK	The potential is not so high due to the fact that if a change is to occur, it must involve the other sister companies within the region.	Could hold further discussions with the Technical Director if a sample is to be tried out.	Cassava could be used if the following are taken into consideration; -Temperature at which starch gelatinises should be 68 – 72^{o}C -the starch should be oil free because oil affects the stability of the foam -Starch should be free of any toxic substances & metals

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
OK PLAST Ltd. Plot 89-90 Vingunguti industrial area Tel: 2844223 E-mail: okplast@cats-net.com Mr. Mohammed Ali Ghaddar 26-2-01	Produces waffles and is planning to resume biscuits Plans to use 50 bags per day of 50 kg Has 3 years of manufacturing and employs about 40 labourers	Has not used cassava flour before . He is willing to use cassava for trials	Currently not producing biscuits. Produced biscuits in the past using wheat flour	Firm is willing to use cassava flour once the product is of a good quality and the price of cassava is good	Should get the formulation	This is a small factory, which is trying to establish itself in the market.

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Soza plast industries ltd. Mr. Ramzi Mikocheni B Plot 112 Dar-es-Salaam Tel: 2775926/2700 880 E-mail: Soza@intafrica.com Visited: 26-2-01	Produces biscuits using wheat flour	Cassava flour can substitute wheat flour up to 30%	Has about 60% of the market Uses about 150 to 200 bags per day of wheat flour for biscuit making It's the biggest manufacturing concern in the biscuit sub-sector Operates a 2 shift production system	Is already convinced that cassava flour can be used to make quality biscuits. The concern, however, is about its marketability He suggested this should be done at the cost of Sarrnet. He is willing to assist use his distribution channe eg putting about 20 packets in each of his deliveries. He however needs to procure packaging material at a cost to sarrnet	Need to provide the flour Need to work out the cost of the samples immediately	Two crucial issues are marketability of the product and also the price of cassava flour. According to this industry, the cost of cassava should be about 1/2 that of wheat flour

Organization/ Key Person	Basic information	Relation to cassava	Current situation	Relation to SARRNET	Next steps	General remarks
Tabisco Mr. Narandra-Care-taker manager Mr. Sanjay Yenugwar (Technical Mananger) Phone: 0742-787051 Tabisco@raha.com Address: Box 570 Locations: 114 Mbozi Road, Chang'ombe DSM Visited Wednesday 21-2-01	Produces 8 brands of biscuits. The market is local, around the country. Firm enjoys about 10% of the market. It hopes to increase this to about 40 or 50%.	Have not used cassava products before. However, cassava products can partially substitute wheat flour as a raw material in biscuit making.	Uses wheat flour with quantities ranging from 40 to 100 tonnes per month depending on the demand of the product. It also uses other 7 ingredients that were not specified. The demand for the Product fluctuates with time and place eg. it is higher in Mtwara when people have sold their cashew-nuts and in Dar during time of festivities. Dar-es-Salaam constitutes the main market for the products. However, the company faces stiff competition from imports which still dominate the market. The current policy does not protect the local manufacturers against cheaper imports. The products produced have a shelf life of 12 months. Packaging material is also imported. The company uses smaller packets of 75 and 100 grams which sell at a much lower price of 50 and 100 Shillings respectively. This is done in order to increase revenue by targeting low income groups.	Interested in industrial trials to determine effectiveness of the technology. Already established distribution outlets, which he is willing to use to assess consumer acceptability. This is a crucial factor as the firm has a marketing strategy and has gradually built a name in the local market.	-Provide sample of cassava flour (about 175 kg) after 15th March -Should provide the formula for biscuit making. -Should provide technical backing at this time of industrial trials	-could make serious partner in the development and marketing of cassava based biscuits in Tanzania. Firm is willing to use cassava products if the cost of the raw material does not exceed 250 Tanzanian shillings per kilogram (factory delivered). As long as the quality is acceptable, this company might think of using cassava raw material in its products. Its crucial that the sample is provided and biscuits made to get practical economic figures as this is what will drive the company to include cassava flour its products. It might be a good idea for the industry to give the price at which it thinks cassava can be used given the competition from current cheaper raw materials

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Bahresa / Azam Bakery Moses Tel: 0744-291610 Visited: Monday 26-2-01	Makes bread and biscuits He is also a miller	Aware of cassava flour inclusion in bread making Doesn't think can work in bread Thinks it work in biscuits and cakes	One of the biggest producers Uses about 400 bags for bread and 50 bags for biscuits Employs 30 labourers in the biscuits section Each bag produces 20 boxes of biscuits with each box containing 100 packets of 35 grams each Each packet is sold for 33 TS	Is interested in using cassava flour in the biscuits Issues to resolve include the price of the cassava For bread thinks its not a viable idea	Should be availed with the sample	The technologist is already aware of the technology. This might be another good partner to push forward with

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Asante- DSM Bakery Location: Uwarani street Magomeni-Mapipa, Tel: 0744-263322/363702 Contact person Salim (manager) and Ahmed (owner) visited 28-2-01	Started in 1998. Makes bread only Products include box type, original round bread, French bread and scone The main product in terms of sales is what the industry calls the box type of bread. This product has relatively more sugar and oil	Cassava flour can be partially be substituted in bread	Employing 8 bakers running a 1 12 hr shift. Currently utilizing 15 bags of wheat flour per day. This is obtained from Coast millers (Nyati) at a cost of 12,500/= per bag, factory delivered. The flour is already partially mixed into bakers flour. However, the bakery adds more ingredients There is stiff competition amongst the flour millers leading to the practice of interlocking markets Bread is sold at 160/= per loaf factory price. The bakery too practices interlocking markets due to the stiff competition in the industry The demand for bread exhibits seasonal fluctuations. These depend on factors such the availability of substitutes in terms of cheaper farm crops like sweet potatoes, cassava during the harvest time. Substitutes lead to low demand	This factory is willing to explore marketing opportunities for the new product	Supply cassava flour sample Work together to produce the bread at the factory	This bakery thinks it would be better to introduce the cassava baking flour through millers Established millers know the type of quality that can produce good bread and the bakeries have their confidence

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Asha Bakery Location: Kinondoni Phone: 022- 2760381 Mobile: 0744-290931 E-mail: shirwaally@hotmail.com Visited 27-2-01	Makes bread only Employs 6 labourers with 1 shift Started in 1998	Never aware of cassava as a raw material before	Uses about 4 bags of wheat flour per day to produce about 100 loaves of bread Reported stiff competition that has driven sales low. There are now too many bakeries Involved in interlocking markets-receives raw material on credit Factory price for the 400 gm bread is 400 TS, which is then retailed at 160 TS or more depending on the area.	Willing to try cassava flour if gets the formulation	Avail the formulation	This is a small bakery that is struggling to stay in business

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Esam bakery Rubada-Ubungo area Manager: Mr. Said Zahoro Tel: 0741-324232 Visited: 28-2-01	Only Bread is produced	Unaware of use of cassava in bread making	Using about 20 bags per day, running one shift from 6 am to 6 pm Employs about 15 laborers Obtains flour from Soza plast who deliver it to bakery at a cost of about 12,800/= per 50 kg bag There are many bakeries now and sales have reduced. Also, the purchasing power has reduced leading to low sales	Willing to receive new knowledge but is wondering what the incentive for adoption will be	Avail the sample	

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Qooch bakery Location: Magila street, Kariako,Dar. Contacted Manager Mr. Mohammed – Mr. Qoosh –(owner) Phone: 0742-608656 Visited : 28-2-01	Bakes bread alone of 500 grams Started June 2000	Unaware of cassava as raw material in bread baking	Uses wheat flour from bibi millers. The cost could not be obtained as respondent was not the owner Currently utilizing about 5 bags of 50 kg per day. Employs 3 laborers working 24 hours per day About 180 loaves are obtained from the 50 kg bag Other ingredients include sugar, salt, yeast, and maji mix Competition is stiff now and sales have gradually come down. This is attributed to more firms coming into the industry.	The bakery is willing to receive the novel technology and to test the product on the market	Sample and technology (formulation should be availed)	This is a small bakery. Details could not be obtained as the owner was not around

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Royal Bakery Location: Swahili-Faru junction, Kariakoo Director: Ashraf M. Al-Mauly, Phone: 022- 2183850 Mobile: 0741-333128 E-mail: aalmauly@hotmail.com Visited: 24-2-01	Produces only bread	Lacks information about cassava based products	Uses only wheat flour obtained from millers. The grain is imported from Australia, Zimbabwe, Saudi-Arabia. The wheat flour costs 13,000 shs per 50 kg bag factory delivered. Before the price was 15,000/= but has now come down. The quality at times is not good for the flour. The firm thought this was due to over mixing the soft grain with the hard one thereby making the end product hard for bread. The bakery used to use 8 to 10 bags per day but since last year in August this has reduced to 4 to 6 bags. This was attributed to increased competition in the market and the fall in the consumer purchasing power. The current shelf-life of the product was 5 days in good storage conditions. This however reduced to about 3 days in poor conditions usually associated with smaller shops. A 50 kg bag of wheat flour produces about 170 loaves of 500gm.	This bakery would very much want to see the product from cassava. It is willing to try once the formula is provided along with the raw material sample.	A sample of 10 kg of high quality cassava flour should be provided to this bakery	This also could make a serious partner whom the project could and should work with to assess consumer acceptability. The bakery is willing to use its own marketing channels and experience to test the viability of the project.

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Saasi Bakery Abdalhaman Ali and Sherif Alli Abdalla Tel: 022- 2856753 Visited: 22-2-01	Produces bread only, with a specialized market - army	Cassava can be used as a partial substitute in the making of bread.	Could not divulge figures about the market size in terms of raw material usage and end product. Acknowledges stiff competition. The bakery enjoys a special market with the army	The bakery is willing to try using cassava flour in the products only on condition that the substitution rate is up to 50% and the price is not more than 130	No meaningful cooperation in the immediate future	There seems to be difficulties, as those some of those conditions cannot be met at the moment.

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Supa loaf Tel: 022-2862194 Mobile: 0744-692885 Yahya Visited: 26-2-01	Started in 1996 Produces normal sweet bread of 0.5 and 1 kg. Uses 100% wheat flour Employs 30 labourers working 3 shifts	Never used cassava flour in bread Willing to have trials conducted	Uses 60 bags of wheat flour per day with each bag producing about 150 to 155 loaves of a half kg The shelf life of the product is 4 to 5 days in a cool weather while it reduces to 3 in the very hot weather. Uses Australian wheat which was found to be good for bread. The cost of wheat is about 12,600/= per 50 kg bag from Bahresa-Azam Estimated total industry demand for wheat flour at around 1000 bags Reported stiff competition which has driven sales down	Wants to see the cassava bread Interested in trials and is willing to use once the quality is good	Should be availed samples of cassava as soon as possible.	This bakery is more concerned about quality and the price of the cassava flour

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Top bakery Tel: 2856216 Visited 22-2-01	Bakery produces bread only	This too does know that cassava can be used in bread making	It uses between 20 to 40 bags of wheat flour(50kg) per day depending on the market	This is not willing to try cassava. It says other big ones should try first and then it will also follow. They don't believe cassava can make good bread as bread requires soft grain	No immediate cooperation	Highly doubt marketability of cassava based bread

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Yombo Bakery Mr. Alfayo Tel: 022- 2864219 Visited: 27-2-01	Makes bread only 10 years experience Each loaf sells for 170 TS	Lacks information about cassava as a raw material	Currently using about 7 to 8 bags of wheat flour per day Source of the raw material is Soza plast Stiff competition at the moment which has reduced sales			Didn't talk to the owners so some information could not be availed

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Henkel Chemicals Changombe Ind. Area Mbozi Rd. Mr. Arif General Manager Visited: John, Betha	It is a sister company to Henkel EA in Kenya. It is involved in producing a number of chemicals					

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
Tanzania – China Friendship Textile Co. Ltd Ubungo Ind. Area Tel: 2443344 Fax: 2443689 Mr. Joseph Kijeruda (Deputy Manager P&T) 022-2443110 Mr Edward Chikumbeni Purchases Manager Visited: 23/2/01 John, Berta, Sicco, Shaun	-Ownership is 51% Tz Govt and 49% Chinese Govt. - produces textiles -covers 40% of the market share of locally produced textiles.	none	-utilises 100MT of food grade Maize starch from China at a cost of $0.28 per Kg (cif Dar) Maize starch from France was once used at a cost of $0.40 per Kg (cif Dar)	Not in near future	-Sample of about 50Kg could be availed to them	-availability of the starch at a price lower than the current source is very important to consider - cassava starch has to meet the required quality specifications ie moisture content <10%, has to be odourless & white in colour

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
MCC Products. Msasani Mrs Mnzava Tel: 2668910 Visited: John, Berta,	- produces composite flour, cakes, bread, snacks -1kg pack of composite flour is sold at Tsh. 1,000	none	-utilises 2MT of maize, 5MT of finger millet, 3MT of wheat, 1.5MT Soya & 0.5MT of G.nuts per annum.	Quite willing to incorporate cassava flour as a raw material	-a sample of high quality cassava flour could be availed	-if cassava is to be used, it should have a benefit in terms of cost. -at present maize flour costs 150/= per Kg while wheat costs 250/= & Soya 450/= per Kg.
Solile Products Ltd Bagamoyo Rd. Ms Solile Ramadhan Visited: John, Bertha,	Makes composite flours using maize, Finger millet, Soya & G.Nuts -1 Kg pack of composite flour is sold at Tsh.800	none	-60MT of the composite flour are made per annum. Maize is purchased at 150/= per Kg while Finger Millet at 350/= per Kg & Groundnuts at 450/= per Kg	The prospects for using cassava flour are quite high but there must be an advantage in terms of cost.	-50 Kg could be given as a sample for composite flour trials.	They are very willing to use cassava though they claim that the current cost of cassava flour is 600/= Per Kg hence there is no cost advantage.

Organization & key persons	Basic information	Relation to cassava	Current situation	Potential links to SARRNET/ FOODNET	Next steps	General remarks
Power Food Ltd. Kawa, DSM Mrs. Anna Temu Managing Director Powerfoods@hotmail.com Phone: 0744-274129 **Visted**: 24 Feb 2001 Shaun, Sicco,	• Started milling operations with maize mid'80 • Introduced Soya based products in the mid'90 • Targeting the middle and higher urban income class • Use of proper and well designed packaging material • Supplying retailers, supermarkets and refugees (WFP and TZ-Mozambique friendship NGO) • Works already with INCRISAT Bulawayo (David Robert ?) on sorghum processing (purchase of a destoner; 6,000 U$) • Intersted in Soya milk processing: identified appropriate equipment from Malaysia (www.oceangrand.com)	• Has started a new line of 1 Kg Cassava flour using SARRNET provided grating and pressing equipment • Price: Wholesale: 400-450 Tsh/kg Retail: 600-650 Tsh/kg • Price of raw material: 30.000 Tsh/tonne (Kibaha): Approx. 120 Tsh/kg flour • Sales volumes on the increase	**Products lines:** Sorghum Millet Soya Maize Blends of above Dried Soya blends for health drinks Cassava flour sales volumes are still low as there have not been any (aggressive) advertisement/promotion activities	• Despite delays in allocating funds for a joint project the company went ahead and started processing cassava	• Formulation of project between FOODNET and SARRNET on extrusion technology (based on a loan basis) for equipment (investigate the set up of a new separate company to run this facility and provide training and processing services to other private sector partners). • Conduct Internet search to find appropriate equipment, prices, capacity and import costs • Invite to next SARRNET and FOODNET SC meetings **Cassava work:** Need to test different processed flours on various cooking characteristics (i.e. elasticity, taste, preference by consumers	• Future market: will supply new RSA Scoore l (RSA Supermarket) • UNCHR/WFP have requested that future supplies need to be extruded to meet new global WTO food standards • New government regulations for supplies to institutes require micro-nutrients input (i.e. Vit A and iron). • To meet above standards she is investigating possibility of purchasing extruder (capacity up to 5 tonnes per day). Looking at a Insta-pro extruder at 50,000.U$. Looking also at packaging machine: 9,500 US$, filling machine (9,300 US$) as labour costs are high and interest in destoner (6,000 U$). This complete set will enable the business to produce full range of food, staple, baby, snack food and pet food

Organization & Key Person	Basic Information	Relation to cassava	Current situation	Potential link to SARRNET	Next step	General Remarks
TBS Tanzania Bureau of Standards Visited 28-2-01	Sets product standards and gives specifications for the industry	Private sector producers would like to know whether the products will meet standards and whether they will be accepted	At present there are no standards for cassava flour Also, biscuits specifications do not include cassava flour Cassava based products can therefore not be dismissed TBS may only do informative tests on cassava based products The cost of testing includes 5000/= for moisture;8000/= for acid insoluble ash on dry basis;10,000/= for acidity of extracted fat(as oleic acid) and a service charge of 2000/=.	Interested in co-operation to come up with standards	Should see samples of cassava-based biscuits Should sensitise TBS about the usefulness of cassava in biscuit making	At the moment TBS does not offer any obstacles to the promotion of cassava-based biscuits

Annex 5. Information gathered in tanzania. Second round of visits with industries

Organization & key persons	Basic information	Relation and interest to cassava	Follow up activities
Interchick Co Ltd. Po Box 5774 Dar es Salaam Tanzania Managing Director Mr. N. Nambiar Dr. Ralph Pinto Veterinarian Email: Interchick@twiga.com **Visited:** 26 Feb 2001 Shaun, Sicco and Lekule	• Animal Feed merchants supplying 7 products but focussed on layers and broiler feeds. • Currently hatch 70,000 1 day chicks for broilers per week • Hatching 12-15,000 layers on own farm • Use of Soya (imported from India) • Interchick is a key player in the Tanzanian Animal Feed Association. IC are also providing farmer associations with technical advise. Focus is on quality products through quality feed and high standards of hygiene. • Selling 10-12,000 50kg bags of feed per month. Also using another 12,000 50 kg to Interchick farm for poultry production. • 50 sales agents around the country to sell the feed.	• Experiment on cassava and sweet production has been installed using organic manure as a source of fertiliser • Experiment on animal feeding will be installed later this year using raw materials produced in the experiment (cassava roots, cassava foliage and sweet potato)	Kibaha research Station Will provide planting material, field layout and technical assistance during planting, manuare application and disease application. SARRNET Staff in Tanzania will provide logistic support during the experiment

(These contacts were realized by Sicco Kolijn and collaborators in Tanzania)

Company and location	**Picture**	**Land Preparation**	**Check visit 28th June (John and Sicco) and August/September**
Interchick Kunduchi, 20 Km north of DSM City centre, along the Bagamoyo Road. The land is on a hill, 4 km from the Ocean	**28 June 2001**	Land preparation and planting completed late due to some internal constraints within Interchick. (2nd week of May). Estimated area: 1.5 acres of cassava 1.0 acre of sweet potato	Need to check late September and start harvesting sweet potato
Malika Investment Pugu Hills, 25 Km South west of City Centre DSM		Land preparation and planting was carried out late April. SARRNET financed purchase of manure and transportation costs to the farm. Estimated area: 4 acres of cassava 1.5 acres of sweet potato	Mr. Malika had travelled up to USA (3 months) SARRNET has financed hand weeding of the plot The company is now only selling one-day chicks as the feed milling operations have been suspended

Company and location	Picture	Land Preparation	Check visit 28th June (John and Sicco) and August/September
Kihamia Plot situated 3 Km north of the Morogoro highway, 10 km west of Ubungo.	**25 April 2001** **28 June 2001**	On 25th April Sicco checked out the plot with Prof. Kihamia. Chicken manure was bought from Interchick. Planting was done early May. As the ridges were big the spacing was not ideal. Estimated area: 1.5 acres Cassava, 1 acre sweet potato.	As planting was done rather late the crop did not grow very well due to shortage of rain. Need to weed some parts of the plot as grass is getting through. Sweet potato planted earlier seems to be ready to harvest .

Company and location	Picture	Land Preparation	Check visit 28th June (John and Sicco) and August/September
Farmers' centre/ Salim Msellem The farm is located 10 km south of the intersection road between Kigamboni and the connection with Kilwa road. (25 km south of town using the ferry)	**4th April 2001** **28 June 2001** **6 August 2001**	Planted was done early April with addition of cow manure as fertiliser. Salim Msellem requested for more planting material, as they wanted to plant a larger field. Crop development was also affected by short rainfall. Part of the field was planted with groundnuts and beans as intercrop. Estimated area planted: Cassava 2 acres Sweet potato 2 acres	Due to a communication mistake the farmer-applied manure in all fields… There is a clear, visible effect of the impact of manure application on the germination and growth of both crops. Farmer is very eager to use leaves as feed ingredient. Early September Sicco collected a grass chopper from the farm which needed some repairs. This chopper will be used for leave chopping in the 4 trial plots. Chopping of leaves will start late September after a visit by the Kibaha team to evaluate the effect of manure application on disease incidence in the different plots.

Company and location	Picture	Land Preparation	Check visit 28th June (John and Sicco) and August/September
Kibaha Root Crop Research Program 40 Km west of Dar es Salaam along Mogorogo high way		Sweet potato was planted late April 9 plots with different treatments, (Estimated area of 20 sq.mt each). In another plot 1 acre of sweet potato was planted for vines production. Poor rainfall affected crop development Early September the team tried to dry leaves but all turned brownish during sun drying. Just recently we founded out that drying in the shade could avoid the discolouring.	

General observations:

- Planting was done late at all 4 plots due to late land preparations and other commitments / activities by the Kibaha team (planting their own, earlier planed plant trials) in April.

- The effect of manure application on the growth is clearly visible, as the crop seems to have a better leave and stem production.

- Most of the cassava plots intended for leave production are growing slowly therefore periodic harvesting of leaves has been postponed until the unset of the coming rains. (Expected early October).

- The Kibaha team will evaluate the plots within the the coming 2 weeks and find out what the effect is on crop yield and disease infestation.

- Commercial growers of sweet potato in the region are expecting that sweet potato yields this season will be 30 to 40% lower than last year due to insufficient rains during May and June.

Annex 6. PROPOSAL PRESENTED BY FOODNET/SARRNET TO CTA FOR DEVELOPMENT OF A PRIVATE – PUBLIC SECTOR PARTNERSHIP BASED AROUND A BUSINESS CENTRE FOR SUPPORT TO THE POULTRY FEED SECTOR IN TANZANIA

Development of a Private – Public sector Partnership based around a Business Centre for support to the Poultry feed sector in Tanzania

Submitted to the CTA

Dr. Germana Laswai Sokoine University for Agriculture SUA, Project leader
Dr. Anna A. Temu SUA
Dr. Bernardo Ospina CLAYUCA
Mr. Sicco Kolijn IITA-SARRNET
Dr. S. Ferris IITA-FOODNET

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J Appendices

A. Background

FOODNET project 17, entitled "Strategies for the Improvement of Poultry feed industry in Tanzania" http://www.cgiar/foodnet/Projects/projects.htm was developed to analyse the value-adding processes and quality control mechanisms in the production of poultry feeds and identify the major constraints and best opportunities available for promotion of good quality poultry feeds in Tanzania, with a focus on incorporating new lower cost substitutes into the feed such as roots and leaves from cassava and sweet potato.

Progress to date:

A market survey study was organised and executed in collaboration with the SARRNET, CIAT and CLAYUCA(Colombia), FOODNET, TFNC and TARP II-SUA (Cassava Commercialisation) projects, during the last two weeks of February 2001. The major purpose of the study was to find out possibilities of commercialising cassava through its inclusion in various processed products. The sectors visited were animal feeds, bakeries, small food processors and non-food firms. The information collected was mainly the types of products processed, volumes, raw materials and end products including prices. The opportunities for the inclusion of cassava in the various products were also identified.

A summary of the poultry feed processing sectors visited and their approximate annual volumes of the feed processed are presented in Table 1. Detailed information was collected on the sectors, including location, contact addresses, current production status and constraints to production. In addition the possibilities of including cassava into their products and potential collaboration in research were discussed and several joint projects were developed and are currently being implemented. This was a very encouraging development given that prior to the market survey, there were no linkages between SUA and the private sector.

Table 1: A list of feed processing firms visited in Dar es Salaam and Kibaha and their approximate volumes

Feed Sector	Volume (tons/Year)
Interchick	13,200
Riami Miller	720
Jadide	7,800
Gold Feed mills	360
Top Miller	520
A-Z Feed Miller	1,300
Km Animal Feed	NA
Igo	6,240
Mkuza chicks	10,000
Farmer Miller	10,000
Kibaha Education Centre (KEC)	728
Interfarm	200

The processors gave various feed formulations and they seem to vary between batches and sectors due to availability and price of the raw materials. The different types of poultry feed products produced by the different mills and approximate prices are shown in Table 2.

Table 2. Types of livestock Feeds produced by the feed mills and selling price

Product	**Price range (Tsh./50 kg bag)**
Broiler mash	7,500-8,000
Layers mash	7,000-7,500
Growers mash	5,900-6,500
Broiler starter	7,700-8,200
Breeder starter	8,200
Protein concentrate	5,000-6,000

4.3 Meeting of the market survey study group

Members who participated on the market survey study met on 1st March 2001 to synthesise the information collected during the survey with regard to livestock feed processing and marketing. The following is a summary of the observations made:

a) The annual average production level of livestock feeds in the visited sectors ranged from 200 to 13,000 metric tonnes. The national capacity of the livestock feeds produced is about 300,000 metric tonnes. Production is mainly concentrated in Dar es Salaam.

b) The types of the feed produced were mainly Broiler mash (55-60 %), layers mash (30-35%) and less than 5% of the other types shown in Table 2.

c) Raw materials commonly used in the formulations were maize, maize bran, fishmeal, cotton seed cake, sunflower seed cake and wheat. Other ingredients include salt, bone meal, limestone, dicalcium phosphate and vitamin-mineral premixes. Essential amino acids, such as lysine and methionine are also used in some sectors. Cassava is not been used in livestock feed processing.

d) The prices of the different raw materials are quite variable depending on the source and season. The strategic grain reserve was shown to skew the prices of maize hence cause price imperfection.

e) Some large feed millers have vertical integration in their operations. Some have hatcheries, processes feeds, have farms, sell birds and buy birds from their clients, sometime on exchange with feeds and sell to their agents. Some provide extension services to their clients.

f) The feed millers have recently revived their organisation, Tanzania Feed Millers Association (TAFMA)

g) Minimal attention is being placed on the standards for the whole poultry industry, from production, processing to marketing. For example, only about 5% of birds produced are sold as processed chickens (dressed). The rest (95%) as live birds.

Poultry keepers prefer selling broiler at less than 6 weeks. There is no incentive for the quality of birds on the market and the like for the processed feeds.

h) The major constraints identified with the feed processors were:

   a) There is general lack of information on optimal feed formulations and other business aspects related to the industry

   b) The millers had no contacts with research agencies within Tanzania, some companies did use local consultants on an adhoc basis.

   c) The millers had little access to current information related to the feed industry and only one feed miller had access to a computer and the internet. This was the largest miller. Most other millers were either reliant on supplied information from trade sources or were not able to get new information.

   d) No millers had regular access to formulation software to improve the quality of their feeds based on access to feed ingredients which are constantly changing.

   e) Lack of update nutritional values of raw materials and processed feeds and no access to new ideas for substitution of higher cost materials with low cost substitutes such as cassava.

   f) There are some unfavourable trade policies, such as taxes for manufactured goods versus imported goods and taxes for large-scale versus small-scale producers. For example manufactured goods pay a value-added tax (VAT) of 20% and less for imported goods. VAT is only been paid by large-scale producers and exempted for small-scale producers.

   g) Marketing of feeds is also limited. Most of the time in cash as there is little customer loyalty.

   h) None of the Millers, bar one, had access to business related software

i) Basing on the above observations the following were suggested as possible interventions;

   a) Supply of price lists of raw materials to the market
   b) Provide business training and business information for feed millers, livestock keepers, etc.
   c) Provide information accesses to feed millers and farmers (e.g. Internet e-mail, price optimisation software etc.)
   d) Sensitisation on cassava usage as a raw material to feeds. Practical trials of cassava.
   e) Demonstrations on the utilisation of cassava roots and leaves in various forms to farmers.

j) In the part of FOODNET project, it was recommended that a joint business between the researchers and feed processors to be initiated and provide the following:

a) Market information access (e.g. internet e-mail, price)
b) Feed optimisation/formulation software
c) Catalogue of feed tables
d) Testing of some raw materials and processed feeds
e) Client oriented seminars
f) New technologies
g) Business information centre and training

B. Problem statement and significance

The Feed millers association is a broad collection of millers, most of whom are small-scale operators. This group has poor linkage with research institutes and also has significant problems in gaining access to new forms of IT based technology to obtain information regarding new animal feed based technologies, trade information in regard to their business interests. The millers are not using feed optimization software due to lack of awareness and are also not able to access simple business development software for accountancy and other decision making tools through which they could improve their competitiveness and business opportunities. The idea of using alternative feed sources such as root crops was not something that the group had considered.

C. Research question.

Is developing public-private sector partnership an effective and sustainable way of strengthening linkages between public research organizations, who are seeking to develop a market oriented or more commercial approaches to their technology generation and delivery activities and private sector organizations faced with lack of information on new technologies, poor access to IT communication systems and software for improving their product quality and ability to improve their sectoral competitiveness through training that links business acumen with new technology adoption.

D. Objective

To develop a public –private sector interface via the development of a joint business center to strengthen the ability and the availability of information and tools to plan and undertake agro-industrial research between the national agricultural research systems of Tanzania and the private sector; to support members of the Tanzanian Feed Millers Association to establish functional agroindustrial research partnerships, whereby both researchers from SUA, MinAgri and IITA can interact with members of the private sector organization TAFMA in improving

E. Methodology

The methodology for developing the partnership is based on the model developed by CIAT for CLAYUCA and that being developed by ISNAR for agro-industrial partnership development for Latin America. This is a relatively new area of research for agriculture, but is one that has good prospects for sustainability as it is directed towards and hopefully eventually taken over by the private sector.

F. Policy implications and expected Output

The development of a Public-Private Partnerships for Agro-industrial Research will have far reaching policy implications if this proves to be successful and also provides a new approach to Public research for sustainable and competitive agroindustrial development. Public research organizations contribute to the knowledge base required for agroindustrial development and may guide agroindustrial development to minimize environmental risks and maximize the contribution to poverty alleviation. This may be done, for example, by the generation of technologies to reduce waste and by the development of value added chains that integrate small scale producers with consumer markets. More integrated farmers that better understand the market will be able to adapt their production and increases their incomes more effectively. In this way the public sector fulfills its function of setting an appropriate enabling framework for agroindustrial development.

By responding to the demands of the agroindustry, public research organizations in Latin America, such as CLAYUCA, widen their stakeholder base. They gain a new client who needs quality research services and may provide financial compensation if they positively respond to their research demands. Some agroindustries in the region are ready to invest substantially in research, such as the substitution of maize with cassava based products which either can be carried out by themselves or by research organizations on contract. Providing efficient and effective research results to agroindustry enhances the relevance of public research at a moment that the traditional production-oriented mandate is eroding.

An effective focus on the agroindustry can only be achieved when the changing role of public agricultural research in general is recognized. It has become apparent that technological innovations no longer solely originate from the research institutes that were established for this purpose in the 1950s. Donors, development theorists, and governments start to advocate more flexible research systems, in which public research organizations, universities, extension services, NGOs, private companies, and farmers organizations collaborate and compete freely (Byerlee, 1998). This movement is fueled by the concern about the limited success of the traditional agricultural research organizations and its technology generation and transfer approach to solve contemporary problems of agriculture and rural development. Agricultural research should rather take place within more pluralistic knowledge generation and information systems (Hartwich and Meijerink, 1999). Within these knowledge and information systems, the actors form partnerships according to their specific demands and expertise.

G. Workplan

Activities	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**May**	**June**	**July**	**Aug**	**Sept**
Set up centre	Xx	xx										
Meetings with TAFMA and research group	xx	xx	xx	xx	xx	xx	xx	xxx	xxx	xx	xx	xx
Developing training		xx		xx		xx		xxx		xx		xx
Training activities			xx		xx		xx		xxx		xx	
Develop joint research activities		xx	xx	xx								
Implement joint research			xx	xx	xx	xx	xx	xxx	xxx	xx	xx	xx
Develop a business plan for long term							xx		xxx		xx	
Website development and updating	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Report writing						xx						xx
Workshop with IITA / CLAYUCA						xxx						xxx

Roles and beneficiaries

SUA to provide technical support to TAFMA poultry feed members in terms of feed development and on-farm feed formulation trials.

IITA-SARRNET to develop the protocols of operation between the Tanzanian research group and the TAFMA members, management support and operational assistance as required.

CLAYUCA a public – private sector organization based in Latin America, with links to SARRNET, to provide input in terms of technical advise, training and conceptual development for the partnership.

IITA-FOODNET to provide technical support for business tools usage and skills development for software management.

TAFMA to provide technical support in terms of developing joint projects, business planning and being the recipient for the private – public sector agency.

Beneficiaries

Primary beneficiaries

TFMA members are the primary beneficiary from this process as they will be the main target of the business center and the research developments based on the poultry sector

SUA, will benefit from close contact with the private sector and through making their research outputs more aligned to the market needs.

IITA/CLAYUCA will benefit from fulfilling one of our more challenging targets that of public private sector partnerships developments

Secondary beneficiaries

Cassava farmers who are producing the raw materials that are intended for substitution in the animal feeds

Consumers who will gain from cheaper meat products

Other processing organizations such as the women's food processing association recently developed by SIDA, who would also benefit from association with the business center and associated linkage to the cassava processing group at IITA-SARRNET.

H. The Budget

Budget	No	Unit cost	2001	2002	2003
Project staff			7000	7000	Sustainable
Motorbike			1000		
Fuel			1500	1500	
Travel			3000	3000	
Computers	3	1000	3000		
CD-copier	1	600	600		
Email / internet connectivity	1	350	350	350	
Telephone connection	1	150	150	150	
Telephone costs	12	50	600	600	
Training	4	500	2000	2000	
Rent	12	60	720	720	
Security and electricity	12	100	1200	1200	
Overhead	*22.8*		*4,794*	*375*	
Total			**25,914**	**16,895**	
Supplemental support					
IITA SARRNET					
Staff time			2000	2000	
Transport			500	500	
Workshops			1000	1000	
Training			1000	1000	
CLAYUCA support			2000	2000	
Joint projects at sites			1500	1500	
IITA-FOODNET					
Training			1500	1500	
Staff time			2000	2000	
SUA					
Joint projects at sites			1000	1000	
TFMA					
Staff costs					7000
Recovery costs for services					3000
Total			**12500**	**12500**	**10000**

References

Byerlee, D. **1998**. The Search for a New Paradigm for the Development of National Agricultural Research Systems. World Development, Vol. 26, No 6, pp. 1049-1055.

Bernardo Ospina (**2000**) CLAYUCA, a public-private sector partnership developed for linkage between the poultry industry in Latin America and CIAT.

Willem Janssen, (**2001**) Public-Private Partnerships for Agro-industrial Research. ISNAR Project development document.

Hartwich, F. and G. Meijerink **1998**. Questioning the NARS Paradigm: An Alternative View on the Generation of Agricultural Knowledge: Revising the systems approach to national agricultural research. ISNAR Discussion Paper, 99-4, ISNAR, The Hague.

Project **16**: Improvement of Marketable

Project **Leader**: Dr. Tagelsir Khidir Ahmed

Funding: The Foodnet funds got delayed due some political problems in the baking System .

Activity 1:

- Questionnaires were prepared for interviews that were carried out at Abu Delag and Tamboul Districts.
- The interviews were conducted at Abu Delag district 170km East of Khartoum with camel-herd owners and district officials on 16th may 2001.
- Similar interviews were conducted in Tamboul with Pastoralist Union officials and district officials on May 23.2001.

The questionnaires will be analyzed after completion of surveys in other areas .

Activity 2:

- Fabrication of churn unit for fermented milk.

Modified unit for churning milk has been fabricated according to the specification suggested by Dr.Tagelsir. This equipment will be in the project.

Dr. Tagelsir Khidir Ahmed

Project 17

ASARECA/FOODNET PROJECT 17
PROGRESS REPORT IN THE FIRST QUARTER (FEB. TO APRIL 2001) AND REVISED ACTIVITIES

1. Names of Researchers and Institutions:

Dr. G. H. Laswai	SUA, Project leader
Dr. Anna A. Temu	SUA
Dr. Salome K. Mutayoba	SUA
Dr. S.J.S. Mosha	TBS

2. Project Title: Strategies for the improvement of poultry feed industry in Tanzania

3. Project Purpose

To analyse the value-adding processes and quality control mechanisms in the production of poultry feeds and identify the major constraints and best opportunities available for promotion of good quality poultry feeds in Tanzania.

4. Activities performed during the reporting quarter

4.1 Planning meetings

Four planning meetings took place during the reporting period. Two meetings were held at SUA, Morogoro on 12th and 16th Feb., respectively and involved SUA research project members only. One meeting was also held at SUA on 23rd Feb. 2001. In addition of SUA project research members, FOODNET Co-ordinator (Dr. S. Ferris) and SARRNET representative in Dar es Salaam (Dr. K. Sicco) and project leader for the TARP II sub-project on Commercialisation of Cassava (Prof. F.P. Lekule) attended. The fourth meeting was held in Dar es Salaam on 2nd March 2001, following the feed millers meeting. All the project research members attended the meeting, together with the FOODNET and SARRNET co-ordinators, and Drs. J. Buitrago and B. Ospina from CIAT, Columbia. Among other things, the later meeting pointed out the need for the revision of the project activities basing on the outcomes of the market survey study explained below.

4.2) Market survey study in Dar es Salaam

A market survey study was organised and executed in collaboration with the SARRNET, CIAT (Columbia), FOODNET, TFNC and TARP II-SUA (Cassava Commercialisation) projects, during the last two weeks of February 2001. The major purpose of the study was to find out possibilities of commercialising cassava through its inclusion in various processed products. The sectors visited were animal feeds, bakeries, small food processors and non-food firms. The information collected was mainly the types of products processed, volumes, raw materials and end products including prices. The opportunities for the inclusion of cassava in the various products were also identified.

The project leader (Dr. Laswai) participated on this study, particularly on the part of the livestock feed processing, on which this report is based. A summary of the poultry feed processing sectors visited and their approximate annual volumes of the feed processed are presented in Table 1. Detailed information was collected on the sectors, including location, contact addresses, current production status and constraints to production. In addition the possibilities of including cassava in their products and potential collaboration in research were sorted out.

Table 1: A list of feed processing firms visited in Dar es Salaam and Kibaha and their approximate volumes

Feed Sector	Volume (tons/Year)
Interchick	13,200
Riami Miller	720
Jadide	7,800
Gold Feed mills	360
Top Miller	520
A-Z Feed Miller	1,300
Km Animal Feed	NA
Igo	6,240
Mkuza chicks	10,000
Farmer Miller	10,000
Kibaha Education Centre (KEC)	728
Interfarm	200

The processors gave various feed formulations and they seem to vary between batches and sectors due to availability and price of the raw materials. The different types of poultry feed products produced by the different mills and approximate prices are shown in Table 2.

Table 2. Types of livestock Feeds produced by the feed mills and selling price

Product	Price range (Tsh./50 kg bag)
Broiler mash	7,500-8,000
Layers mash	7,000-7,500
Growers mash	5,900-6,500

Broiler starter	7,700-8,200
Breeder starter	8,200
Protein concentrate	5,000-6,000

4.3 Meeting of the market survey study group

Members who participated on the market survey study met on 1st March 2001 to synthesise the information collected during the survey with regard to livestock feed processing and marketing. The following is a summary of the observations made:

j) The annual average production level of livestock feeds in the visited sectors ranged from 200 to 13,000 metric tonnes. The national capacity of the livestock feeds produced is about 300,000 metric tonnes. Production is mainly concentrated in Dar es Salaam.

k) The types of the feed produced were mainly Broiler mash (55-60 %), layers mash (30-35%) and less than 5% of the other types shown in Table 2.

l) Raw materials commonly used in the formulations were maize, maize bran, fishmeal, cotton seed cake, sunflower seed cake and wheat. Other ingredients include salt, bone meal, limestone, dicalcium phosphate and vitamin-mineral premixes. Essential amino acids, such as lysine and methionine are also used in some sectors. Cassava is not been used in livestock feed processing.

m) The prices of the different raw materials are quite variable depending on the source and season. The strategic grain reserve was shown to skew the prices of maize hence cause price imperfection.

n) Some big feed millers have vertical integration in their operations. Some have hatcheries, processes feeds, have farms, sell birds and buy birds from their clients, sometime on exchange with feeds and sell to their agents. Some provide extension services to their clients.

o) The feed millers have recently revived their organisation, Tanzania Feed Millers Association (TAFMA)

p) Minimal attention is being placed on the standards for the whole poultry industry, from production, processing to marketing. For example, only about 5% of birds produced are sold as processed chickens (dressed). The rest (95%) as live birds. Poultry keepers prefer selling broiler at less than 6 weeks. There is no incentive for the quality of birds on the market and the like for the processed feeds.

q) The major constraints identified with the feed processors were:
    i) There is general lack of information on optimal feed formulations and other business aspects
    j) Lack of update nutritional values of raw materials and processed feeds
    k) There are some unfavourable trade policies, such as taxes for manufactured goods versus imported goods and taxes for large-scale versus small-scale producers. For example manufactured goods pay a value-added tax (VAT) of 20% and less for imported goods. VAT is only been paid by large-scale producers and exempted for small-scale producers.

l) Marketing of feeds is also limited. Most of the time in cash as there is no customer loyalty.

r) Basing on the above observations the following were suggested as possible interventions;

f) Supply of price lists of raw materials to the market
g) Provide business training and business information for feed millers, livestock keepers, etc.
h) Provide information accesses to feed millers and farmers (e.g. Internet e-mail, price optimisation software etc.)
i) Sensitisation on cassava usage as a raw material to feeds. Practical trials of cassava.
j) Demonstrations on the utilisation of cassava roots and leaves in various forms to farmers.

k) In the part of FOODNET project, it was recommended that a joint business between the researchers and feed processors to be initiated and provide the following:

b) Market information access (e.g. internet e-mail, price optimisation soft ware)
b) Feed optimisation/formulation software
h) Catalogue of feed tables
i) Testing of some raw materials and processed feeds
j) Client oriented seminars
k) New technologies
l) Business information centre and training

4.4 First Feed Millers Meeting

A meeting between feed millers and researchers was held on 2nd March 2001. Livestock feed millers and researchers from CIAT, Foodnet, SARRNET, SUA, TFNC and TBS participated. In addition representatives from the Ministries of Agriculture and Food and Water and Livestock Development also attended the meeting.

The agenda for the meeting were:

i) Presentation by Ferris Shawn on the observations made on the market survey study done on the feed mills around Dar es Salaam and Kibaha Districts and suggested possible interventions
ii) Presentation by Bernardo P. Ospina from CIAT, Colombia on the integrated approach on cassava utilisation.
iii) Presentation by J. Buitrago from CIAT on the production costs versus output from the poultry industry.
iv) Discussions

During the discussion session some of the feed millers volunteered to participate in the cassava research. In addition it was agreed that another meeting of the feed millers be

held in order to gauge their commitment for their involvement in the research and in particularly the establishment of an Information/business centre. The meeting was planned to take place on 8th March 2001.

4.4. Second feed millers meeting

The second meeting of feed millers was held on 8th March 2000. Two representatives of the feed millers attended. Other participants were Dr. K. Sicco, SARRNET office Dar es Salaam, Dr. B. P. Ospina and Dr. G.H. Laswai. After revisiting the observations made on the marketing study and presented in the previous meeting, two representatives of the feed millers volunteered to prepare a concept paper, which could be used as a working paper during the meeting of their association (TAFMA). It was agreed also that the meeting of TAFMA be held towards the end of March or early April 2001.

5. Revised project activities

The project activities initially planned were revised in order to include interventions for the identified feed sector problems (Ref. Sect. 4.3j). The following activities will be considered in the coming project period:

5.1 Development of a catalogue of feed tables

A catalogue of feed tables will be developed by compiling existing information on feed composition and nutrient requirements of different groups of poultry from various sources. The information sources will include Sokoine University of Agriculture National Agricultural Library (SNAL), Tanzania Food and Nutrition Centre (TFNC), Tanzania Bureau of Standards (TBS) and Tanzania Feed Manufacturers Association (TAFMA). A research assistant will be required for this work.

5.2 Feed Testing

The information compiled in the feed tables, especially on the feed composition will be updated/supplemented by carrying out various feed tests. The type of feeds and analyses to be carried out will depend on the variability of the feed materials and reliability of the information gathered.

5.3 Feed optimisation/formulation software

The software for feed optimisation budgeted in the original project proposal appeared to be too expensive for the project to afford. During the project-planning meeting in Dar es Salaam, Dr. J. Buitrago promised to find ways of providing this software. The FOODNET co-ordinator, Dr. S. Ferris will make a follow on the issue.

5.4 Establishment of a business information centre

A business information centre will be established as a link between the feed millers and the researchers. The centre will be equipped with two computers, Internet access, telephones and catalogues of feed tables. Other information to be available is prices of different feed raw materials, feed optimisation programme and other relevant market information. This will allow the feed millers to access information easily and utilise the available facilities at a cost. The centre will be expected to run under TAFMA supervision and the modalities are being worked out.

Need to find the interview frames???

6. Financial Statement

ITEM	AMOUNT	
	US$	TSH[1]
Disbursement (Feb. 2001)	1,000	802,000
Expenditure	705.87	564,700
Balance	294.13	235,304

[1] Average exchange rate 1US$ = 800 Tsh.

The detailed accounts including receipts are sent by DHL

7. Budget for Planned activities (See budget notes)

ITEM	COST (US$)
1. Personnel	2,500
2. Supplies	3,800
3. Services	1,700
4. Travel	1,500
5. Equipment	4,000
6. Meeting costs	-
TOTAL	**13,300**

Budgetary Notes:

ITEM	**AMOUNT (US$)**
2nd Period (six months, US$ 6,500)	
i) Development of catalogue of feed tables	
Research assistant for 4 months @ US$ 250	1000
Travel costs	500
Per Diem for literature search for 20 days @ US$ 40	800
Stationery and Publication	800
Communication	400
ii) Feed testing	
Sampling costs	500

Laboratory chemicals and labour charges	2500
Sub-Total	**6500**
3rd period (three months, US$ 7,000)	
iii) Establishment of business information centre[1]	
Two computers and printer	2000
Two telephones lines	2000
Office-space hire	1500
Staff hire for 6 months @ US$ 250	1500
Sub-Total	**7000**
GRAND TOTAL	**13,500**

[1] The business information centre will be established and assisted initially to enable the Feed Millers Association develop strategies for managing it, probably through charging the services.

8. Chronogram of project implementation

The project will continue for another nine months according to the following action plan:

Period	Payment Instalment	Project Activity	Output
6 months (May to Oct. 2001)	**(US$ 6500)**	1. Development of catalogue of feed tables 2. Publishing the feeding table 3. Feed sample collection and laboratory analysis 4. Writing and submitting second report	1. Booklet of feed composition and poultry requirements available to feed millers 2. Nutritional composition of major raw materials and feeds established 3. Second report submitted
3 months (Nov. 2001 to Jan. 2001)	**(US$ 7,000)**	1. Soliciting office space and staff recruitment 2. Two computers and printers purchased 3. Two telephone lines installed 4. Final report writing and submitting	1. Business information centre established 2. Final report written and submitted

9. Additional Comments

The project has been revised to accommodate some of the identified interventions for solving the feed millers' problems.

Date…11th April 2001 Signature G.H. Laswai

ASARECA/FOODNET PROJECT 17
PROGRESS REPORT IN THE PERIOD APRIL TO AUG. 2001

1. Names of Researchers and Institutions:

Dr. G. H. Laswai	SUA, Project leader
Dr. Anna A. Temu	SUA
Dr. Salome K. Mutayoba	SUA
Dr. S.J.S. Mosha	TBS

2. Project Title: Strategies for the improvement of poultry feed industry in Tanzania

3. Project Purpose

To analyse the value-adding processes and quality control mechanisms in the production of poultry feeds and identify the major constraints and best opportunities available for promotion of good quality poultry feeds in Tanzania.

4 Activities performed during the reporting quarter

4.1 **Development of catalogue of feed composition tables**

A research assistant (Mrs. Pamela Kusolwa) has been recruited to assist on the development of feed composition tables. Available information is been collected through literature search, and this will be combined with the analyses to come up with the feed tables. This activity is progressing well.

4.2 **Field trips**

The activity was carried out as part of FOODNET Research Project activities and it involved visits to Dar-Es-Salaam by the research team, Dr (Mrs.) G.H.Laswai; Dr (Mrs) Anna Temu and Dr (Mrs) S.K.Mutayoba and a research Assistant (Ms Pamela Kusolwa). The major objective of the trips was to find out the views of the feed millers and other partners i.e. Ministry of Water and Livestock and Agriculture, Sector Program Support (ASPS) project and TBS on the possibility of collaboration in research and establishment of the Business Information Centre. The visits aimed also in collecting samples of feed ingredients used in the formulation of poultry feeds from various mills.

4.2.1 Visit to TBS: Dr J .Mosha, one of the research partners was visited at TBS to discuss project implementation plans. The progress of the project was discussed briefly and the following were noted: The research assistant had already been recruited and had started

working on the development of poultry feed table through literature search. In connection to this it was further noted that feed ingredients are to be collected from the feed millers and carry out chemical analyses at TBS (Tanzania Bureau of Standards). After meeting the head of the laboratory section at TBS, it was found out that the components of feeds which could be analysed by TBS were Dry matter (DM)/Moisture and Crude protein (CP) only. It was AGREED that several analyses could be carried out using various laboratories at SUA. The foreseen problem was for the amino acid profiles, which are not analysed in most laboratories in Tanzania. Depending on the money available, samples could be sent to outside laboratories for amino acid analysis. Whilst at TBS the team was informed by Dr. J..Mosha that there was an initiative of developing a feed standards act and that a preliminary meeting was to take be held in Dodoma, discussing a consultative report on this. Likewise the process of developing East African Feed Standards for different classes of poultry is currently in progress.

4.2.2. Ministry of Water and Livestock: Discussions were made with Mr. J.Boki, who was the acting Director of Animal Production at the Ministry. During this visit, Mr. Sicco also accompanied the research group. The idea of establishing a Business Information Centre was well received and supported by Mr J. Boki, who pointed out further that the Ministry in previous years has been making attempts of meeting the feed Millers and that they had various meetings in the different Zones. Nonetheless, he noted that there were some problems with the feed millers and that sometimes it was difficult to implement some of the agreed plans. He commended on what has been planed by the group and insisted the need of having a stronger collaboration between the various stakeholders such as the University, Feed Companies, NGOs, different projects etc. in the development of the sector. He pointed out that the immediate undertaking was to have a Rapid Appraisal of the Tanzanian Feed Sector, identify who are the players, their capacities, constraints and potentials. It was noted that the Ministry/Government was working on introducing a feed law, which will be responsible for regulating the feed industry.

4.2.3. Agricultural Sector Support Programme (ASPS): Met Dr Soyi, who is an in-charge of the livestock sub sector under the programme. The Foodnet Project Leader briefed Dr Soyi about the project and enquired on the possibility of

collaborating with ASPS. Dr Soyi deliberated on the activities of ASPS. He noted that ASPS started in 1999 with a sectoral review on livestock as a whole. The project aimed at identifying the activities carried out by the Ministry/government (public sector) and those of the private sector. One of the activities the program is working on under the public sector is that of developing a feed act. He mentioned that there were shortfalls in the existing by laws and as a result of this it was difficult to enforce standards of Livestock Feeds and many products produced in the country. He mentioned the importance of having a central laboratory and informed members that some lab equipment was bought by JICA and waiting for installation. The Central office for private Livestock Sector under ASPS is in Morogoro. He stressed that research carried out under ASPS should be client-oriented research. He informed the members that ASPS programme was under review in preparation for the next phase of 2003 and that there was room for including new areas of activities as long as the Directorate in the Ministry recommends them.

4.2.4 Interchick - The persons contacted were Mr. Nambiar, a General Manager and Mr. Jagadi, a Quality Controller. Mr Nambiar gave a briefing about the activities at Interchick and highlighted that production of poultry feeds was their major activity. He further gave a brief information about TAFMA (Tanzania Feed Millers Association) and that there were about 36 members. Feed manufacturing was mainly based in Dar-es-Salaam (70%) and the other regions accounted for about 30%. He was positive about the idea of establishing Business Information Centre and stressed that the centre should make sure that the information reaches all stakeholders, it should provide new information about alternative feed ingredients, feed formulation programmes and also market information of the raw materials.

The team was also informed on the type of raw materials used. The major ones included protein sources (fishmeal and sangara meal (Mwanza), Soya cake (India), cotton seed cake (Shinyanga and Mwanza), sunflower cake (Iringa and Dodoma) Copra cake (Bagamoyo) and maize from Central regions and Tanga. It

was noted that there was fluctuation in availability of raw materials, which had an influence on prices and to some extent on quality of feed ingredients. Mr. Jagadi informed the team during the 1980's in collaboration with SAREC did chemical analyses on most of the feed ingredients in Tanzania with the aim of producing ingredient composition tables. Samples of all ingredients used at the plant were collected for further analyses.

4.2.5 Riyami Feed Millers : Mr Mansoor explained briefly about the activities of the company and the sources of raw materials. Ingredient samples were collected for further analyses.

4.2.6 A to Z Feed Company : Mrs. Mbuya briefed the group the activities of the company, raw materials used, sources and prices. Samples of raw materials were also taken for further analyses.

4.2.7 Arusha Feed Mills: The research Assistant of the project (Mrs. P. Kusolwa) visited three mills in Arusha, with the aim of collecting samples of feed raw materials used there. The mills visited were Arusha Animal Feeds, Kiluvia Feeds and Kijenge Animal Feeds. The samples collected and there sources (in bracket) were cotton seed cake (Shinyanga), sunflower seed cake (Babati and Arusha town), wheat pollard (Arusha), wheat bran (Arusha), sardines (Musoma), Limestone (Dar), Maize (Babati), Maize bran (Arusha), bone meal (Kilimanjaro) and sunflower seed cake (small industries). The feed millers were anxious to know the results of the analyses and showed interest to the idea of the establishment of the Business Information Centre.

4.2.8 Chairman of TAFMA: Mr Lema was visited and informed the group the activities of TAFMA. The project leader gave a briefing about the project plans especially on the issue of setting a business information centre. Mr Lema remarked that the idea was good but stressed that a centre for providing just information was not adequate. He noted that the major problem in the sector is lack of a laboratory

where the feed millers could analyse the composition of feed ingredients quickly before they do purchases. He said that this was important because traders were free to bring in anything even materials of poor quality. However, he commended the idea and said it could be a step forward towards solving the constraints of the feed processors. Further, requested the researchers to contacted the persons entrusted for technical issues of feed processing. The contact persons were mentioned to be Mr. Maximambali, Mkuza Feeds (Tel. 023 2402561) and Mong'ateko, Gema Feeds (Tel. 0741 340080)

4.3 Feed preparation and analysis

The collected feed samples have been ground and packed into bottles. Analyses are been carried at SUA laboratories.

5. Financial Statement

ITEM	AMOUNT	
	US$	TSH[1]
Initial balance	406.45	359,300
Disbursement	6,842	6,048,244
Total	7,248.3	6,407,544
Expenditure	1,176.1	1,039,681
Balance	6,072.2	5,367,862

[1] Average exchange rate 1US$ = 884 Tsh.

The detailed accounts including receipts are sent by EMS

Project 18

Just started

Project 19

No progress

Kenyan fruit ????

Project 20

No Progress

ASARECA/ FOODNET **FOFIFA/ DRD/ DRT**

ETUDE DES MARCHES DU FRUIT A PAIN A MADAGASCAR

(RAPPORT DE SYNTHÈSE MISSION EXPLORATOIRE)

REGION NORD EST

RAKOTONIAINA Victor : Coordonnateur du projet, Chercheur DRD, chef de fil Sud-Est

Antananarivo, septembre 2001

ETUDE DES MARCHES DU FRUIT A PAIN AMADAGASCAR (RAPPORT DE SYNTHÈSE MISSION EXPLORATOIRE)

Introduction

Le projet ASARECA/ FOODNET/ FOFIFA s'inscrit dans le cadre d'une collaboration des centres nationaux de recherches en Afrique et à Madagascar. Il est hébergé au DRD/ FOFIFA et met en cause deux départements de recherche à savoir le DRD et le DRT.

Le projet Foodnet/ Fruit à pain dure 1 an et se réalise en trois grandes phases : la phase préparatoire, la phase opérationnelle et la phase rédactionnelle. Le présent rapport rend compte des résultats d'analyses, issus de la phase préparatoire ou plus exactement de l'enquête exploratoire bouclant cette première étape méthodologique. Une grande enquête fera l'objet de la phase opérationnelle.

L'étude des marchés du Fruit à pain touche trois sous régions de Madagascar qui vont être successivement présentées l'une après l'autre dans le présent rapport. L'objectif est d'avoir une vue comparative des trois.

A - DESCRIPTION SOMMAIRE DU PROJET

A.1 – Titre du projet : *« L'étude du marché du Fruit à Madagascar »*

A.2 – Source de financement : ASRECA/ FOODNET

A.3 – Montant du projet : $ US 14 000

A.5 – Durée du projet : 1 an

A.6 - Partenaires :

- ONG « 8 Mars »
- FIVESAVA
- Femme et Développement
- Anakavy Ami-Reny
- AFITD
- CIRAD

A.7 - Objectifs généraux du projet

On reconnaît de plus en plus l'importance que revêt le Fruit à Pain (FAP) dans le régime alimentaire d'une grande majorité des paysans malgaches. Il figure parmi les produits des cultures sous-estimés naguère, comme les racines et les tubercules. Il ne fait jusqu'ici, l'objet d'aucune action concrètes de développement ou de recherche. Le Fruit à Pain (FAP) constitue toutefois, une sécurité vivrière dans certaines zones agro-écologiquement humides de Madagascar. En

outre, il est fondamental de collecter autant que possible, le maximum informations sur le fruit à pain pour palier à une défaillance chronique à ce niveau.

Il convient alors, dans le cadre de ce projet, de :

- **Connaître le milieu de l'exploitation de l'arbre à pain et d'étudier l'organisation structurelle et socioéconomique de la filière FAP dans le contexte de la Production, de la Commercialisation, de la Transformation et de la Consommation ;**
- **Faire état de la logique et des stratégies des acteurs par rapport, d'un côté, à l'abondance de la production et à la demande, de l'autre côté par rapport aux autres spéculations habituelles ;**

Constatant le manque chronique de littérature sur le fruit à pain, la présente étude vise pour un premier temps, **à constituer des bases de données pouvant être utiles et pour la recherche et pour le développement**.

Pour un deuxième temps, elle a l'ambition de **pouvoir élaborer une série de recommandations afin de développer l'importance des rôles que joue actuellement ce fruit, dans la vie socioéconomique de population rurale soit en tant qu'appoint financier pouvant contribuer à la constitution des revenus des ménages soit en tant que complément, voire même substitut alimentaire pendant les périodes de soudure.**

A.8 Objectifs spécifiques

Pour atteindre ces objectifs généraux, l'étude doit se pencher sur des objectifs

beaucoup plus terre à terre ou spécifiques comme :

- *Définir les différentes saisons du FAP ;*
- *Déterminer la dynamique socio-économique de la filière FAP ;*
- *Constituer un référentiel technique susceptible d'améliorer la production au niveau villageois et de sensibiliser les circuits de commercialisation existants ;*
- *Déterminer les flux du produit et sa disponibilité quantitative et qualitative où les zones de consommation sont à faire distinguer des zones de production ;*
- *Localiser et analyser les structures des marchés des FAP afin de d'étudier la formation des prix ;*
- *Identifier les acteurs impliqués de près ou de loin, dans la filière FAP ;*
- *Définir les enjeux et intérêts qui animent respectivement ces acteurs tout en considérant l'aspect genre.*

A.9 - Justification

Il apparaît indéniable que les possibilités d'améliorer les conditions de la production à partir de l'arbre à pain existent. Elles demeurent, en fait mal définies ou non identifiées même, à cause du fait que le secteur est tout à fait négligé, les activités de développement actuelles, principalement au niveau villageois, sont rarement coordonnées ou soutenues. Ce qui laisse leur potentiel non exploité.

Les principales questions à examiner consistent en quelque sorte à déterminer et à mettre en place un itinéraire de développement susceptible d'associer à chaque niveau d'analyse, le social, l'économie et la technique. L'intégration de ces trois volets mérite d'être étudiée et évaluée de manière à ce que les logiques de cette intégration soient bien comprises.

Vu que l'exploitation de ce secteur vivrier sécurisant reste l'apanage des femmes ; les principaux intervenants, la place de celles-ci et le rôle qu'elles y jouent constituent des points à ne pas perdre de vue. Leurs actions méritent d'être approfondis sous deux aspects bien définis : sécurité alimentaire et revenu d'appoint pour le ménage des consommateurs.

A.10 - Méthodologie d'approche et phases du projet

A.10.1 -.Zone d'intervention

Vu l'importance socio-économique de la filière FAP, l'étude devrait avoir une envergure nationale. Mais compte tenu les exigences agro-écologiques de l'arbre à pain, nous sommes contraints à nous limiter à la frange orientale de l'île, reconnue la plus favorable. Le zonage prévoit ainsi un découpage de toute la côte Est de Madagascar en trois sous régions géographiquement bien définies :

- Le Nord-Est, connu sous le nom de la SAVA, mettant en cause quatre Sous-préfectures : Sambava, Andapa, Vohémar et Antalaha,;
- Le Centre Est, regroupant Soanierana Ivongo, Fenerivo Est, Toamasina–I, Toamasina –II, Brickaville et Antsampanana ;
- Le Sud-Est dont Ifanadiana, Mananjary, Manakara, Vohipeno et Vangaindrano.

Trois chefs lieux de province (Antsiranana, Antananarivo et Fianarantsoa) sont particulièrement concernés, surtout en tant que grands centres de commercialisation et de consommation du produit.

A.10.2 - Le partenariat : une collaboration au ras du sol

A.10.2.1 – L'implication des ONG locales

Il a été jugé nécessaire de mettre sur pied un système de collaboration qui permet aux institutions ou organisations locales de s'impliquer dans l'étude et de profiter des produits attendus. Elles font partie intégrante du projet depuis la conception du projet jusqu'à sa réalisation. Dans la plupart des cas, elles sont de nature ONG, œuvrant pour la promotion de la femme et de sa prise de responsabilité face au développement social et économique de leur région. Outre leur participation à l'élaboration du projet, les ONG des sous régions facilitent l'intégration de l'équipe et la mise en place du dispositif d'enquête. Il est important de faire remarquer qu'aucune contribution financière n'a été demandée à ces ONG. Par contre, charge à elles d'arranger les contacts, les rendez-vous et d'assurer tout ce qui a trait à la question logistique.

A.10.2.2 – La valorisation des expertises locales

Pour une meilleure intégration de l'étude et pour un souci de fiabilité des informations colletées, nous avons adopté une formule permettant aux jeunes des sous régions de mettre en valeur leur connaissance. Une équipe mixte d'enquêteurs, composée de professionnel de Tanà et de jeunes bacheliers de la région est à créer pour administrer les questionnaires. Le savoir-faire des enquêteurs venant d'Antananarivo est à marier avec la connaissance des enquêteurs locaux de leur propre région pour atteindre un plus haut degré de complémentarité rentable et efficace.

Nous avons initié ce genre de partenariat pour deux raisons principales :

1 – Répondre au souhait des dirigeants locaux de sensibiliser les jeunes aux problèmes de développement de leur région et de palier au problème d'emploi ;
2 – Sensibiliser ces ONG locales qui sont actives en faveur du développement et à la lutte contre la pauvreté en opérant dans la santé et la nutrition, à l'existence d'une potentialité non exploitée dont il est ici question, et à réagir en conséquence.

A.10.3 - Phase Préparatoire

La phase préparatoire consiste à une collecte d'informations sur l'arbre à pain et à pouvoir programmer une phase d'étude plus approfondie. Pour ce faire, une subdivision en deux sous phases s'est avérée plus pratique.

A.10.3.1 - Recherches documentaires et divers entretiens

L'équipe du projet a fait des investigations documentaires, étoffées par des entretiens divers auprès des personnes ressources (Opérateurs économiques ou Chercheurs) ou institutions susceptibles de disposer d'une certaine quantité et qualité de connaissances publiées ou non sur le fruit à pain. L'objectif à court terme étant de constituer une base de données nécessaires pour servir un point de départ pour l'étude. A moyen et à court terme, une banque de données sur le produit sera créée.

A.10.3.2 - L'enquête exploratoire

Une descente sur le terrain a été programmée au cours de cette phase préparatoire dans le but de se familiariser à l'environnement du produit. La reconnaissance ou enquête exploratoire n'est qu'un prolongement la collecte d'informations générales sur l'objet d'étude.

L'enquête exploratoire est une deuxième étape de collecte de données secondaires sur la filière fruit à pain et qui se réalise sur le terrain. Elle fait partie intégrante de la méthodologie globale de la phase préparatoire et précédée par la recherche et l'analyse documentaire. Elle permet ainsi de faire un débroussaillage de la situation et de diagnostiquer les différents contextes du FAP afin de faciliter la réalisation de l'étude approfondie. Elle a ainsi été conçue pour quelques objectifs spécifiques :

- Contribuer à la meilleure connaissance de la dynamique de la filière fruit à pain ;
- Faire connaissance aux zones de production et de consommation ;
- Aider à l'élaboration de la méthodologie d'approche de l'enquête exploratoire ;
- Etablir un Chronogramme d'intervention.

A.10.4 – Phase Opérationnelle

La phase opérationnelle est une deuxième étape de descente sur terrain. C'est l'occasion d'administrer des questionnaires confectionnés à partir des informations obtenues au cours de la phase préparatoire. Quatre types de questionnaires ont été établis pour chacune des sous région selon l'échantillonnage statistique suivant :

- Production :	90 Enquêtes Producteur
- Commercialisation :	75 Enquêtes Commerçant
- Transformation :	30 Enquêtes Transformateur
- Consommation :	90 Enquêtes Consommateurs
Total :	*285 questionnaires par région*

Un pré-test des questionnaires sera prévu avant le lancement de l'enquête proprement dite. L'adaptabilité des questionnaires est à vérifier. Parallèlement à l'enquête, des entretiens à différents niveaux seront réalisés pour un souci de recoupement des informations obtenues.

A.10.5 – Phase Rédactionnelle

C'est la phase qui bouclera l'étude. Il est donc attendu de cette étude du marché du FAP, une meilleure connaissance de la dynamique de la filière, l'identification des zones de

production et de consommation du produit, meilleure connaissance des systèmes du marché et des stratégies des acteurs impliqués ainsi que la formation des prix. Et ce, pour pouvoir faire des recommandations qui pourraient servir tout intéressé que ces oit individu, institution ou société.

Du fait de la rareté des informations sur le produit en question, la présente étude tente d’esquisser une première base de données.

B – L'ENQUETE EXPLORATOIRE : ANALYSE DE L'EXISTANT

B.1 - Le Fruit à pain dans le Nord Est

B.1.1 - Historique et Philosophie sur le fruit à pain

Connu sous le nom scientifique d'***Articarpus Incisa***, le FAP est une espèce introduite dans le Nord Est de Madagascar vers la fin du 18ième, début 19ième siècle. Il provient des Îles Polynésiennes, emporté par les grands voyageurs colons.

La population locale lui attribue des noms vernaculaires ayant des significations diverses :

B.1.1.1 - Le Fruit à pain ou le « taros suspendu »

Certains paysans du Nord l'appellent *Sahonambo*. Il est donc le résultat de la combinaison de deux mots : *Sahoana* est le nom vernaculaire du taros et *Ambo* veut dire haut. D'où le nom Sahoanambo qui signifie littéralement *taros suspendu en haut*

Le Fruit à Pain est vu comme du taros du fait de sa capacité nutritionnelle à la seule différence que le premier est un fruit suspendu tandis que le second est une tubercule. Les deux produits jouent pourtant les mêmes rôles en tant que complément voire substitut alimentaire pendant les périodes de pénurie du riz.

B.1.1.2 - Le Fruit à pain comme *« Kimoja Domona »*

Kimoja est une variété de riz et *Domona* est le bruit entendu à la tombée du fruit. En plus de sa capacité de remplacer le riz, le fruit de l'arbre à pain se caractérise par sa fragilité lors de la maturation. Le fruit à pain tombe facilement par terre lorsqu'il est trop mûr en résonnant.

B.1.1.3 - Fruit à pain comme *« Jesosy Mamomjy »* ou le « Fruit Sauveur »

Le FAP est considéré comme « Jésus Christ, le Sauveur » (*« Jesosy Mamomjy »*) vu sa capacité de palier au manque de nourriture pendant la période soudure. La saison de récolte coïncide à cette période de crise où la nourriture en général, le riz en particulier fait défaut.

B.1.1.4 - Fruit à pain : marquage de territoire des colons

Partout dans la frange orientale de l'île, presque toutes les anciennes concessions sont marquées par l'existence des arbres à pain. Selon la tradition orale, les colons plantaient ces arbres et se servaient des fruits dont l'unique objectif était de pouvoir nourrir les indigènes qui travaillaient pour eux.

B.1.1.5 - Fruit à pain, le fruit qui fait honte

Dans la région de la SAVA, le FAP est vu comme une nourriture des pauvres et détermine une attitude paradoxale chez certaines couches sociales. C'est un produit bien apprécié par toutes les catégories sociales. Par contre, il est une grande honte pour les autres couches sociales d'être vues par ses paires acheter du FAP au marché, de peur d'être considérées comme étant quelqu'un,

chroniquement d’appauvri. Par conséquent, il est devenu très courant de déléguer quelqu’un pour l’acheter au marché.

B.1.2.1 - Les exigences du FAP

Le terme d'un climat tropical chaud et humide s'applique à la région de la SAVA. La forte humidité atmosphérique et les précipitations abondantes et continues donnent lieu à des températures généralement homogènes le long de l'année et qui conviennent parfaitement à l'arbre à pain ;

Quant aux autres exigences, le fruit à pain préfère les sols légers qui se drainent naturellement. Par ailleurs, les sols riches en matière organiques, les alluvions sablonneuses localisées le long des fleuves ou des rivières lui sont très propices.

B.1.2.2 - Mode de multiplication et technique de production

D'une manière générale, le FAP se multiplie naturellement en émettant des rejets distancés de 2 à 3 mètres le long d'une racine. La technique de transplantation est intervenue récemment. Elle s'applique au moment où le jeune plant (le rejet) atteint une certaine hauteur (1 mètre environ). Toutefois, la transplantation est une pratique rare dans la région du Nord Est. Elle est seulement, l'œuvre des planteurs ayant des problèmes d'espace.

La fructification de l'arbre à pain se produit à l'âge de 5 à 6 ans dans la région de la SAVA. Il a un cycle végétatif qui peut aller jusqu'à 180 ans. La vieillesse de la plantation explique ce fait. En outre, la plupart des gens confirment ce long cycle végétatif de l'arbre à pain en disant que leur plantation est héritée de leurs grands-parents.

B.1.2.3 - Saisons du FAP et disponibilité de la production

Comme il s'agit d'une plante pérenne, la saison du FAP se définie par rapport à la période de récolte. Deux types de saisons ont ainsi été identifiés dans la région de la SAVA au cours de cette étude exploratoire :

- La saison principale, définie comma la plus longue débute le mois de mars et se termine en fin mai. Elle peut s'étaler jusqu'au mi-juin. La période d'abondance se situe en avril et mai. C'est la saison la plus productive.
- La deuxième saison dure deux mois seulement et se situe en octobre - novembre.

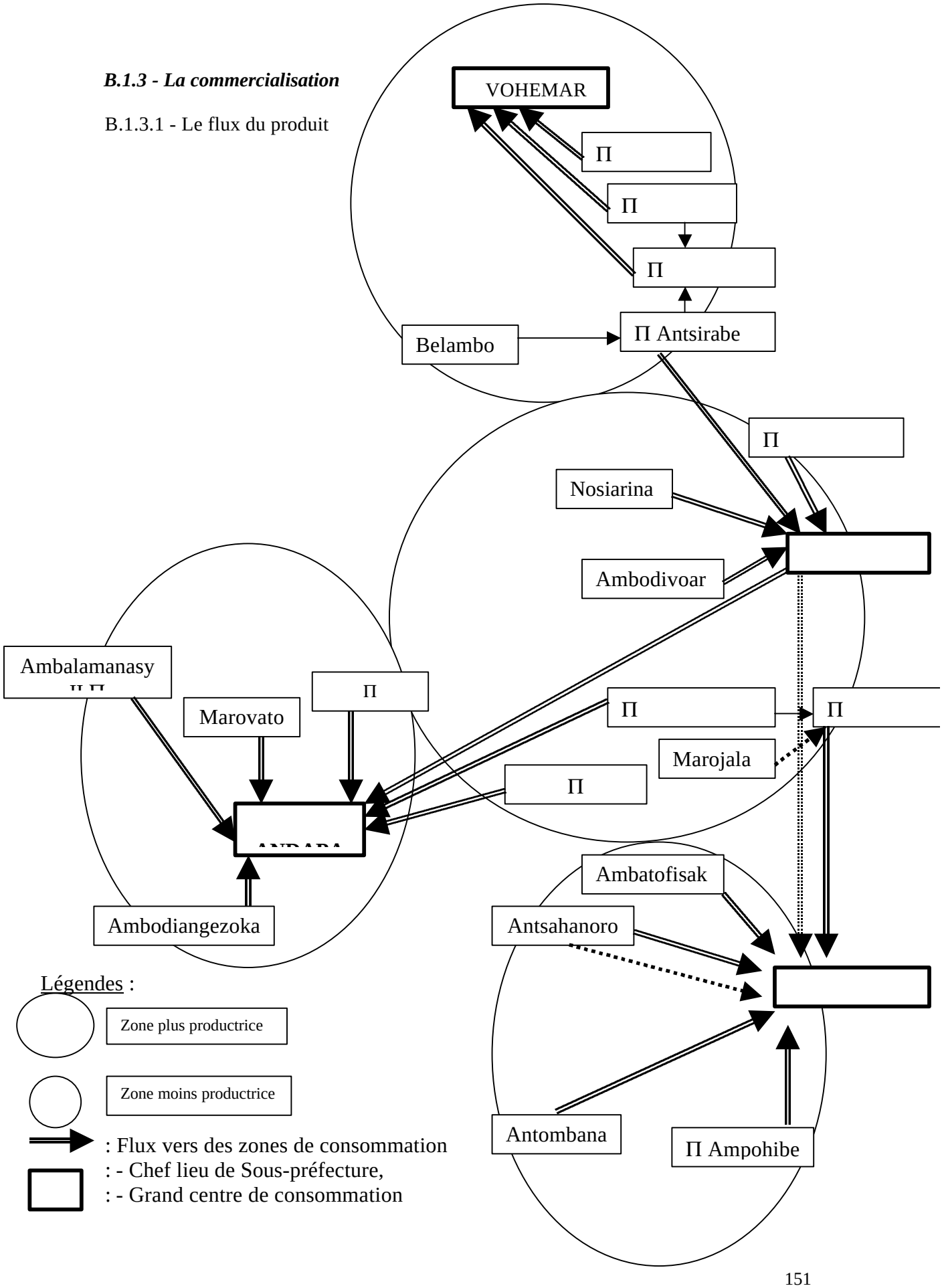
La grande disponibilité du produit se trouve pendant la principale saison où le taux de perte est estimé à 35 % environ. Les fruits trop murs pourrissent et tombent facilement par terre.

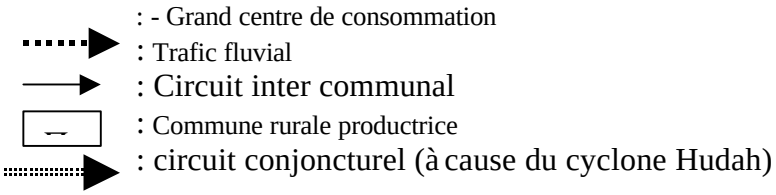
Les premiers résultats d'analyse à l'issu de cette phase exploratoire montrent que presque 80 % des paysans plantent de l'arbre et chaque ménage en dispose en moyenne 5 pieds.

Les fruits se présentent en grappe de 3 à 5 unités dont le poids moyen tourne autour de 800 grammes. Le rendement moyen d'un pied est de 200 fruits.

B.1.3 - La commercialisation

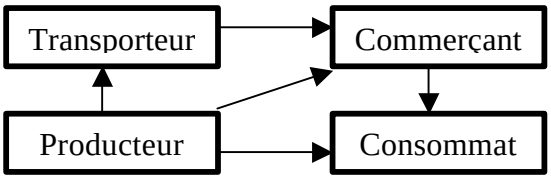
B.1.3.1 - Le flux du produit




: - Grand centre de consommation
: Trafic fluvial
: Circuit inter communal
: Commune rurale productrice
: circuit conjoncturel (à cause du cyclone Hudah)

La commercialisation demeure le maillon « poumon » d'une filière. C'est à ce niveau que commence à se définir et à se mesurer la dynamique de la filière par l'intermédiaire des transporteurs. Les trois principaux acteurs directs (Producteur, Commerçant et Consommateur) s'y rencontrent.

La chaîne de commercialisation



En d'autres termes, les stratégies des acteurs s'y affrontent où la simple loi économique de base entre l'offre et la demande trouve son champ de validation.

Le système du marché rend compte plusieurs points à considérer en matière de flux et de commercialisation.

Parmi les quatre sous-préfectures constituant les sous-région, celle de Sambava se hisse en première position pour être une grande zone de production et de consommation en même temps.

Huit Communes rurales s'y trouvent productrices et exportent vers les marchés vers les marchés interrégionaux en ravitaillant les chefs lieux de la sous-préfecture d'Andapa et d'Antalaha. Ces derniers ont à près la même potentialité ou disponibilité en FAP.

Sambava dispose d'un excédent de produit qu'il exporte vers Andapa et Antalaha connus comme déficitaires, suite au passage de plusieurs cyclones qui ont ravagé les plantations. Cette situation permet à Vohémar, un peu plus localisé au Nord, de se classe en deuxième position avec ses 6 Communes rurales productrices. Andapa et Antalaha se situent alors dans le même rang (troisième position) en ayant chacun 5 communes productrices de fruit à pain. Il est à noter que, Sambava et Antalaha demeurent les sous-préfectures les plus productrices du Nord-Est dans des conditions normales (sans cyclones). Ceux-ci constituaient le terrain de chute des grandes implantations des Colons dans le temps.

Andapa et Vohémar ne sont pas ainsi très producteurs en FAP à cause du microclimat du premier et des conditions climatiques sèches du deuxième. Par ailleurs, Antsirabe Nord, une commune limitrophe mais rattachée administrativement à la Sous-préfecture de Vohémar, rejoint la zone de consommation et les marchés urbains de Sambava vu sa proximité par rapport à celui-ci.

Pour chacune des zones d'étude, un grand flux du produit se dirigent vers les grands centres urbains à forte densité de population lesquels sont également considérés comme des zones de consommation par excellence ;

Les marchés du chef-lieu de la province d'Antsiranana sont ravitaillés à moindre degré en FAP, par Sambava. La région de DIANA, malgré sa faible production, constitue son principal fournisseur.

B.1.3.2 - La structuration des prix

Le tableau ci-dessous montre les fluctuations des prix du fruit à pain.. À Sambava, Antalaha et Andapa, la formation des prix est surtout déterminée par, la saison de récolte, la grosseur des fruits, le type du marché (hebdomadaire ou permanent, urbains ou communaux) le coût du transport ainsi que le type de produit ; fini ou transformé.

Par contre, d'autres aspects ne sont déterminants qu'à un niveau un peu plus loin de la chaîne. La préférence des consommateurs influe également sur la structure des prix du fruit à pain. Les techniques de transformation ainsi que les modes de consommation des gens exigent des aspects morphologiques entrant en relation avec le prix du produit FAP.

- La morphologie du fruit (ovale ou ronde) ;
- La couleur du fruit (verte ou jaune verte) ;
- Le degré de maturité (mûr ou moyennement mur) ;

Le coût de transaction joue également un rôle très important dans la formation des prix du produit. L'enquête exploratoire n'a pas permis d'aborder d'une manière approfondie cette question. Elle sera reprise au cours de la phase opérationnelle. Par ailleurs, des acteurs intermédiaires comme rabatteurs existent bel et bien dans la filière et font augmenter la valeur ajoutée qui n'est pas profitables pour les producteurs.

Zones	FOURCHETTES DE PRIX			
	Vohémar	**Sambava**	**Andapa**	**Antalaha**
Grande saison de récolte	Prix non disponibles	250 – 1000 Fmg/ pièce de fruit	500 –750 Fmg/ pièce de fruit	250 – 1000 Fmg/ pièce de fruit
Saison secondaire	Prix non disponibles	500 – 1000 Fmg/ pièce de fruit	Prix non disponibles	750 - 1000 Fmg/ pièce de fruit

B.1.3.3 - La Situation des marchés

À l'issue de cette phase exploratoire, les marchés du FAP peuvent se caractériser de la manière suivante :

Les **marchés formels** commencent à se définir au niveau de chaque commune productrice (aussi bien dans le milieu rural que dans le milieu urbain) ;

Un marché peut-être **permanent et hebdomadaire** en même temps. Il est hebdomadaire en ayant un jour de marché, désigné comme celui le plus grand. Ce type de marché n'existe qu'au niveau des communes urbaines ;

Un marché uniquement **hebdomadaire** n'existe que dans les communes rurales ;

Le FAP est aussi visible dans les petits **marchés informels** du quartier ;

Les marchés ruraux comme les marchés de type urbain connaissent la coexistence de tous les acteurs directs tel les producteurs, les transformateurs, les commerçants et les consommateurs dans leur sein.

B.1.4 – Le transport

B.1.4.1 – Les types de transport

Il existe trois types de transport dans la région de la SAVA :

Le **transport par voiture** (Taxi-brousse). Ce type de trafic dessert les chefs-lieux des communes rurales et les relie aux centres urbains de consommation comme Sambava, Antalaha, Vohémar et Andapa.

Le **transport par voie fluviale** (pirogue métallique ou en bois) n'est pas tout à fait utlisé malgré l'importance de l'hydrographie dans la région de la SAVA. Il semble que ce type de transport n'est pas profitable pour les paysans producteurs de fruit à pain.

Le transport **à dos d'homme** est seulement pratiqué pour les transactions entre les FKT producteurs et le chef-lieu de la commune rurale où il y a le marché hebdomadaire. Un homme est capable de transporter de son village jusqu'au marché communal, un sac de 50 fruits, sur une distance de 3 à 5 km.

B.1.4.2 – Les coûts de transport

Les coûts de transport dépendent largement du type et de la taille du contenant utilisé quel que soit le type de transport emprunté par les acteurs. Ils varient selon les zones. Les informations sommaires collectées au cours de l'enquête exploratoire se présentent de la manière suivante :

Type de transport	Sambava	Antalaha	Vohémar	Andapa
Taxi-brousse	2250 Fmg/ soubique de 30 fruits	2 500 fmg/ soubique de 40 fruits	Coûts non disponibles	6 000 Fmg/ sac. de 60 fruits
Pirogue	Coûts non disponibles	Coûts non disponibles	Coûts non disponibles	Coûts non disponibles
A dos d'homme	Coûts non disponibles	Coûts non disponibles	Coûts non disponibles	Coûts non disponibles

B.1.5 - La transformation

La chaîne de transformation traduit à la fois techniques de conservation et modes de consommation

B.1.5.1 - Les simples techniques de conservation

Il est à rappeler que le fruit à pain est un produit très périssable. Face à ce problème, les paysans n'appliquent aucune technique de conservation. Cueilli à l'état mûr, il peut résister jusqu'à trois jours. Il peut quand même se conserver pendant 5 jours si la cueillette se fait quelques jours avant la maturité.

Selon les dires des paysans du Nord Est, une perte de 30 % par pied s'enregistre quand les fruits arrivent en maturité. Ils pourrissent facilement et tombent par terre.

Les fruits à la longue tige résistent plus que ceux à la courte tige qu'ils soient ovales ou ronds.

 : Plus résistant  : Moins résistant

Toutefois, les commerçants des marchés urbains d'Antsiranana conditionnent leurs produits non vendus, chaque nuit, dans un bassin contenant de l'eau froide, juste pour limiter le dégât. De par cette technique, ils affirment que le fruit à pain peut garder son état pendant une semaine parce que la fraîcheur de l'eau atténue le coup de la chaleur sur l'écorce.

B.1.5.1.1 – La transformation en tant que technique de conservation

Rares sont les techniques modernes de conservation par transformation. Un transformateur artisanal applique la technique de confiture de fruit à pain pour le conserver. Il épluche le fruit et fait cuire la pulpe avec du sucre.

B.1.5.1.2 – La transformation en tant que modes culinaires

L'acteur Transformateur traite le fruit à pain brut selon différents modes pour obtenir des produits finis, destinés à la vente. Ce qui n'est pas le cas pour l'acteur Consommateur. Les fruits qui subissent des transformations pas le biais des modes culinaires, sont directement destinés à la consommation.

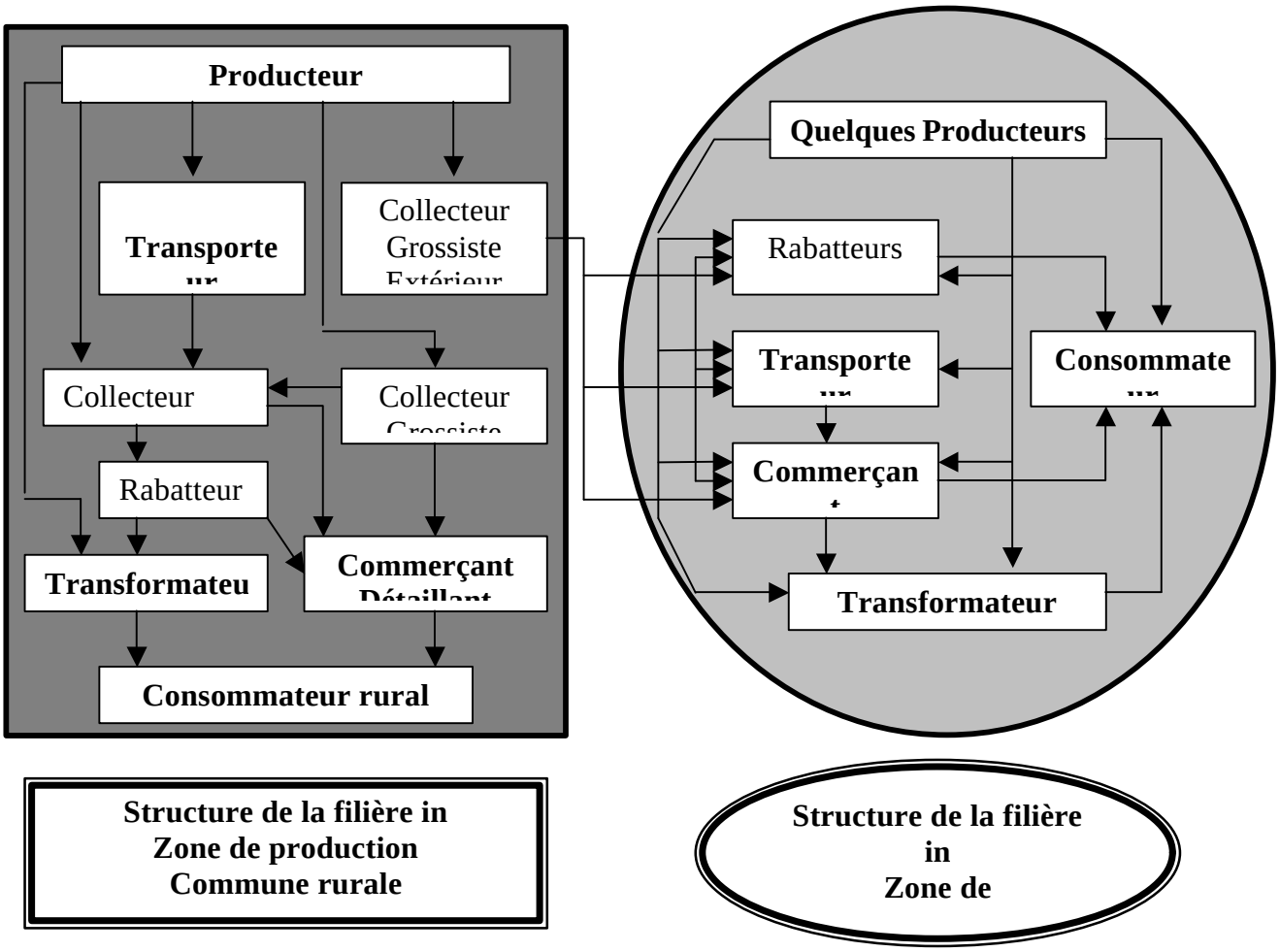
Les consommateurs du Nord Est connaissent toute une série de modes de cuissons :

- Le « Sahoaba » : C'est du fruit épluché et découpé en petits cubes, cuit avec du lait de coco plus sel ou sucre et se mange comme de la soupe ;
- Le « Sambaika » est du fruit à pain épluché et découpé en morceaux plus ou moins gros, à faire cuire avec de l'eau et pris en tant que goûter ;
- Le Fuit à pain fritte est découpé en lame et à tremper dans de l'huile bouillante pendant quelques minutes pour être croqué et accompagné de brochette ;
- Boulette de fruit à pain ;
- Le Fruit à pain est à faire cuire avec de la viande ou des crevettes ou encore du poisson et, salé et servi comme du plat de résistance ou goûter.

Pour l'alimentation animale, porc ou bœuf en consomme vert sans aucune préparation préalable à part le découpage en morceaux.

B.1.6 - La structure de la filière

STRUCTURE DE LA FILIÈRE FRUIT À PAIN
DE LA ZONE DE PRODUCTION A LA ZONE DE CONSOMMATION



Légendes

Acteur direct

Acteur

La filière fruit à pain se structure en deux niveaux dont le deuxième n'est en quelques sortes qu'une extension ou un prolongement du premier. La filière au niveau locale fonctionne beaucoup plus dans la zone de production et en milieu rural tandis que celle du deuxième niveau est plutôt dynamique dans le secteur urbain, une zone principalement de commercialisation et de consommation.

A première vue, les deux structures semblent identiques et complètes. Chacune d'elles a plus ou moins les mêmes types d'acteurs directs qui forment une filière normale et

complète. D'une manière générale, le maillon « Commerçant Grossiste » n'est pas formellement constituée dans la chaîne. Le Collecteur Grossiste semble assumer le rôle d'intermédiaire entre le Producteur et le Commerçant Détaillant. Dans tous les cas, tout collecteur intervenant dans une filière, qu'il soit grossiste ou demi grossiste n'est considéré que comme un simple acheteur/ revendeur à la recherche de plus de bénéfice avec un petit coût.