



SOUTHERN AFRICA ROOT CROPS RESEARCH NETWORK (SARRNET)

A Vision based on Regional Integration through Partnership and participation for Demand-led Process of Root Crops Research and Development.

TERMINAL REPORT OF SARRNET PHASE II



United States Agency for International Development
USAID Grant No. 690-G-00-99-00258-00

January 2004



Table of Contents

Acronyms	iii
EXECUTIVE SUMMARY	iv
1.0. Introduction	1
2.0 Results Framework	2
3.0 SARRNET vision, strategy and governance	2
4.0 ACHIEVEMENTS	4
4.1. Sub-sector analysis of cassava and sweetpotato	4
IR 1.1: Farmers have access to a wider range of improved varieties resulting in higher rates of adoption	5
1.1.1 Primary multiplication and distribution of improved/clean planting materials	5
1.1.2 Adoption of improved varieties (Area planted with improved/clean varieties)	6
1.1.3 Involvement of SARRNET in HIV/AIDS Programme	7
1.1.3 Involvement of SARRNET in HIV/AIDS Programme	8
IR 1.2: Farmers in target areas using a wider range of crop management options leading to increased productivity ..	9
1.2.1 Demand-led Research for Development	9
Germplasm development for targeted specific uses	9
IR 1.3: Broader public and private partnerships promoting regional technology development, exchange and application leading to increased availability of improved technologies to end-users	12
1.3.1 Networking	12
1.3.2. Technology transfer	12
1.3.3. Information sharing	12
1.3.4. Training and capacity building	14
IR 2.1: Post harvest systems linking root crops producers and industrial consumers to accelerate commercialisation of cassava and sweetpotato	16
2.1.1 Promotion of cassava commercialisation	16
2.1.1a Promotion of cassava production and marketing using farmers’ associations	18
2.1.1 b Promotion of cassava production through out-growers schemes	19
2.1.1c Promotion of cassava production and marketing through commercial producers and processors	19
2.1.1d Promotion of cassava marketing through intermediate traders: “The middlemen”	20
2.1.2 Quantity of improved clean planting material sold by private sector	23
2.1.3 Post harvest technologies and research on product development	24
2.1.4 Research on product development	28
2.1.5 Cassava in livestock feed	29
5.0 Competitive Grants to SADC stakeholders	31
6.0 Subcontract Agreement between the International Institute for Tropical Agriculture (IITA) and the International Center for Tropical Agriculture (CIAT) on SARRNET	35
7.0 SARRNET Staffing	35
8.0 NARS CONTRIBUTION TO ROOT CROPS ACTIVITIES	36
9.0 Conclusion	37
Annex 1: Small grants	38
Annex 2: MINUTES OF SARRNET STEERING COMMITTEE MEETING HELD AT COURTYARD HOTEL IN DAR – ES - SALAAM, TANZANIA	53
Annex 3: MINUTES OF SARRNET STEERING COMMITTEE MEETING HELD AT AGRICULTURAL RESEARCH COUNCIL IN PRETORIA, SOUTH AFRICA	63
Annex 4: MINUTES OF THE 10TH SARRNET STEERING COMMITTEE MEETING HELD AT PAMODZI HOTEL, LUSAKA, ZAMBIA FRIDAY, 23RD MAY 2003	75
Annex 5: Subcontract Agreement for the Execution of USAID/SADC/SARRNET Grant No. 690–G–00–99–00258–00 between the International Institute for Tropical Agriculture, IITA, and the International Center for Tropical Agriculture, CIAT	80
ANNEX 6: A SUCCESSFUL HISTORY OF SARRNET IN TANZANIA	123
ANNEX 7: CASSAVA PRODUCTION IN MALAWI–FIELD TRIALS	130
ANNEX 8: CASSAVA PRODUCTION IN TANZANIA - FIELD TRIALS	137
Annex 9 Success story: Cassava enters the estate subsector: The case of Chitipi farms in Malawi	142
Annex 10 Success story: Promotion of cassava silage as a feed for dairy animals- Katete farm.	144

Acronyms

CBSD:	Cassava brown streak disease
CIAT:	Centro Internacional de Agricultura Tropical
CIP :	Centro Internacional de la Papa (International Potato Centre)
CLAYUCA:	Consortia Latinoamericano y del Caribe de Apoyo a la Investigacion y Desarrollo de la Yuca (Latin American Consortium for Cassava and development)
EARRNET:	East African Root Crops Research Network
ESARC:	East and Southern Africa Research Center, (IITA, Uganda)
ESARRN:	East and Southern Africa Root Crops Research Network
FANR:	Food, Agriculture and Natural Resources (SADC Directorate)
ha:	Hectare
IITA:	International Institute of Tropical Agriculture
mt:	Metric ton
NARS:	National Agricultural Resource systems
NGO:	Non-Governmental Organisation
NRI:	Natural Resources Institute, UK
RCSA:	Regional Center for Southern Africa (USAID)
SACCAR:	Southern Africa Centre for Cooperation in Agricultural Research and Training
SADC:	Southern Africa Development Community
SARRNET:	Southern Africa Root Crops Research Network
USAID:	United States Agency for International Development

EXECUTIVE SUMMARY

IITA/SARRNET Phase I was launched in 1994 and focussed on increasing income and improving household food security of resource in Southern Africa. The main objectives were to increase cassava and sweetpotato production and utilisation by smallholder households in the resource poor areas of Southern Africa through adoption of improved varieties and crop husbandry practices, and strengthening the capacity of national root crops research for development programs in the SADC region.

Phase II which started in 1999 shifted its focus to include the needs of the markets/consumers by promoting cassava and sweetpotato commercialisation. Thus, improved cassava and sweetpotato varieties and other technologies have been and are being developed for specific uses. The demand-driven approach being used helped the research agenda to focus on the needs of consumers/users of the commodity in the market chain with a strong bias on income generation, private sector participation and food security.

Sub-sector analysis

Sub-sector analysis studies were conducted in Malawi, Tanzania and Zambia to understand the structure and performance of cassava and sweetpotato markets in these countries. The studies showed that there has been significant increases in production and consumption of cassava and sweetpotato in the region in the recent years with production expanding even in non-traditional growing areas.

Pricing of cassava/sweetpotato is subjective with a certain level of bargaining for both quantities and price. No clear standards are set but tuberous root size, grade, farm gate price, and to a lesser extent, variety, freshness and colour play an important role in pricing. It was found out that the fresh market is more lucrative than the industry. In addition, the linkage between industrial processors and producers is very weak and non-existent in most areas.

Cassava commercialisation

There has been greater private/industrial sector participation in cassava production/utilisation and promotion. Significant increases in use and demand of cassava products by pre-selected industries in the region have been registered with usage increasing from 7000 MT in 1999 to 12000 MT in 2003. Similarly, industries utilising cassava products have increased in the three leading IITA/SARRNET countries: Malawi, Zambia and Tanzania. This has been a result of four functional models that IITA/SARRNET initiated to promote cassava commercialisation, which focussed on production, marketing and processing. There has also been greater participation of commercial cassava and sweetpotato plant material production in the region with commercial producers increasing from 2 firms/individuals in 2001 to more than 20 firms/individuals in 2003.

Demand-led Research for Development

IITA/SARRNET role in research for development was based on specific needs of the region. Several commissioned studies and small competitive grant projects were undertaken on participatory variety selection targeting specific uses and market. Through these and collaboration with NARS, 16 cassava varieties and 7 sweetpotato varieties have been released during SARRNET phase II. These were bred answering specific needs of both fresh and industrial markets; combating the emerging threat of Cassava Brown Streak Disease and those aimed at combating vitamin A deficiency. About 100,000 families in Mozambique, Tanzania and Malawi benefited from the distribution of orange-fleshed sweetpotato planting materials to combat vitamin A deficiency.

SARRNET also promoted the use of improved post harvest technologies on cassava and sweetpotato with a shift from the traditional rudimentary methods to modern labour saving, quality

improving and value adding technologies to improve on grades and standards of the end products. Graters, chippers, slicers were tested for acceptability in some SARRNET countries. Local artisans were trained for the fabrication and sale of these machines as business following the introductions of 17, 23 and 37 prototypes respectively in Tanzania, Malawi and Zambia.

Cassava in dairy cattle feed

IITA/SARRNET in partnership with CIAT/CLAYUCA and in collaboration with Land O'lakes in Malawi also conducted research on livestock feed in Tanzania and Malawi. Cassava silage which is made up of 80% leaves and 20% roots is a good feed for dairy animals and in Malawi resulted into increases in milk yield during the dry season from an average of 6 litres/animal/day to 13 with improvements in butterfat content from 3.2% to 3.6%. The health of the animals/body conditions was also improved. This implies that there is high potential for improving the dairy industry by using cassava silage in the SADC region. Dairy farmers have started growing cassava

Multiplication and distribution of improved/clean planting material

Cassava and sweetpotato multiplication programme was initiated in many SADC countries and this helped in the spreading of improved, introduced varieties and clean planting materials of recommended varieties. About 739 ha of cassava and 647 ha sweetpotato were planted as primary multiplication fields, which led to a multiplier effect of 7 per year for establishment of secondary and tertiary multiplication fields for distribution and/or sale to farmers/producers by NGOs and other private producers.

As a result of these multiplication and distribution activities, there has been steady but remarkable increases in area planted with improved/cleaned cassava and sweetpotato varieties. The percentage area put to improved sweetpotato varieties in the region grew from 12% to 29% while that of cassava grew from 7% to 13.5% during SARRNET Phase II.

Involvement of SARRNET in HIV/AIDS programme

IITA/SARRNET in partnership with Save the Children Federation (USA) carried out joint cassava and sweetpotato activities to assist people caring for the terminally ill patients and orphaned children in Malawi. A total of 21 community groups of HIV/AIDS were formed. Cassava and sweetpotato were found more appropriate to such communities dominated by reduced labour force as they demand fewer inputs. In addition, introduced processing machines reduced the high labour requirement and processing time. A total of 206 men and 98 women were trained as trainers in seed multiplication, agronomy, processing and utilisation, and HIV/AIDS prevention. About 18.8 hectares of cassava and 11 hectares of sweetpotato nurseries were established. An estimated number of 6000 vulnerable households benefited from the seed.

Information and technology transfer

SARRNET has been highly successful in developing effective means of sharing information and technology within the region. SARRNET released *ROOTS* newsletter bi-annually for information sharing within and outside SADC region. The posting of a web page www.sarnet.org on the Internet, which was updated regularly, also improved information sharing. SARRNET also conducted steering committee meetings where delegates shared information through presentations of technical papers and country reports; sponsored symposia and workshops and also produced technical reports, which were distributed to stakeholders. A scientific workshop was held in 2003 where commissioned and competitive grants studies were presented and are being peer-reviewed for publication in a special issue of *African Crop Science Journal*.

Training and capacity building

About 233 participants in the SADC countries have been trained in various themes.

Collaboration

To achieve the above outputs, SARRNET collaborated with the SADC/FANR, NARS and sister networks/institutions such as CIAT/CLAYUCA, EARRNET, FOODNET, NRI and NRI International and had efficient backstopping from IITA-Ibadan, IITA/ESARC and CIP-Nairobi.

1.0. Introduction

About SARRNET

The Southern Africa Root Crops Research Network (SARRNET) was inaugurated in 1994 as a follow-up of the East and Southern Africa Root Crops Research Network, which was split into SARRNET, and East Africa Root Crops Research Network (EARRNET). The International Institute of Tropical Agriculture (IITA) executes the project with the responsibility of coordinating the Network. The International Potato Center (CIP) through its regional headquarters in Nairobi, Kenya backstops activities on sweetpotato.

Twelve Southern Africa Development community (SADC) countries are members of the network including Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe and of late (2001) the Democratic Republic of Congo (DRC) who joined the network for its southern agro-ecological zones as DRC joined the SADC grouping. The network is working under the umbrella of SADC-FANR (Food, Agriculture and Natural Resource) directorate, which took over the Southern Africa Centre for Cooperation in Agricultural Research and Natural Resources (SACCAR) Board. The United States Agency for International Development (USAID) Mission in Malawi and later the Regional Center for Southern Africa (RCSA) has been the main financial support to SARRNET.

SARRNET Phase 1 had, as major goal to improve household food security of resource poor farmers in Southern Africa. The main objectives were to increase cassava and sweetpotato production and utilisation through adoption of improved varieties and practices and strengthening the capacity of national root crops research programs in the SADC region. The major thrusts of SARRNET I were research, training, information and technology exchange and institutional capacity building. Its main research objectives were in the fields of the development and/or introduction and evaluation of improved germplasm, managing pests and diseases through an ecologically sustainable plant protection (ESPP) approach, surveying production systems, development of post-harvest technologies and the establishment of rapid multiplication and distribution systems for improved planting material and technologies.

SARRNET phase II, jointly developed by representatives of the member countries, IITA and CIP, and USAID/RCSA at the Harare stakeholders meeting in 1999, shifted its focus to demand-led research and development in cassava and sweetpotato crops with strong bias on income generation, private sector participation, and food security. This objective was clearly based on tackling issues of poverty reduction through improving the opportunities for sustainable income generation. The network thus shifted its focus to include the needs of the markets/consumers by promoting cassava and sweetpotato not only as food crops but also as commercial commodities to create opportunities for off-farm employment. Thus, improved cassava and sweetpotato varieties and other technologies have been and are being developed for specific uses including industrial uses and animal feed. In addition, cassava and sweetpotato are low input requiring crops doing well in marginal production systems; hence, they have become important crops in HIV/AIDS afflicted communities facing shortage of labour force.

The recognition that these crops can also be transformed into broad-based commodities for sustained food security, better nutrition and income generation has helped accelerate its uptake. In view of this, SARRNET activities took pragmatic and holistic approach to broaden the mandate to accommodate cross cutting issues for the demand-led research and development. This was done in order to achieve high levels of commercialisation, a strong and vibrant private sector participation by linking farmers to the private/public sectors, increased environmental protection, expanded crop diversification and improved nutrition and health including involvement in HIV/AIDS programs and the promotion of orange flesh sweetpotato varieties rich in vitamin A.

2.0 Results Framework

SARRNET Phase II was designed on a Results Framework following the then USAID/RCSA strategic objective (SO3) “**Accelerated Regional Adoption of Sustainable Agricultural and Natural Resource Management Approaches**” through its IR1 and IR2.

SARRNET II project entitled “*A Vision based Regional Integration through Partnership and Participation for Demand-led Process of Root Crops Research and Development*” contributed to USAID/RCSA Intermediate Results 1 (IR1) “**Functioning systems in place for transferring agricultural and natural resources management technologies and best practices across the region**” with three expected results:

- SARRNET IR 1.1 Farmers have access to a wider range of improved varieties resulting in higher rates of adoption**
- SARRNET IR 1.2 Farmers in target areas using a wider range of crop management options leading to increased productivity**
- SARRNET IR 1.3 Broader public and private partnerships promoting regional technology development, exchange and application leading to increased availability of improved technologies to end users.**

Phase II of SARRNET also contributed to USAID/RCSA IR2 “**An enabling environment that provides increased incentives for smallholder and communities to adopt sustainable agricultural and natural resources management technologies and approaches**” with one expected result.

- SARRNET IR 2.1 Post-harvest systems linking root crops producers and industrial consumers to accelerate commercialisation of cassava and sweetpotato.**

To achieve the above IRs, activities were carried out through competitive grants and commissioned studies by IITA/SARRNET staff and/or in partnership with CIAT following a subcontract agreement between the IITA and CIAT on execution of SARRNET activities.

3.0 SARRNET vision, strategy and governance

SARRNET Phase II vision was to promote a dynamic economic growth in the agricultural sector in the region by linking farmers to private industries/markets so as to develop viable small, medium and large-scale enterprises both in the rural and urban areas that will look at root crops from a business point of view. It also believed that producers will only be motivated to adopt commercial production and increase their productivity if they can sell their produce to dependable and sustainable local industries and exporters based on a thorough understanding of domestic, regional and international markets.

SARRNET strategy was based on:

- 1. Food security** (ameliorating natural disasters and civil strife)
- 2. Income generation and equity** (high value markets linked to s/holder farmers)
- 3. Commercial crop and industrial uses** (import substitution/foreign exchange earnings & portion of the value added retained in the rural sector).

In pursuit of its goals and objectives, SARRNET conducted market-led research for development activities through small competitive grant projects, commissioned studies and through collaboration with the National Agricultural Resource Systems (NARS). In this endeavour SARRNET and its partners developed demand-driven technologies such as varieties targeting specific end-uses and

introduced processing technologies to the producers to improve on grades and standards of the end products following end-users requirements. As Such, SARRNET had to:

- Carry out an in-depth analysis of potential agricultural sub-sectors to determine appropriate commodities/products demanded from root crops and develop promotional interventions;
- Develop and introduce/promote market-led technologies such as germplasm adapted to specific uses and responding to commercial production
- Improve grades and standards, assure that food and products quality is maintained and that superior products attract premium from the market;
- Develop viable business models based on such analysis to link the producers, processors and users in the market chain (Consortium approach); and
- Provide practical advice to interested stakeholders in the production, processing and handling, utilisation of the products in order to improve the efficiency and quality products to meet the local and international high grades and standards.
- Conduct Integrated Production and Pest management (IPPM) including crop and soil management practices

In the **‘linking farmers/producers to markets’**, SARRNET used the following approach:

1. Market opportunities identification of root crops products (flour, feed and starch and other industrial applications);
2. Development of processed root crops products that fit the identified markets or industrial processors;
3. Industrial testing/applications of the root crops products with private sector partners;
4. Identification of suitable production areas and provide improved production and processing technologies to rural farmers to fulfil required market grades and standard and link them to identified markets;
5. Providing technical support/training to local partners (manufacturers development and extension partners, private sector);
6. Scaling up with assistance of support partners (NGOs, micro-credit facilitators, traders etc) and development of public-private sector partnerships;

SARRNET II as well as Phase I was managed by a Coordinator and governed by a Steering Committee (SC). The SC was a mix of private and public sectors comprising representatives from the private industries, National Agricultural Resources Systems (NARS: Farmers associations, research, extension, planning etc.), the universities, NGO’s, CG centers and donors. The SC was the policy making body of SARRNET and set the market-led research for development agenda, priorities. Other regional networks representatives and stakeholders participated in the SC annual meetings.

4.0 ACHIEVEMENTS

4.1. Sub-sector analysis of cassava and sweetpotato

Sub-sector analysis studies were conducted in Malawi, Tanzania and Zambia to understand the structure and performance of cassava and sweetpotato markets in these countries and draw inferences for Southern Africa. The surveys were carried out in major cassava and sweetpotato production, consumption and marketing areas between 2000 and 2002. Data was collected at farm, rural market, wholesaler, transporters, retailer and industrial processor level covering all marketing aspects including marketing opportunities for processed products. The surveys comprised of three phases: literature review, qualitative assessments and quantitative studies. A total number of 730 producers, 544 traders and 790 consumers were interviewed using structured questionnaires and participatory methodologies.

The studies showed that there has been significant increases in production and consumption of cassava and sweetpotato in the region in the recent years with production expanding even in non-traditional growing areas where 90% of the farmers sold their cassava, implying that cassava have become an important cash crop in the region. For more than 70% of the farmers, food and cash were the major reasons for growing cassava and sweet potato.

Consumers of cassava/sweetpotato are mainly low to middle income class people and these products are substitutes for products taken during breakfast. The major form of consumption reported was fresh boiled roots. Preferred varieties are those with good (sweet) root taste, fast cooking and high dry matter content, all related to fresh root consumption.

Players in the cassava/sweetpotato marketing chain: producers, traders (middlemen /wholesalers, retailers), transporters and consumers mainly rely on “social networks” and personal observations for marketing information. Pricing of cassava/sweetpotato is subjective with a certain level of bargaining for both quantities and price; however, traders especially middlemen have an upper hand in price determination. No clear standards are set but root size, grade, farm gate price, and to a lesser extent, variety, freshness and colour play an important role in pricing especially at retail markets. Transport costs constitute the major costs incurred by traders.

There are a number of industries using cassava products as raw materials; however, little cassava penetrates the industries at the time of the studies despite the fact that demand for industrial use has been increasing. Producers and traders mainly target the fresh cassava/sweetpotato market other than the processing industries. It was found out that the fresh market is more lucrative than the industry. In addition, the linkage between industrial processors and producers is very weak and in most areas, it is non-existent. Little processing of cassava was reported amongst players with most of it being done to change the form in which the product is consumed and to increase shelf life. Processing was mostly reported in areas where cassava is grown as a staple food. Processing methods reported were mainly rudimentary involving peeling, fermenting and pounding.

Fostering technological advances in domestic processing and strong linkages between producers and the industry would enhance consumption and utilisation of cassava /sweetpotato products. The supply of timely and reliable market information as well as establishing grades and standards would facilitate the marketing process. The country reports and a regional synthesis report have been published separately as monographs.

IR 1.1: Farmers have access to a wider range of improved varieties resulting in higher rates of adoption

1.1.1 Primary multiplication and distribution of improved/clean planting materials

Lack of adequate, high quality planting materials of improved varieties was identified as one of the bottlenecks to the expansion of cassava and sweetpotato in Southern Africa. This is compounded by the bulkiness and high distribution costs, low multiplication rates, and poor keeping quality of vegetative planting material. Multiplication and distribution of planting material is thus essential for successful adoption of improved cultivars at farm level. Thus, cassava and sweetpotato multiplication programme was initiated in many SARRNET country members. This has helped in the spreading of improved, introduced varieties and cleaned planting materials of locally recommended varieties.

Total area under cassava multiplication in the region in 2002/2003 was 739 ha, which produced a quantity of 33,923,300 m, which planted about 10,000 hectares of improved materials from nurseries alone. The hectareage for sweetpotato multiplication was 647 that produced about 38,820,000 m and this planted over 4,000 hectares (Table 1). The multiplied varieties are those that were released and recommended in the region.



Cassava and sweetpotato multiplication plots at one of the primary nurseries



A farmer transporting planting material



Cassava stems loaded on a vehicle for transportation to various locations for distribution



Farmers attending a seed distribution meeting



Cassava and sweetpotato planting material distribution for planting in 2001/2002



Table 1. Area under primary multiplication (SARRNET, NGOs, GVT, FAO) with improved/clean planting materials in different SARRNET countries for 2002/2003.

Country	Area under cassava (ha)	Quantity of cuttings (m)	Area under sweetpotato (ha)	Quantity of vines (m)
Malawi	300	13,410,000	190	11,400,000
Mozambique	274	12,247,800	337	20,220,000
Zambia	35	2,458,500	60	3,600,00
Tanzania	85	3,795,500	40	2,400,000
Angola	45	2,011,500	20	1,200,000
Total	739	33,923,300	647	38,820,000

1.1.2 Adoption of improved varieties (Area planted with improved/clean varieties)

As a result of multiplication and distribution exercises carried out in the region, there has been a steady but remarkable increase in area planted with improved/cleaned cassava and sweet potato varieties (Table 2). During the period under review, the percentage area put to improved sweetpotato varieties in the region grew from 12% to 29% while that of cassava grew from 7% to 13.5%. The sweetpotato variety SPN/O called Kenya in Malawi and Chingova in Zambia, Zimbabwe, Mozambique and Democratic Republic of Congo, has extensively spread in Southern part of Africa with high rates of adoption (Fig 1). The slower growth rate for cassava adoption compared to sweetpotato has been due to shortage of planting material as a result of early harvests to circumvent the hunger crisis, pressure of diseases such as CBSD, drought and floods problem and the slow propagation rate. However, the participation of other stakeholders in the root crops plant material multiplication and distribution has been on the increase particularly for food security reasons. A total of 123 recorded stakeholders within the region have participated in plant material multiplication and distribution (Table 3).

Table 2. Percentage area planted with improved/cleaned cassava and sweet potato varieties in some SARRNET participating countries

Country	Crop	% Estimates of area put to improved varieties in target countries ¹				
		1998	1999	2000	2001	2002
Malawi	Cassava		21.81	20.89	22.87	24.0*
	Sweetpotato		5.22	5.84	6.70	30.0*
Mozambique	Cassava		0.04	0.044	0.063	6.10
	Sweetpotato		7.2	7.5	8.208	8.3
Zambia	Cassava		7.0	13.5	15.31	19.0
	Sweetpotato		25.3	25.4	47.75	50.0
% Regional average	Cassava	5.00	7.38	8.81	9.77525	13.5
	Sweetpotato	6.00	12.57	12.77	15.6645	29.4

Table 3: Number of Non governmental organisations (NGOs), community based organisations, private sector and public institutions involved in the multiplication and distribution systems in the region by country

Country	No. of NGOs	No. of CBOs	No of Private organisations	No. Public institutions
Malawi	24	2	14	9
Mozambique	7	27	-	5
Zimbabwe	2	1	2	8
Tanzania	5	1	-	2
Zambia	-	-	-	-
Angola	3	-	-	1
Lesotho	-	-	-	6
Swaziland	-	-	-	4
Total	41	31	16	35

Figure 1. SARRNET countries where SPN/O Sweetpotato variety has been adopted



1.1.3 Involvement of SARRNET in HIV/AIDS Programme

SARRNET in partnership with Save the Children Federation (USA) in Malawi decided to carry out joint cassava and sweetpotato activities to assist people caring for the terminally ill patients and orphaned children. Cassava and sweetpotato was chosen in the initiative because of their potential to make major contributions to socio-economic improvements. They demand less labour, requires less or no external inputs, are tolerant to drought and most crop diseases and pests and can provide cash when sold, vegetable relish and main dish when prepared at household level as cheap sources of Vitamin A, proteins, minerals and carbohydrates. The main activities were the establishment of nurseries in the target communities and training of the communities on root crops production and HIV/ AIDS prevention.

A total of 21 community groups of HIV/AIDS were formed in 3 districts of Malawi (Dedza, Mangochi and Nkhosakota) with 3 district AIDS Coordinating Committees (DACCs). A total of 206 men and 98 women were trained as trainers in seed multiplication, agronomy, processing and utilisation, and HIV/AIDS prevention. This activity resulted into increases in yields of sweetpotato and cassava in the target areas to an average of 12 and 15 tonnes per hectare respectively. About 18.8 hectares of cassava and 11 hectares of sweetpotato nurseries were established. An estimated number of 6000 vulnerable households benefited from the seed each planting 0.06 ha cassava and 0.04 ha sweetpotato. Harvested roots for both crops totalled 560 tonnes and benefited about 5000 vulnerable households each getting 112 kg. One community aids committee received a grater for cassava processing. The Processing period has been reduced from 7 days to 2 thereby enabling families to dedicate more time to care for the sick and orphaned children.

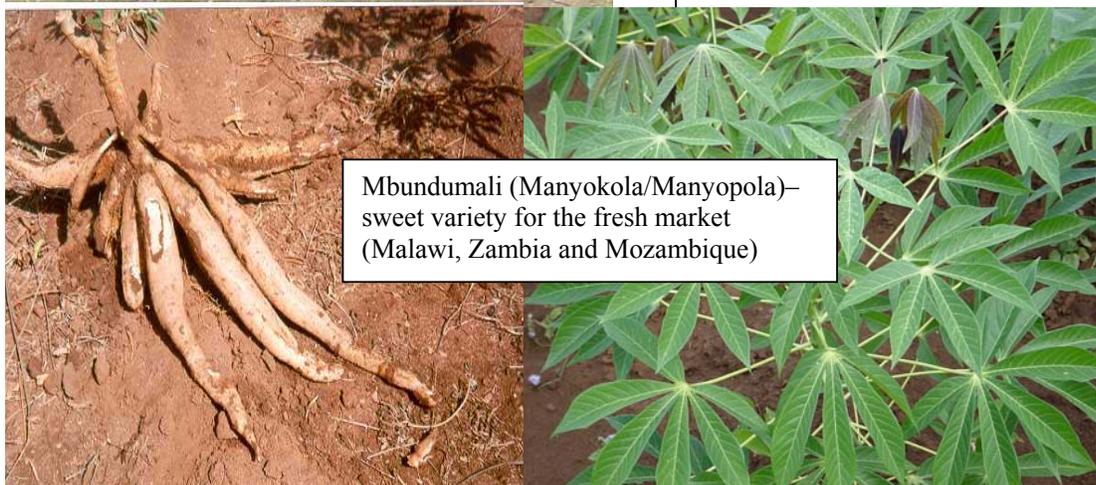
IR 1.2: Farmers in target areas using a wider range of crop management options leading to increased productivity

1.2.1 Demand-led Research for Development

SARRNET role in research for development was based on specific needs of the stakeholders. A number of researchable areas were undertaken to come up with improved agricultural technologies and practices in the region for adoption by farmers, public and private sectors. These included the following:

Germplasm development for targeted specific uses

SARRNET undertook several commissioned studies on participatory variety selection targeting specific uses and market. For fresh cassava market, SARRNET breeding and selection strategy was to develop sweet varieties with low cyanogens while bitter and high dry root yield varieties were being developed for industrial uses (starch, industrial flour etc.). Orange fleshed sweetpotato varieties; rich in Vitamin A were introduced for fresh market in rural and urban communities to combat vitamin A deficiency. For instance in Mozambique, distribution of improved orange-fleshed sweetpotato planting materials to combat vitamin A deficiency benefited 55,000 and 33,500 families respectively in Zambezia and Nampula provinces.



To increase the yields of cassava, SARRNET efforts were geared towards combating the emerging threat of Cassava Brown Streak Disease (CBSD). CBSD is a major biotic constraint to cassava production along the lakeshores of lake Malawi and in the coastal regions of Tanzania and Mozambique. The disease affects total root yield and root quality. Field trials conducted in Tanzania established that CBSD could decrease root yield up to 70 %. Collections and exchange of botanical seeds for different varieties and promising clones from Uganda, Tanzania and Malawi have been done for regional germplasm development work mainly for screening for CBSD resistance (Table 4). More than 240,000 true seeds were exchanged between IITA Ibadan, IITA Uganda, Mozambique, Tanzania and Malawi.



Cassava brown streak disease on the cassava leaves and roots

Table 4: Seed collections and exchange for regional CBSD screening trials.

Country of origin	Number of seeds collected/introduced		
	To Malawi	To Tanzania	To Mozambique
Uganda	20,000	-	-
Tanzania	600	3000	-
Malawi	110,000	9000	30,000
Mozambique	-	-	-
IITA-Ibadan	20,000	30,000	18,000

Through commissioned studies, small competitive grant projects and through collaboration with the National Agricultural Resource Systems (NARS), a total of 32 cassava varieties were released during phase I and II of SARRNET (Table 5). Some of these varieties have high levels of tolerance to Cassava Brown Streak Disease (CBSD), which is becoming a threat in the region. In addition, 24 sweetpotato varieties were also released during the same period (Table 6).

SARRNET also conducted Leaf and Root Production trials for livestock feed industry. Results of these experiments are presented in Annex 7. Variety selection to produce low cost livestock feeds from root crops for increased milk, meat and egg production as demanded by the farmers was being done. Work was done with Land O Lakes and Central Region Milk Producers Association of Malawi, while in Tanzania work was done with egg and poultry producers.

Table 5. Cassava varieties released in the SADC region during SARRNET Phase I and II

Variety	Source or place of origin	Place of release, year and local name (<i>Italics</i>)	SADC population reached
Manyokola	Malawi	Malawi 1999 (<i>Manyokola</i>) Zambia (<i>Manyokola & Maniopola</i>) and Mozambique	20,000,000
TMS 91934	IITA (Nigeria)	Malawi 1999 (<i>Silira</i>)	1,000,000
TMS 60142	IITA (Nigeria)	Malawi 1999 (<i>Maunjili</i>), Angola	1,000,000
MK 95/478	Local selection from IITA OP	Malawi 1999 (<i>Mkondezi</i>)	1,000,000
CH92/112	Malawi (IITA OP)	Malawi 2002 (<i>Yizaso</i>)	1,000,000
CH92/077	As above	Malawi 2002 (<i>Sauti</i>)	2,000,000
Bangweulu	Zambia	Zambia 2001	2,000,000
Nalumino	Zambia	Zambia 2001	2,000,000
Kapumba	Zambia	Zambia 2001	2,000,000
Mbuyu/ Msufi/Mnazi	Tanzania	Tanzania	5,000,000
Kibangameno	Amani selecton	Tanzania, Kenya	3,000,000
Kigoma mweusi	Tanzania	Tanzania (<i>Kigoma Red</i>) mweusi, Mozambique (<i>Kigoma Red</i>)	30,000,000
Ngwananhanga	Tanzania	Tanzania	3,000,000
Mfaransa	Tanzania	Tanzania	3,000,000
Lumala mpunu	Tanzania	Tanzania	3,000,000
Kibaha	Amani selection	Tanzania	3,000,000
Hombolo 95/05	Selection from IITA OP	1998, Tanzania, drought resistant	200,000
Muzungu	Amani selection	Tanzania, Kenya	3,000,000
NDL 90/34	Tanzania	Tanzania	3,000,000
TMS42025	IITA	2002 Mozambique	2,000,000
TMS30001	IITA	2002 Mozambique and Tanzania	5,000,000
TMS30395	IITA	2002 Mozambique	2,000,000
MF 1	Australia	1994 Zimbabwe	3,000,000
MF 2	Australia	1994 Zimbabwe	3,000,000
MF 3	Australia	1994 Zimbabwe	3,000,000
MF 4	Australia	1994 Zimbabwe	3,000,000
Nachinyaya	Tanzania	Tanzania and Mozambique	15,000,000
TMS 60142	IITA (Nigeria)	1994 Angola	4,000,000
M 96000910	IITA parent I8200058HS (Nigeria)	1994 Angola	4,000,000
Precoce d'Angola	Local recommended variety	1994 Angola	4,000,000
TMS 40142	IITA Introduction	1994 Angola	4,000,000
Nganarico	Local variety	2000	4,000,000

Table 6. Sweetpotato varieties released in the SADC region during SARRNET Phase I and II

Variety	Source or Place of Origin	Place of release, Year and Local Name (<i>Italics</i>)	SADC population reached
Ribbok	South Africa	Botswana, Namibia and South Africa	10,000,000
Eland	South Africa	Botswana, South Africa	5,000,000
SPN/O	Tanzania selection	Malawi 1986 (<i>Kenya</i>), Mozambique (<i>Malawi</i>), Zambia and DRC (<i>Chingovwa</i>) and Zimbabwe (<i>Chingovya</i>), Botswana (<i>Kenya</i>), Swaziland <i>Kenya</i>)	80,000,000
Cemsa 74-228	(CIP)	Malawi 1999 (<i>Semusa</i>), Angola (<i>Cemsa</i>)	10,000,000
Mugamba	(CIP)	1999 Malawi	2,000,000
Tainoni	Asia (CIP)	1999 Malawi	2,000,000
Kakoma	Malawi	1999 Malawi	2,000,000
Salera (1941/121)		2002 Malawi (<i>Salera</i>)	2,000,000
Kapiri,	Zambia selection	Zambia (<i>Kapiri</i>)	3,000,000
Katondo	Zambia selection	Zambia (<i>Katondo</i>)	3,000,000
Mbete	Zambia selection	Zambia (<i>Mbete</i>)	3,000,000
TIS 25 32	IITA (Nigeria)	Mozambique 2002	1,000,000
TIS 2534	IITA (Nigeria)	Mozambique 2002	1,000,000
INIA 15	Mozambique	Mozambique 2002	1,000,000
INIA 9	Mozambique	Mozambique 2002	1,000,000
INIA 3	Mozambique	Mozambique 2002	1,000,000
NC1560,	Nigeria	Angola	3,000,000
Lanceolada,		Angola	3,000,000
Lo323,		Angola	3,000,000
W119,		Angola	3,000,000
Cubana	Angola selection	Angola	3,000,000
Bosbok	South Africa	Zimbabwe, South Africa, Botswana	15,000,000
Brondal	South Africa	Zimbabwe, South Africa, Botswana	15,000,000
Blesbok	South Africa	Botswana, Lesotho, South Africa, Namibia	15,000,000

IR 1.3: Broader public and private partnerships promoting regional technology development, exchange and application leading to increased availability of improved technologies to end-users

1.3.1 Networking

SARRNET has developed regional networks and strategic partnerships with government, non-governmental organisations and business sector organisations. Through these networks, SARRNET has been able to develop and introduce technologies and knowledge from one country/place to another.

1.3.2. Technology transfer

There have been several cases where technologies of cassava and sweetpotato developed in one country have proved to be well adapted and acceptable to farmers in several other countries. This is true for cassava and sweetpotato germplasm exchange and dissemination, processing machines dissemination, scientific and technical visits exchange among stakeholders. Seed multiplication and distribution systems developed in some countries were replicated in other countries to accelerate adoption of improved/cleaned varieties.

1.3.3. Information sharing

SARRNET II has published and distributed **ROOTS** newsletter bi-annually for information sharing within and outside the SADC region. Six regular issues and one special issue on CBSD totalling 15,000 copies were produced and distributed to various stakeholders and interested partners. SARRNET also posted a web page, www.sarnet.org on the Internet, which was updated regularly for efficient information dissemination. SARRNET conducted steering committee meetings where delegates shared information through presentation of technical papers, country reports and general

discussions (Annex 2, 3 and 4). SARRNET also sponsored symposia and workshops where stakeholders shared information (Table 7). In addition to these, 19 books titled “The CASSAVA Transformation” by Nweke, F.I. et al were distributed to some countries in the region. SARRNET also produced semi-annual and annual technical reports, which were distributed to all stakeholders and the donor.

Table 7: Workshops sponsored by SARRNET Phase II

Title	Year and place	No. of participants	Observation
Workshop/ Symposium			
Sweetpotato breeding study tour and training workshop.	14-22 May, 1999, Uganda and Tanzania	9	SARRNET sponsored SADC participants to the workshop
Production and Impact statistics for cassava and sweetpotato	13-16 Sept, 1999, Dar-es-Salaam, Tanzania	39	Jointly organized with other IITA networks
SARRNET stakeholders conference	18-20 Jan, 1999, Harare, Zimbabwe	74	Formulation of SARRNET II implementation strategy
2001 steering committee meeting	14-18 May, 2001, Dar-es-Salaam, Tanzania	33	Participants came from the private sector, NARS, NRI-UK, CIP and IITA. A total of 25 presentations were made including progress reports
Cassava commercialisation for economic development in Malawi	21 st –23 rd May 2001, Blantyre, Malawi	82	This was an in country symposium and the proceedings were distributed to all stakeholders
2002 SARRNET Steering Committee meeting,	29-30 April, 2002, Pretoria, South Africa	37	Participants came from the private sector, NARS, sister networks, CIP, IITA and USAID. 10 country reports, 12 papers on commissioned studies and 4 progress reports for small grants were presented
2003 SARRNET Steering Committee and 2 nd SARRNET scientific workshop	19- 24 May 2003, Lusaka, Zambia	24 and 64	Proceedings of the workshop published in a special crop science journal.

1.3.4. Training and capacity building

One of the goals of SARRNET was to develop manpower through higher degree/non-degree training, and in service training to develop their capacity for research on root crop research for development. About 233 participants from the SADC countries were trained in various themes as presented in Table 8. The direct impact of these training programmes has therefore been attainment of skills to better execute research activities, which ultimately leads to increase in the production and productivity of the agricultural and natural resource sector.

Table 8. Short-term courses sponsored by SARNET Phase II

Title of course	Country/Locati on	No. of participants	Gender		Period
			Male	Female	
Mozambique					
Multiplication of cassava and sweetpotato	Nampula	30	23	7	2-13 July 2001
Nutrition and Agro-processing of cassava and sweetpotato	Maputo	26	10	16	29Oct-9Nov, 2001
Rapid multiplication of cassava and sweetpotato	Gaza	4	4	0	11-14 Nov, 2001
Rapid multiplication of cassava and sweetpotato	Gaza	8	7	1	25-29 Marco 2002
Nutrition and Agro-processing of cassava and sweetpotato	Maputo	9	6	3	25-29 Marco 2002
Nutrition and Agro-processing of cassava and sweetpotato	Maputo	4	2	2	17-22 April 2002
Tanzania					
Training of local manufacturers in the construction of cassava processing	Mwanza	2 Workshops	5		May-Aug 2001(each workshop 3-5 working days)
On-farm cassava and sweetpotato rural processing and product development	Dar es Salaam	29	15	14	9-19 Oct, 2000.
Training of local processors in cassava processing	Kibaha	10	-	10	March 2001 (2 days)
Malawi					
Root crops production processing and utilization	Blantyre, Thuchila	34	24	10	1 st week August 2000
Root crops production processing and utilization	Ntcheu, Nkhonde	52	39	13	1 st week July 2000
Commercialization and enterprise development of cassava and sweetpotato planting material	Lilongwe	27	16	11	24July-4 August 2000
Training of local manufacturers in the construction of cassava processing equipment	Lilongwe/Blantyre	2 workshops	8		May-Aug 2001(each workshop 3-5 working days)
Zambia					
Training of local manufactures in the construction of cassava processing equipment	Lusaka	1 Workshop	4		Aug 2001

Workshops and training outside SADC region

Table 9 gives a summary of workshops and training courses attended by SARRNET staff/collaborators.

Table 9. Workshops attended by SARRNET Staff or Collaborators

Course/ Workshop	Period	No. of SARRNET sponsored participants	Location/organizer
Agro-enterprise course,	May 2001	5	Entebbe, Uganda/ FOODNET
GIS- course,	June 2001	3	Kampala, Uganda/ IITA
Post-harvest and Marketing course,	9 – 19 October 2000	29	SARRNET/ Tanzania
ISTRC-AB,	12 – 16 November 2000	12	ISTRC-AB/IITA/ Nigeria;
Quantitative Analysis of Data from Participatory Plant Breeding workshop	23 – 25 August, 2001	1	Giessen, Germany
Sweet potato symposium	November 2001	2	Lima, Peru
Sub-Sahara African Network of the International Biometrics Society	3 – 8 December 2001	1	IITA, Uganda

IR 2.1: Post harvest systems linking root crops producers and industrial consumers to accelerate commercialisation of cassava and sweetpotato

2.1.1 Promotion of cassava commercialisation

SARRNET in collaboration with CIAT /CLAYUCA promoted a dynamic economic growth in the agricultural sector in the region by linking root crops farmers to private industries so as to develop viable small, medium and large-scale enterprises both in rural and urban areas. Strong private sector participation has been developed in the region following four functional models that SARRNET initiated which focussed on production, processing and marketing. As a result, the region registered increasing demand and use of cassava as a raw industrial material. Cassava has application in food, confectionery, timber, paper, packaging, pharmaceutical and textile industries. Ethanol and gel fuel manufacturing and animal feeds are emerging uses of cassava. Industrial demand and use of cassava products by pre-selected industries in the region rose from 7000 mt in 1999 to 12000 mt in 2003 (Figs. 2 and 3; Table 10). Within the same period, there was also an increase in the number of industries utilising cassava products in the three leading countries:



Files of plywood successfully made using cassava flour as a binder at RAIPLY



Cassava flour in a supermarket in Zambia

Zambia, Tanzania and Malawi. With the projects efforts, other companies such as METL (Mohammed Enterprises Tanzania Limited) in Tanzania are planning to develop a commercial cassava starch factory targeting at 15000-18000 mt of native starch per year (around 80,000 mt of fresh cassava roots). The company supported SARRNET and the national program on cassava research activities with land, labour and logistics and SARRNET and NARS Tanzania provided technical backstopping (germplasm,

agronomy trials, contacts and technical information). In Malawi, an Ethanol extraction company and a gel fuel company are also planning to start utilizing cassava products of up to 36,000 mt per year.

The region has also seen the growth of fresh cassava and sweetpotato markets in urban and peri-urban centers where these crops have acted as substitutes for bread. The four functional models that SARRNET initiated include:

2.1.1a Promotion of cassava production and marketing using farmers' associations

Two farmers' associations as 'pilots', one in each, Malawi and Tanzania were formed under SARRNET guidance and technical support from CIAT/CLAYUCA following the sub-contract signed in 2000 between IITA/SARRNET and CIAT.

In Malawi, SARRNET worked with Phalombe farmers association, which is under Christian Service Committee (CSC). Phalombe is located 137 km east of Blantyre and is accessed by traders including intermediate buyers. Industries establish satellite depots from where they purchase agricultural produce. SARRNET took advantage of this situation to rejuvenate production, processing and marketing of cassava, a crop that was previously grown in the area but abandoned due to lack of market incentives and declining yields due to pests and diseases. SARRNET worked with 100 farm families from eight villages. Clean cassava seeds of improved varieties were distributed to 100 farmers for 25 ha since the major constraint in the area was lack of planting material. A demonstration on improved processing methods involving use of motorised cassava chipper was done. SARRNET contacted Rab processors and Universal industries on behalf of the farmers to get their industrial demand for cassava chips. These companies accepted to purchase cassava chips from farmers as long as quality was assured. So far these companies require over 12,000 metric tonnes of cassava chips for their domestic industrial production and export. SARRNET installed a motorised cassava chipping machine, a drying floor to improve grades and standards for products to be processed at the site. Although farmers accepted the technology and produced good quality chips, distance between the pilot site and the main road to the urban market was the major limiting factor hindering the success of this project as the industries contacted wanted farmers to deliver the products at their factory.



A processing machine under demonstration with farmers in Phalombe **Cassava field in Phalombe (Malawi)**

In Tanzania, SARRNET worked with Bungu community in Rufiji district, eastern Tanzania, where four farmers associations have been formed for cassava processing and marketing. Bungu community was identified as a potential area for cassava processing, as farmers are not able to sell fresh cassava into Dar es Salaam market due to poor road linkages despite high cassava production in the area. Traders from the city prefer buying cassava from areas closer to Dar es Salaam where farmers get as high as 30 US \$/mt while farmers at Bungu are offered as low as 10 US \$/mt due to extra transport costs (distance and poor roads). Cassava yields are good in Bungu and there is low disease pressure. Traditionally farmers eat cassava in fresh form or processed (makopa). However, the processing of makopa takes long and is very basic. The entire drying process



A good cassava yield in Bungu **Traditional way of drying makopa**

takes over 10 days, while the roots are getting fermented subsequently discoloured. Most often drying is done on the ground hence the final product contains a lot of sand and dust or soil particles. SARRNET introduced motorised cassava chippers and drying racks in the area so that farmers can produce dried, clean white chips-producing higher quality products in a



Cassava processing at Bungu using motorised chippers

The group with SARRNET staff looking at drying racks

shorter time. The group was invited to Dar-es –Salaam to visit major markets and potential buyers. The group is now able to sell processed cassava chips/flour at 150 US\$/mt, is less dependent on few traders of fresh cassava, and there are new employment opportunities for women including the elderly (peeling, processing and harvesting). (See details in Annex 6)

In addition to these, other cassava production associations were organised in collaboration with NGOs such as World Vision in Malawi and Food net in Tanzania.

2.1.1 b Promotion of cassava production through out-growers schemes.

Most private industries using cassava do not produce enough cassava for their requirements. For example, a Cassava Starch Manufacturing Company in Pietersburg in South Africa produces cassava for its factory on more than 2000 ha. To catch up with its daily requirements of 250 tons per day of fresh cassava roots, CSM contracts farmers in Mpumalanga region to produce cassava for the factory.

In Malawi, Njuli farm of Universal Industries distributed cassava seed to farmers for 260 hectares. It buys the roots from farmers. The farm has a power chipper for making chips introduced by SARRNET and hammer mill for flour making. The farm also participated in evaluating 5 new cassava clones.



Visit of Njuli farm , Malawi

2.1.1c Promotion of cassava production and marketing through commercial producers and processors

SARRNET efforts also resulted in some estates diversifying their production to cassava with the intention of processing cassava into various products such as flour and starch. Chitipi farm is one such a case



Cassava at Chitipi farm

in Malawi where over 120 ha of cassava has been planted on the farm with technical backstopping from SARRNET. The farm has already profited from the sale of planting material to NGOs and other farmers and has plans of processing the roots into starch, flour or pellets (see success story, Annex 9)

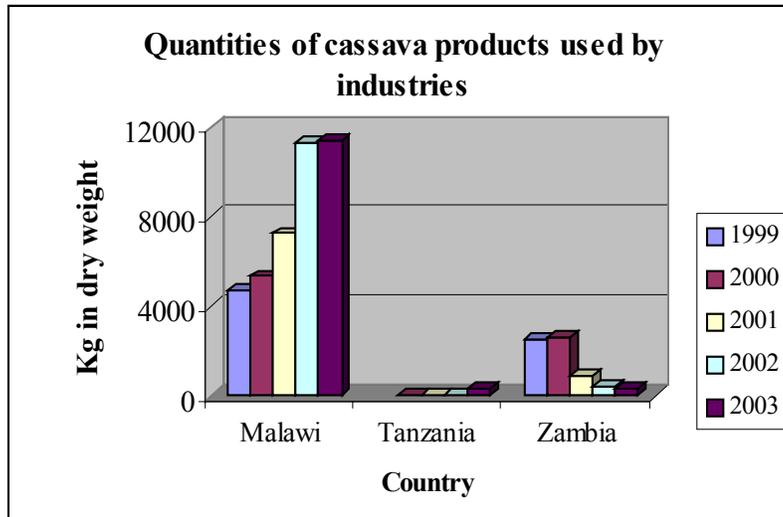
In Tanzania, METL, Tanzania’s largest Agro-enterprise company has decided to invest in large scale starch processing.

2.1.1d Promotion of cassava marketing through intermediate traders: “The middlemen”

The strategy was used to promote marketing of cassava products through intermediate buyers (IBs) in the region. IBs play an important role in the fresh cassava and sweetpotato markets by sourcing the products from the rural areas into urban markets. The role that SARRNET played was to link the IBs to the industry. These reach remote areas to source cassava chips/roots for sell to consumers and industries. Some industries have benefited from the use of intermediate buyers in Zambia, Tanzania and Malawi. Examples of such industries are one timber industry in Malawi (ITL, a plywood manufacturing company) and Rab processors (produces cassava/maize blended flour).



Fig 2. Quantities of cassava products used by industries in the three leading countries for 1999-2003.



Note: The market of cassava is just coming up in Tanzania as a result of SARRNET and NARS activities. The crop suffered the image problem and was confined to the rural areas. The decline in cassava use by industries in Zambia for 2001 and 2002 is attributed to hunger such that most of the cassava was consumed than sold to industries and for 2003, data from other companies could not be collected.

Fig 3. Number of Industries utilising cassava products in the three leading countries since 1999

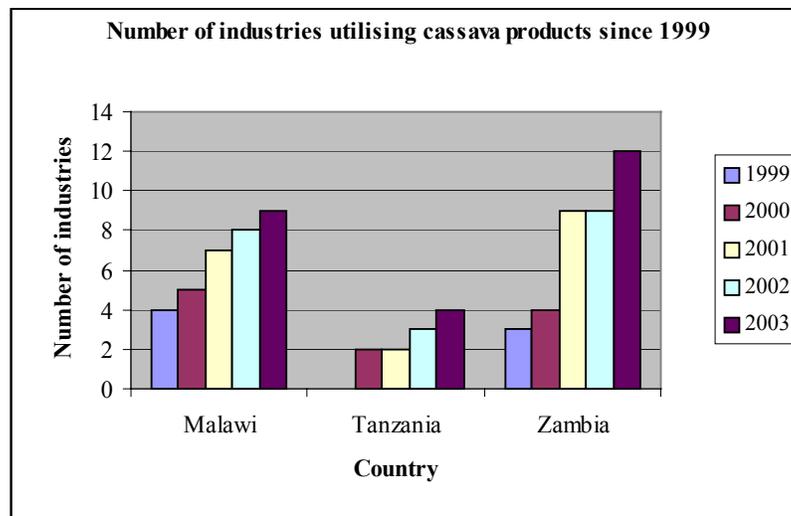


Table 10. PRE-SELECTED PANEL OF COMPANIES USING CASSAVA IN SARRNET TARGET COUNTRIES

Country	Industry	Estimated utilization of cassava per year in metric tons of fresh cassava				
		1999 (baseline values)	2000	2001	2002	2003
Malawi	David Whitehead	520	1,200	344	0	0 ¹
	Universal Industries	227	333	700	1000	1000 ²
	Rab Processors	3,000	1,800	6,000	10000	10,000 ³
	Hussen Mahommed	1,000	2,000	0	60	- ⁴
	ITL	0	0	192	220	300 ⁵
	Katete farm	-	-	-	-	100
Mozambique	Casa do Gaiato	0	-	12	-	- ⁶
Tanzania	Ramesh Patel Mlandizi	0	0	0	-	- ⁷
	Power Foods Limited, Igesa and Kitco Ltd		12	12	20	180 ⁸
	Mtwara Farmers	0	0	0	-	- ⁹
	Jayaba Mills			0	10	- ¹⁰
	Vita Feeds	-	-	-	-	120
Zambia	Chundleigh Bakery (Pro-Processing Enterprises)	2,400	2,400	100	150	- ¹¹
	Namando Investments	50	50	500	10	- ¹²
	Wood Processing Industry – Ndola	50	50	167	121	- ¹³
	Unity Paper Packaging Company Ltd		153	157	130	140 ¹⁴
	Trishul	-	-	-	-	50
	Zambezi paper mills Ltd	-	-	-	-	100
	Monterey printing & packaging	-	-	-	-	36
	19 industries	7,247	7,997	8,166	11,721	12,026¹⁵

¹ The company is on the verge of collapsing and is working on skeleton staff through government intervention

² There is steady increase in utilisation of cassava flour for biscuits making, also flour was being sold to consumers.

³ Rab launched cassava maize flour blend, which is selling very well. The management provides figures which cannot be verified but which seem underestimated.

⁴ Though not open with figure, but bought about 28MT of chips

⁵ Have started using in plywood manufacture

⁶ A catholic processing unit producing cassava gari (Farinha)

⁷ Is failing to install an already bought cassava starch plant

⁸ Producing flour 1kg packs. Volumes to supermarkets are on the increase

⁹ Used to export cassava chips but stopped due to low world prices

¹⁰ Mills flour and sell to supermarkets

¹¹ Company changed name to Pro-Processing Enterprises. Sell pure cassava flour or cassava blended with wheat flour. May have used more but is withholding information

¹² Activities of the company were scaled down to closing levels due to scarcity of cassava as a result of food crisis and due to managerial problems

¹³ Uses cassava flour in timber, but has problems with suppliers who provide poor quality flour (impregnated with foreign particles) and the quantities are reduced to famine.

¹⁴ Uses cassava for making glue for laminating carton boxes. Manufacturer of packaging material.

¹⁵ This data is on the 3 lead countries

2.1.2 Quantity of improved clean planting material sold by private sector

SARRNET promoted production of clean planting materials of improved varieties for multiplication and dissemination. Commercialisation of planting material has now taken a definite shape. At first (in the year 2000), only few farmers were reporting that they sold or bought some cassava or sweetpotato planting material. Commercial seed production was observed only with Mtendere Campus in Malawi who produced 3 ha of land for cassava and ZIMCAP Company in Zimbabwe who produced sweetpotato seed. However, SARRNET and NARS have witnessed 4 more established multipliers of cassava and sweetpotato-planting material while in Zimbabwe ZIMCAP was joined by Dr Robertson to multiply sweetpotato. The commercial market has rapidly developed in Malawi, Zimbabwe and Zambia. For instance, 15 firms/stakeholders were involved in the production and selling of cassava and sweetpotato seed over the last two years (Table 11). In addition to these, there are a number of public and private multiplication sites some of which were established by SARRNET/NARS but supervised by extension staff. NGOs, CBOs, CSOs, and individuals buy planting materials from the multiplication sites.

Table 11 Companies/individuals multiplying cassava and sweetpotato planting material, 1999-2002)

No	Name of Farmer	Planting Material	Land (ha) in 2002
1	Mtendere Campus	Cassava	20
		Sweet potato	2
2	Malindi Farm	Cassava	15
3	Mr Mafuta	Cassava	3
4	Nathenje Farmers Group	Cassava	10
5	Mtukuso Chitedze Farm	Cassava	1
6	Mr Tembo Chiwamba	Cassava	0.4
7	Mr Steven Banda	Sweetpotato	0.3
8	Nathenje EPA	Cassava	2
		Sweetpotato	0.4
9	Mr Chinzimu	Cassava	2.0
10	Mr Munthali	Cassava	3
11	Chitipi farm	Cassava	120
12	Research Institutions 1. Chitedze	Cassava	5
		Sweetpotato	0.5
		Sweetpotato	1
		Cassava	1
		Cassava	3.5
13	ADDs	Cassava	20
14	Mr Mwakanema Zimbabwe	Cassava	5
15	Macheke	Sweetpotato	10
16	ZIMCAP Company	sweetpotato	3
	Total for cassava		210.9
	Total for sweetpotato		17.2

2.1.3 Post harvest technologies and research on product development

SARRNET and NARS promoted the use of improved post harvest technologies on cassava and sweetpotato with a shift from the traditional rudimentary methods to modern labour saving quality improving and value adding technologies to improve on grades and standards of the end products. To this effect, SARRNET promoted the use of modern chipping, slicing, and grating technologies, which were introduced in Zambia, Tanzania and Malawi from IITA/ESARC Uganda. In line with this, 10 local commercial fabricators in Zambia (1), Tanzania (7), and Malawi (2) were trained to fabricate technologies imported from other countries and produce them locally (Table 3). The adoption of these processing equipments is quite good with increasing level of commercialisation of cassava.



In Zambia, the processing technologies were introduced through a competitive grant project: “Promotion of Cassava Processing Equipment and Product Development”. The project introduced the technologies to over 2000 farm families in five provinces Northern, Western, Central, Lusaka, Eastern and Southern province. The main districts where the technologies were introduced include Lusaka, Kaoma, Kasama, Samfya, Solwezi, Choma and Chipata. About 37 units of machines were distributed in these areas to groups of farmers and a few entrepreneurs through project activities and those of collaborators (Table 12). In Malawi, the technologies were introduced in selected districts in the three regions of the country namely: Mzimba, Lilongwe, Nkhonkhotakota, Phalombe, Blantyre and Mulanje (Table 13). About 1600 farmers were reached.

In Tanzania, Powerfoods Limited was the first private company taking up processing technology and started selling high quality cassava flour after introducing equipment at the factory in Dar es Salaam. Later, more urban groups started using cassava processing (like women groups in Tanga town and in Kibaha). In addition to these, SARRNET introduced processing efforts further out of town in areas of high cassava production but poor market linkages due to distance to town and poor roads. One of such areas is Bungu in Rufiji district where farmers are now able to sell processed cassava products and are benefiting significantly from the intervention. Tables 14 and 15 present the distribution of processing machines in Tanzania and Zambia.

Table 12. Local artisans trained to modify and/or fabricate the imported processing machines

Tanzania	Malawi	Zambia
Nyumbu Automotive Technical Centre	Luso Workshop in Lunzu in Blantyre	Sams
Relaible Motor Works	Petroleum Services in Lilongwe	
Workshop Mtana		
Mushi Engineering		
Intermech Engineering		
Vitanda Engineering		
Pemba Engineering		

Table 13. Distribution of processing machines in Malawi

Type of machine	Distributed to/location	Collaborating Institution	Remarks
1 Engine driven grater 1 Manual chipper 1 Pressing machine	Chintheche EPA	Mzuzu ADD	Demonstrations on Processing for home consumption
Manual chipper	Mulanje	GTZ	Demonstrations on Processing for home consumption
1 Engine driven grater 1 Manual chipper	Nkhotakota	Save the Children Federation (US)	Mitigation of HIV/AIDS impact on affected communities for processing cassava for home consumption
6 Engine driven Chipping machines	Chata ADP (Chiwamba)	World Vision International	Processing for home consumption and sale to industrial markets
1 Motorized Chipper	Njuli Farm	Universal Industries	Processing cassava chips for biscuit and other confectionery manufacturing
1 Engine driven grater	Nali factory	Kay Marketing	Starch extraction
1 Engine driven slicer	Bunda College	Private processor	Processing cassava flour for making baby foods
1 Manual chipper	Area 25	Farmer (Mr Phiri)	Processing cassava for home consumption
1 Engine driven slicer	Bvumbwe Research Station	DARTS	Demonstrations on Processing for home Consumption
1 Engine driven Chipper	Embangweni	Christian Service Committee	Processing cassava chips for sale to timber industry
1 Engine driven slicer 1 Engine driven chipper 1 Engine driven grater 1 Manual chipper 1 Manual slicer	Chitedze Research Station	DARTS	For research purposes and Demonstrations on Processing for home Consumption

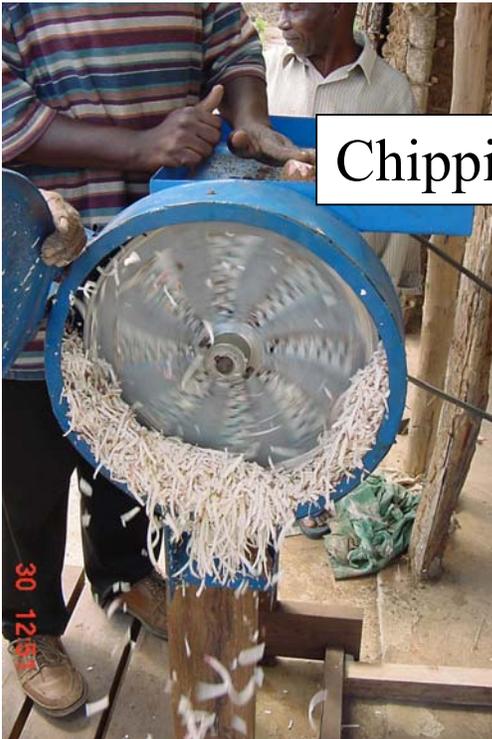
Table 14. Distribution of processing machines (Chippers) in Tanzania

Institution	Purpose/location	Type of equipment
Women group	Kibaha	Chipper
Women group	Tanga town	Chipper
Farmer groups	Zanzibar isles	2 manual; 2 petrol driven units 1 electric chipper
NRI/IITA project on CMVD	Lake Zone	Various units
Farmers group	Mvuti (Pugu)	1 motorised unit
Farmer group	Mkuranga	1 motorised unit
Power foods	Dar es Salaam	1 motorised unit
TFNC		1 Motorised chipper
Kibaha Team	Research, Kibaha	1 Motorised chipper; 1 grater
SUA departments	Demonstration, Kibaha	4 Chippers; 1 motorised unit

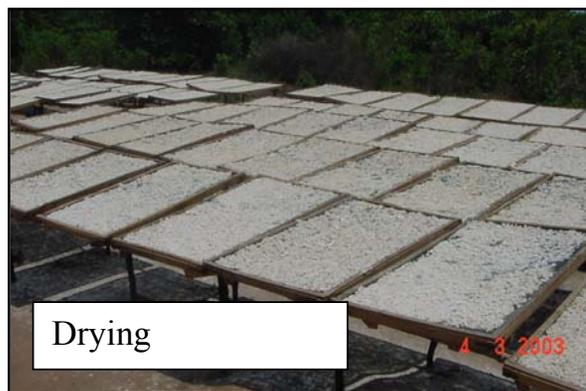
Table 15: Distribution of processing machines to collaborators/stakeholders in Zambia.

Institution	Purpose/location	Type of equipment	Remarks
Mt. Makulu Research Station	Demonstration & Promotion	1 Manual chipper; 1 Grater 1 Electric chipper; 1 Screw press	Delivered
Dept of Field Services Western Province	Demonstration & Promotion in Kaoma District	5 Manual chippers; 1 Petrol chipper	Delivered
PAM	Demonstration & Promotion in Eastern Central & Western provinces	1 Petrol chipper; 5 Manual chippers; 1 Grater +1 press	Delivered
AFRICARE	Setting up a livestock feed mill at Refugee camp in Kasama	1 Petrol chipper; 3 Manual chippers 1 Electric chipper	Delivered
Mansa TAS	Demonstration & Promotion in Samfya	1 petrol grater; 1 Petrol chipper 5 Manual chippers	Delivered
SAMs	Demonstration & Promotion	1 Electrical chipper; 1 Manual Chipper	Delivered
Mutanda Research Station	Demonstration & Promotion in Solwezi	5 Manual chippers; 1 Petrol chipper	Delivered

Display of the promoted New/improved cassava processing technologies



Chipping



Drying

2.1.4 Research on product development

SARRNET Phase II also promoted research on product development. Products developed from cassava and sweetpotato have been accepted while some products need further research. The most successful product from improved technologies is non-fermented cassava flour. Unlike traditionally made flours fermented and unfermented, flours made from slicing, chipping or grating technologies is superior in quality and also the advantage of bulk processing during short period of time makes it get premium price from industries. Cassava flour has multiple uses; it substitutes maize flour, wheat flour and sometimes starch in various industrial and food applications.

So far it is used in:

Meal flour, pure or blended with maize (Malawi, Zambia and Tanzania)

Paper mill industry (carton and tissues) substituting starch (Zambia)

Plywood Industry. Glue (Malawi and Zambia)

Packaging industry glue for cartons (Zambia)

Confectionery Biscuits and crisps (Malawi)

Bakery (Malawi, Zambia and Tanzania (*secretive industry*))

Other products Gari (Zambia), scones, cakes and doughnuts (Malawi and Zambia)

For sweetpotato, the most successful sweetpotato post harvest product is Sweetpotato juice. The product is produced by women groups and sold in Mozambique. Other products which have been selected for further trial in Zimbabwe (Rukuni, 2001) after successful preliminary sensory testing include jam, crisps and bakery or confectionery products.



A display of cassava products in Malawi.

From left to right: mandasi ; Boiled cassava chips (makopa, makaka,) with meat; cassava juice and wine; cassava doughnats; traditional cassava chip; ,assorted cassava products)

The silage and compound feeds from sweetpotato and cassava roots and leaves also showed strong signals for growth of the livestock feed industry in the region. In Malawi research work on silage was done with Land O Lakes and Katete livestock farm. In Tanzania, joint field trials were conducted with feed millers and livestock farmers on silage and compound feeds from sweetpotato and cassava roots. These include Farmers' Centre (Nguva farm, Kigamboni); Interfarm feeds (Kiwalani area); Odata farms- Dairy farm with various crops, Mpigi/Magore; Tan Daries, Kimara (dairy cattle keeper) and others.

2.1.5 Cassava in livestock feed

SARRNET in collaboration with CIAT/CLAYUCA conducted research on livestock feed in Tanzania and Malawi. In Malawi cassava feed production trials were conducted with Land O lakes and Katete farm while in Tanzania, research was conducted with some egg and poultry farmers (Annex 6). In Malawi, the research was aimed at determining the acceptability of cassava silage by dairy animals, the effect of feeding cassava root and leaf silage on the health of the animals and milk yield. Six animals were used of which 3 were fed from cassava silage (80% leaves and 20% roots) and the other 3 were controls fed on grass and maize silage. A mixture of four varieties of cassava namely Silira, Mbundumali, Maunjiri and Mkondezi were used for making the silage. Fresh leaves and roots were chopped using pangas (machetes) and tractor-operated chopper to make the silage. Results indicated that the animals accepted the cassava silage and that their body conditions/health were improved. The cassava silage increased milk yield from an average of 6 litres/animal/day to 13 litres during the dry season. Results also indicated that butterfat content of the milk was improved by the cassava silage from 3.2% to 3.6%. Economic analyses of feeding cassava on dairy animals indicated that every money invested in cassava silage brought a return of 49.20 more folds in milk as opposed to investment in maize/grass silage which brought a return of 14.00 more folds only. There seems high potential for improving the dairy industry by using cassava silage in Malawi.



Cassava silage at Katete farm (Malawi)



Dairy cattle feeding on cassava silage at Katete farm (Malawi)

Cassava silage making in Malawi (Training Land-O'Lakes technicians/farmers)



Silo construction for silage, Malawi



Compacting Silage in the silo - SARRNET coordinator



Participants at Silage Pit,



SARRNET assessing different spacing, time and method of harvesting for maximum leaf yield.



Measuring of leaves (chopped) and roots (chipped) for a balanced ration silage (80% leaves & 20% roots)



Cassava silage in a pit

5.0 Competitive Grants to SADC stakeholders

Various competitive small grant studies were awarded to SADC NARS (Scientists, NGO's/extension officers, universities etc). The project steering committee took the responsibility of collaborative work plan proposals and grant allocations. A total of 27 small grants projects were funded and conducted demand –led research and development in germplasm, post harvest and market studies. Details of the small grants studies are presented in Annex 1 and are reported per country. There were 10 approved sweetpotato, 12 cassava and 5 for both cassava and sweetpotato funded projects (Table 16).

Table 16. Number of funded projects for each intermediate result (IR)

I.R.	Activity	Cassava	Sweetpotato	Both crops	Total
1.1	Improved varieties/multiplication and distribution	5	8	1	14
1.2	Agronomic improvement/plant protection	0	1	0	1
1.3	Regional exchange	0	2	1	3
2.1	Post harvest	5	1	2	8
	Total	10	12	5	27

Following the IRs, the small grants could be grouped as follows:

IR1: Farmers have access to a wider range of improved varieties resulting in higher rates of adoption

Project Leader	Budget (US\$)	Project title and objectives
Mr. Haij Hamid Saleh	6,000	Title: On-farm evaluation of improved cassava clones to facilitate farmers' choice in Zanzibar Objective: To evaluate and screen improved and local clones of cassava under farmer's conditions that will resist diseases, pests and give good yield and are acceptable to farmers adaptable to different agro ecological zones.
S.M. Shaali	6,000	Title: On-farm evaluation of improved sweetpotato varieties in Zanzibar Objective: To test on-farm selected sweetpotato varieties for weevil resistance
Mr. Haij Hamid Saleh	6,000	Title: Expanded multiplication and delivery of cassava and sweetpotato planting materials through wider partnerships in Zanzibar Objective: To increase the distribution of improved sweetpotato planting materials to smallholder farmers
Ms. Esther Masumba	9,772	Title: On-farm evaluation of improved sweetpotato varieties in the eastern zone of Tanzania Objective: Generation of promising genotypes which are potential in yield and other attributes such as pest and disease resistance and drought tolerance.
Mrs. Kiddo Mtunda	14,570	Title: Enhanced multiplication and distribution of cassava planting materials through expanded partnerships in Tanzania Objective: To multiply improved varieties of cassava resistant to cassava mosaic virus disease and cassava brown streak virus disease
Mrs. Kiddo Mtunda	12,000	Title: Increasing sweetpotato production in Tanzania through the distribution and multiplication of improved farmers selected varieties Objective: Expand area under improved varieties establishing effective system of planting materials to farmers.
Mr. Gabriel Ndunguru	13,500	Title: On-farm testing and utilisation of orange-fleshed sweet potato varieties in the lake Zone, Tanzania Objective: Promote the best available orange-fleshed sweet potato
Mr. Davies Chitundu	8,000	Title: On-farm testing of introduced and locally bred cassava genotypes in Zambia Objective: To increase the number of adapted cassava varieties from which farmers can make choices
Davies Chitundu	7,500	Title: Evaluation of improved sweetpotato varieties under on-farm conditions in different agro-ecological zones in Zambia Objective: Evaluate agronomic Performance of new sweetpotato Genotypes in varying environments
J. Allemann	9,000 \$	Title: On-farm validation of superior cassava clones for different agro-ecologies of South Africa Objective: To evaluate improved cassava genotypes developed by the cassava breeding programs in Tanzania and Malawi, as well as at IITA, in four provinces in South Africa under local conditions.
S. Laurie	5,000	Title: Accelerated multiplication and distribution of selected improved sweetpotato genotypes in South Africa Objective: To train trainers and leading farmers on the principles of rapid multiplication and distribution of improved sweetpotato genotypes. To assist in the establishment of secondary multiplication and distribution systems in target areas in six provinces in South Africa.
D. Kanyerere WorldVision	10,000	Title: Expanding production and utilisation of cassava through farmer training, seed multiplication and distribution of improved varieties in Chata, Malawi Objectives: To make improved cassava varieties available to 240 farmers in 8 commitment areas in Chata ADP by September 2002.

		To institute sustainable seed supply system for cassava in Chata community by 2002. To improve the processing and utilization methods of cassava and add value to the crop by September 2002.
F. Chipungu	US\$11,658	Title: Scientist-Farmer participatory sweetpotato selection for the different production seasons and for year round supply - by Mrs. F. Chipungu - Bvumbwe Research Station Objectives: To characterise sets of newly released and promising sweetpotato cultivars and breeding lines for yield potential and stability, pests and diseases, consumer acceptability and storability under local conditions. To identify key environmental factors that limit sweetpotato production and make recommendations of varieties. To link the formal sector breeding with farmers breeding, selection and evaluation of the released and promising varieties. To attempt to combine the best scientists and farmers knowledge in research and development in an innovative way.
S. Laurie	14,981	Title: Evaluation of improved and imported sweetpotato genotypes in sub-humid and dryer agro-ecologies in South Africa Objective: To multiply improved sweetpotato genotypes developed by the regional breeding program in South Africa and imported lines and disseminate mother plants to target areas in six provinces in South Africa for evaluation, as well as to the sweetpotato evaluation programs of Namibia, Botswana, Swaziland, Lesotho and Zimbabwe

IR1.2: Farmers in target areas using a wider range of crop management options leading to increased productivity

Project Leader	BUDGET US\$	Project Title and objectives
M. Simwambana	6,000	Title: On-farm demonstration of staggered planting dates in Zambia to optimise the marketing of sweetpotato Objective: To generate technologies that widen period for supply of sweetpotato tubers to the fresh market

IR1.3 Broader public and private partnerships promoting regional technology development, exchange and application leading to increased availability of improved technologies to end users

Project Leader	BUDGET US\$	Project Title and objectives
D. C. Chitundu	15,000	Title: Regional breeding programme for sweetpotato based on the needs of farmers in the northern region of SADC Objective: Hybridisation as a means of developing new sweetpotato genotypes.
G.C. Bothma	15,000	Title: Facilitating the regional exchange of the best improved varieties and land races of cassava and sweetpotato among SADC countries Objective: To produce pathogen-free material of local cultivars and land races of cassava and sweet potatoes from SADC countries.

IR2.1: Post-harvest systems linking root crops producers and industrial consumers to accelerate commercialisation of cassava and sweetpotato

Project Leader	BUDGET (US\$)	Project Title and objectives
Ms. M.S. Zulu Mr. Ivor Mukuka	24,000	Title: Introduction and demonstration of processing equipment and product development of cassava through promotion of recipes Objectives: To improve the processing of cassava through introduction and demonstration of processing machines. To develop products from cassava so as to widen the use of cassava at household and industrial level
Dr.A. Temu, Dr. D. Nyange, Mr. F. Mashamba	17,450	Title: Cassava and sweetpotato marketing study in Malawi, Zambia, and Tanzania. Objective: Determine household and commercial demand for raw and processed cassava and sweetpotato and supply
Montford Mwiko	10,000	Title: Utilization of sweetpotato in livestock feed production in Zambia Objective: To Enhance Income Generation and Food Security
D. Kanyerere WorldVision	10,000	Title: Expanding production and utilisation of cassava through farmer training, seed multiplication and distribution of improved varieties in Chata, Malawi Objectives: To make improved cassava varieties available to 240 farmers in 8 commitment areas in Chata ADP by September 2002. To institute sustainable seed supply system for cassava in Chata community by 2002. To improve the processing and utilization methods of cassava and add value to the crop by September 2002.
J.D. Kalenga Saka	7,000	Title: Processing and marketing of high quality cassava products Objective: To promote cassava processing and marketing by women and their households in the rural and peri-urban areas of Malawi.
Mrs A. Mwangwera	15,000	Title: Commercial Processing of Cassava and Cassava-Maize Blended Flour. Objectives To develop a consumer acceptable cassava - maize blended flour To commercialise cassava flour
C.C. Moyo	7,000	Title: SARRNET II Baseline Studies in Malawi
Rukuni/A. Mutungamiri	15,000	Title: Cassava product development & marketing studies in Zimbabwe Objective: Improve the profitability of cassava production through exploitation of post harvest technologies

6.0 Subcontract Agreement between the International Institute for Tropical Agriculture (IITA) and the International Center for Tropical Agriculture (CIAT) on SARRNET

The subcontract agreement between the International Institute of Tropical Agriculture (IITA) and the International Center for Tropical Agriculture (CIAT) was to provide professional and other related services to meet the overall objective of SARRNET. CIAT provided these services through its membership of the Latin American Consortium for Cassava Research and Development (CLAYUCA) and its own Rural Agro enterprise Development Project. These services contributed to the achievement of the specific objectives as detailed in annex 5.

7.0 SARRNET Staffing

SARRNET has at present local and International staff located in Malawi, Mozambique and Tanzania. Mozambique is now under IITA bilateral project directly funded by USAID mission in Mozambique. SARRNET works in collaboration with National Agricultural Research and Extension Systems in these countries. Tables 17 and 18 present the list of international and local staff in these countries.

Table 17: Internationally recruited staff

Name of staff	Activity/Specialisation	Country
Dr. Nzola Meso Mahungu (PhD)	Coordinator (Breeder)	Malawi
Dr. James Teri	Coordinator (Pathologist, left Sep. 2000)	Malawi
Dr. Maria Isabel Andrade (PhD)	Agronomist (affected to bilateral in 2001)	Mozambique
Mr. Sicco Kolijn (MSc)	Post harvest/Agric. Engineering	Tanzania
Dr. I Kasele (PhD)	Agronomist (left 2001)	Zimbabwe

Table 18: Nationally recruited staff

Name of staff	Activity/Specialisation	Country
Mr. Vito Sandifolo (BSc)	Integrated Projects Research Associate	Malawi
Mr. Albert Mhone (MSc)	Post harvest/ Administrative Officer	Malawi
Mr. C.C. Moyo (MSc)	Documentation Officer	Malawi
Mrs Sella Jumbo (MSc)	Agric. Economist (Monitoring & evaluation)	Malawi
Mr Vianey Rweyendela	Agro-processing	Tanzania
Mr. Josie Edwardo (3 others on bilateral project)	Agronomists	Mozambique

8.0 NARS CONTRIBUTION TO ROOT CROPS ACTIVITIES

SARRNET as a research for development network organisation is working hand in hand with the NARS especially on cassava and sweet potato market-led activities. As a result the NARS benefit from SARRNET through technical, financial and material support. They also benefit from training opportunities and capacity building. On the other hand SARRNET benefit from the expertise and manpower and also from numerous other resources such as land, offices and laboratory, equipment and many operational costs. Below is a table of NARS contributions to SARRNET activities.

Table 19: NARS contribution to SARRNET

Country	Item	No/Quantity	US\$ Annual
Tanzania	Number of staff	25	199,200.00
	Number of office and laboratory equipment	15	4,235.00
	Annual Value of land used for field trials and multiplication		8,235.00
	Annual operational costs incurred		16,605.00
	Total		228,275.00
Malawi	Salaries	46 people	178200.00
	Office hiring	17 offices	4,080.00
	Lab hiring	6 laboratories	14,400.00
	Processing shade hiring	2 processing shades	3,200.00
	Service bills	180000	3,000.00
	Vehicle cost	1200km monthly hiring cost	4,800.00
	Fuel cost		2,000.00
	Land hiring	15 hectares	52,000.00
	Totals		303,680.00
Zambia	Salaries	24 people	240,000.00
	Office hiring and Lab hiring	12 offices and 7 laboratories	20,000.00
	Operational cost		50,000.00
	Land for trials	17 hectares	4,590.00
	Land for multiplication	50 hectares	13,500.00
	Totals		328,090
Zimbabwe	Number of staff:	15	54,720.00
	Offices: 9 and 4 Laboratories:	13	800 000.00
	Value of land:		1,000,000.00
	Operational costs:		6,000,000.00
	Total		7,000,800.00
DRC	Number of staff	17	72,000.00
	Offices		1,800.00
	Laboratory and equipment		2,000.00
	Annual Value of land used for field trials and multiplication	25ha	2,700.00
	Vehicles		11,000.00
	Others services		8,100.00
	Total		97,600.00

9.0 Conclusion

SARRNET has made great progress in achieving its objectives in the area of germplasm development, multiplication and distribution, creation of awareness among policy makers, farmers and the private sector, promotion, and setting ground for cassava and sweetpotato commercialisation. The project has made great impact in changing the image of cassava and sweetpotato in the SADC region such that there has been an overall increase of recognition of the importance of cassava. Cassava has gained recognition by various stakeholders in the SADC region including the private sector. Due to the joint efforts of SARRNET, NARS and key stakeholders, cassava has seen its way into various industries, which were utilising wheat products as raw materials such as timber and confectionery as well as the livestock industry. However there are great challenges for cassava commercialisation, which will require more attention. The challenges here include development of technologies in addition to those already existing, that will lead to increased level of productivity (both crop production and processing) and suit industrial uses as they emerge. Some of such technologies include fertiliser recommendations, irrigation requirements, storage of harvested fresh roots before processing and various other industrial requirements.

The project also allowed participating collaborators to gain some skills and experience to direct their own projects and ensure sustainability. At the same time an effective collaborative regional research system is now established. The provision of a reasonable amount of training to many collaborators in the region will continue to play a role in institutionalisation of skills for root crops research and technology transfer and help in improving the productivity of the farmers.

The partnership established in the network has enabled the collaborators to harness the comparative advantages of each program for the mutual benefit of the region. The network has assisted NARS in keeping active programs with well-focussed research for development enabling them to select new varieties. However, the impact of such new technology can only effectively reach the majority of farmers if government agencies and NGOs are involved particularly in extending proven results of research to end users (farmers).

Annex 1: Small grants

Tanzania- Zanzibar

Project code	Project Leader	Budget (US\$)	Project title and objectives	FINDINGS/STATUS
C111b-1001	Mr. Haij Hamid Saleh	6,000	<p>Title: On-farm evaluation of improved cassava clones to facilitate farmers' choice in Zanzibar</p> <p>Objective: To evaluate and screen improved and local clones of cassava under farmer's conditions that will resist diseases, pests and give good yield and are acceptable to farmers adaptable to different agro ecological zones.</p>	Five locally bred lines were tested on farm at UYT stage at seven sites; 4 in Unguja and 3 in Pemba; against Boma (local best) and a long time introduced variety H.40106/27. The results have indicated that farmers' preferences are on clone ZNZ 98/036 and ZNZ 98/034 due to sweetness, disease and pest resistance, their performance in root yields and dry matter content. These varieties have shown no signs of CBSD infection. Therefore they are recommended for production and for further investigation especially in disease prone areas of the Islands.
S11b-1005	S.M. Shaali	6,000	<p>Title: On-farm evaluation of improved sweetpotato varieties in Zanzibar</p> <p>Objective: To test on-farm selected sweetpotato varieties for weevil resistance</p>	On-farm experiments were conducted for two seasons in Unguja and Mpemba Islands on eight sites: six sites in Unguja and two in Pemba. Two sets of varieties were used for each site. The first set was conventional varieties and second was for the recently introduced orange-fleshed varieties. The Farmer Field Schools and Farmers Research Groups were used in evaluation so as to involve as many farmers as possible. Assessment and evaluation were based on field performance for each variety at different agro-ecological zones and also farmers ranking on the establishment, drought resistance, disease and pest resistance, yield performance, dry matter content and cooking quality. Combining different ranking criteria, the improved variety SPNO is the highest ranked conventional variety of sweetpotato (25.6t/ha). Among orange-fleshed varieties, ZAPALLO (420027) and W-151 (440005) were selected by farmers. These varieties are then recommended for promotion and further testing in other areas of the Islands.
B114-1004 (IITA)	Mr. Haij Hamid Saleh	6,000	<p>Title: Expanded multiplication and delivery of cassava and sweetpotato planting materials through wider partnerships in Zanzibar</p> <p>Objective: To increase the distribution of improved sweetpotato planting materials to smallholder farmers</p>	Multiplication programme was organized at primary sites with two Research Stations, followed by four secondary sites established using the clean and healthy materials from the primary sites. The primary sites were maintained by the project while the secondary sites were maintained by the project and farmers. Then tertiary sites were established where farmers were the main actors. Using Farmers Field Schools, Farmers Group and Individual Farmers

		smallholder farmers	seven secondary sites, and more than fourteen tertiary sites were established.
--	--	---------------------	--

Tanzania

Project Code	Project Leader	BUDGET US\$	Project Title and objectives	FINDINGS/STATUS
S111b-1003	Ms. Esther Masumba	9,772	<p>Title: On-farm evaluation of improved sweetpotato varieties in the eastern zone of Tanzania</p> <p>Objective: Generation of promising genotypes which are potential in yield and other attributes such as pest and disease resistance and drought tolerance.</p>	<p>Sweet potato on-farm trials were established in three villages located in three separate districts of Coast and Dar-es-salaam regions, Tanzania. The villages included Pangani (Kibaha), Chanika (Ilala) and Matimbwa (Bagamoyo). Seven varieties were evaluated including 5 officially released varieties Jitihada, Vumilia, Mavuno, Sinia and Simama. Two local improved varieties Carrot-C (orange-fleshed) and Ukerewe were also included. The released varieties with an exception of Simama were tested in the Lake zone of Tanzania only, prior their release.</p> <p>Participatory evaluation was performed involving researchers, extension agents and farmers in two consecutive seasons. Formal evaluation by researchers proved that a purple skinned and cream fleshed (with orange pigments) variety Ukerewe has generally high performance in terms of establishment rate, is least susceptible to sweet potato mosaic virus disease and sweet potato weevil (<i>Cylas</i> spp.). Farmer's assessment revealed that the variety is highly preferred by end users (farmers and traders) for its purple skin, which renders it marketable.</p> <p>Root yield, marketability, resistance to drought, pests and diseases are the main criteria used by farmers of the area in the selection of sweet potato varieties. The results supported the official release of the variety.</p>

Project Code	Project Leader	BUDGET US\$	Project Title and objectives	FINDINGS/STATUS
B213-1007 (CIP)	Dr. A. Temu Dr. D. Nyange Mr. F. Mashamba	17,450	<p>Title: Cassava and sweetpotato marketing study in Malawi, Tanzania and Zambia</p> <p>Objective: Determine household and commercial demand for raw and processed cassava and sweetpotato and supply</p>	<p>Results show that Sweet potato producers portray stronger market orientation features than cassava. Sweet potato and cassava traders are small, and perform mainly the transfer function – moving produce from production to consumer centers. The major trading cost is transport, making up 50% of the marketing cost. Sweet potato marketing is active in all delineated chains where as cassava marketing is more pronounced in the case of rural to city market chain.</p> <p>Mainly low-income earners, both in urban and rural areas, consume sweetpotato and cassava. There is apparently minimal processing, neither domestic nor commercial for home consumption. The two produce are eaten mostly fresh. Sweetpotato plays a major role as a breakfast and snack item, cassava serves more as a main meal. However sale of cassava as an outdoor snack on the sides of city streets is gaining prominence. Sweetness, being devoid of fiber and early maturity are preferred characteristics for both – sweetpotato and cassava.</p> <p>The sector can be improved and the use of cassava and sweetpotato expanded through advocacy of various recipes and by the development and promotion of commercial and industrial markets (flour, feed, starch and high-value snack foods) through the introduction of improved processing technologies.</p>
C114-1008	Mrs. Kiddo Mtunda	14,570	<p>Title: Enhanced multiplication and distribution of cassava planting materials through expanded partnerships in Tanzania</p> <p>Objective: To multiply improved varieties of cassava resistant to cassava mosaic virus disease and cassava brown streak virus disease</p>	<p>Multiplication of planting materials was done in four locations as follows: Kibaha (2ha), Hombolo (13.2ha), Ilonga (0.5 ha) and Ukiruguru. About 273,645 m in total was produced from all locations except Ukiruguru.</p>

Project Code	Project Leader	BUDGET US\$	Project Title and objectives	FINDINGS/STATUS
S114-1011 (CIP)	Mrs. Kiddo Mtunda	12,000	<p>Title: Increasing sweetpotato production in Tanzania through the distribution and multiplication of improved farmers selected varieties</p> <p>Objective: Expand area under improved varieties establishing effective system of planting materials to farmers.</p>	Improved farmer selected varieties simama (SPN/O), Ukerewe, Sinia, Jitihada, Mavuno and Vumilia were multiplied at SRI – Kibaha, ARI – Dakawa and ARI – Ukiriguru as primary sites. Distribution involved different partners like NGOs and government institutions, i.e. Christian Council of Tanzania, Plan International, District Councils and farmers vines were taken to different locations in Tanzania i.e. Singida, Dodoma, Shinyanga, Tanga, etc. where demand was indicated. Crop management practices and seed storage at farm level were emphasized in areas where seeds were taken. Investment in seed multiplication by private sector still lags behind. A concerted effort in sensitisation is required.
S111b-10yy (CIP)	Mr. Gabriel Ndunguru	13,500	<p>Title: On-farm testing and utilisation of orange-fleshed sweet potato varieties in the lake Zone, Tanzania</p> <p>Objective: Promote the best available orange-fleshed sweet potato</p>	On-farm testing carried out in three districts: Magu, shinyanga and Kwimba. The trials have been harvested and report is being compiled. Similarly the program embarked on selection of high dry matter, high beta carotene clones for promotion. 49 clones were selected for further evaluation out of 464 that survived till harvest (11%). The selected clones yielded equal or higher than the average of the nearest checks (Mavuno and Simana). Total root yield of the selected clones ranged from 0.06 to 0.52kg/plant. Among the selected clones 11 were orange fleshed, 25 were light orange fleshed and the rest (13) had flesh colour ranging from cream to yellow. Light-orange and orange fleshed clones have high contents of pro-vitamin A. Such clones will be highly promoted to combat vitamin A deficiency. Among the orange clones, 10 (91%) had dry matter contents of $\geq 30\%$. Among the light-orange clones 11(44%) had dry matter contents of $\geq 30.0\%$. Consumers usually prefer clones with high dry matter content ($\geq 30.0\%$). The number of roots per plant among the selected clones ranged from 1.0 (clone 22) to 10.0 (clone 274). Disease and pest pressure was not high enough to detect any significant genetic variability among the clones. However, roots of two clones (334 and 461) were severely damaged by rough weevils. Forty-nine selected clones are being evaluated further for high yielding ability and other desirable traits.

3. Zambia

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
C111b-1003	Mr. Davies Chitundu	8,000	<p>Title: On-farm testing of introduced and locally bred cassava genotypes in Zambia</p> <p>Objective: To increase the number of adapted cassava varieties from which farmers can make choices</p>	Several testing sites were established for three newly developed varieties (L9-304/9, L9-304/4, and L9-304/151). The testing has contributed in the three varieties being released for general use in the country under the names Chila, Kampolombo and Mweru respectively
C211-1012/ C211a-1013	Ms. M.S. Zulu Mr. Ivor Mukuka	24,000	<p>Title: Introduction and demonstration of processing equipment and product development of cassava through promotion of recipes</p> <p>Objectives: To improve the processing of cassava through introduction and demonstration of processing machines. To develop products from cassava so as to widen the use of cassava at household and industrial level</p>	Thirty seven fabricated processing equipments (graters, chippers, slicers) were distributed to Research stations (Mt Makuru, Mutanda,), Dept. of field service Western Province, PAM, Africare, Mansa TS, SAMs for promotion and demonstration to farmer groups and associations. The equipments were promoted in all areas where collaborators operate through demonstrations, field days and processing and utilisation workshops and over 1846 people with 1296 being females have been exposed to the technologies. 1129 farmers were trained in processing of cassava. Developed products containing 10-20% of cassava were comparing favourably with those with 100% wheat flour without drastically changing the taste and likeness and were rated highly in terms of likeness. Visits were made to food industries and livestock feed producers to promote cassava utilisation. Market linkages with industries, hotels and restraints etc.
S121a-1014	M. Simwambana	6,000	<p>Title: On-farm demonstration of staggered planting dates in Zambia to optimise the marketing of sweetpotato</p> <p>Objective: To generate technologies that widen period for supply of sweetpotato tubers to the fresh market</p>	Demonstrations were instituted to show the production of sweetpotato to cover the most critical food deficit periods of the year. Some lessons were learnt. Also, as a consequence of these demonstrations, farmers adopted the use of ridges and planting a vine per station.

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
S211a-1017	Montford Mwiko	10,000	Title: Utilization of sweetpotato in livestock feed production in Zambia Objective: To Enhance Income Generation and Food Security	The study investigated the feasibility of utilising sweetpotato in livestock feeds. Sun-dried sweetpotato chips were milled and replaced maize at 20, 30, 50, and 100% in a commercial pig feed. The four dietary treatments were tested on five 6-8 week old piglets each, and were compared with a maize-based commercial control. Best performance was noticed with sweetpotato replacement at 20 or 30% and this was comparable with the commercial product. Sweetpotato substitution at 50 or 100% did not improve performance of pigs. Meat quality was also improved by replacing maize with 20 or 30% sweet potato. The meat was leaner and tastier when compared with the maize-based control and other levels of sweetpotato substitution.
S111b-1002	Davies Chitundu	7,500	Title: Evaluation of improved sweetpotato varieties under on-farm conditions in different agro-ecological zones in Zambia Objective: Evaluate agronomic Performance of new sweetpotato Genotypes in varying environments	Breeding of sweetpotato in Zambia is done in high rainfall zone. With the spreading of the crop to other areas of low rainfall, different soil and other environmental factors, it was important that genotypes be evaluated in more diverse conditions so that area specific varieties are selected. Five improved clones were tested on farmers' fields for adaptation and acceptability before they can be released. The output of the study is that two clones (L2-103/30 and L0-4/10) have been recommended for release in 2003.
S112a-1006	D. C. Chitundu	15,000	Title: Regional breeding programme for sweetpotato based on the needs of farmers in the northern region of SADC Objective: Hybridisation as a means of developing new sweetpotato genotypes.	The study aimed at breeding sweetpotato varieties that would meet consumer demands in terms of taste, yield and adaptability. The strategy employed creation of variability through polycrosses and controlled crosses. The resulting seeds were germinated, screened and evaluated under on-station conditions. To date, 41 and 31 selections from seeds obtained from the local crossing block and from CIP are being evaluated in single plots at Mansa. In addition, ten varieties obtained through CIP from other countries have been selected to go on-farm in different sites.

4. South Africa

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
B111c-1003 (IITA)	G.C. Bothma	15,000	<p>Title: Facilitating the regional exchange of the best improved varieties and land races of cassava and sweetpotato among SADC countries</p> <p>Objective: To produce pathogen-free material of local cultivars and land races of cassava and sweetpotatoes from SADC countries.</p>	Plant material received from Tanzania, Zambia and Malawi were planted in glasshouses after dipping in fungicide and rooting solution. All plants were tested twice for the presence of viruses. Sweetpotato was biologically tested via indicator plants, and cassava was tested by Elisa. All plant material received tested positive (virus infected). Screening process is being carried out.
S111b-1004	S. Laurie	14,981	<p>Title: Evaluation of improved and imported sweetpotato genotypes in sub-humid and dryer agro-ecologies in South Africa</p> <p>Objective: To multiply improved sweetpotato genotypes developed by the regional breeding program in South Africa and imported lines and disseminate mother plants to target areas in six provinces in South Africa for evaluation, as well as to the sweetpotato evaluation programs of Namibia, Botswana, Swaziland, Lesotho and Zimbabwe</p>	There is continuous maintenance of breeding lines and cultivars at ARC Roodeplaat with a back up collection in vitro. 41 lines were selected from imported seed from CIP. These are established in plots in the glass house and are being indexed for virus.

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
C111b-1005	J. Allemann	9,000 \$	<p>Title: On-farm validation of superior cassava clones for different agro-ecologies of South Africa</p> <p>Objective: To evaluate improved cassava genotypes developed by the cassava breeding programs in Tanzania and Malawi, as well as at IITA, in four provinces in South Africa under local conditions.</p>	<p>The breeding objective is to provide sweetpotato cultivars which have good yield and storage root quality combined to sweet and dry taste, early maturity, and drought tolerance. The virus-tested glasshouse collection with 263 local and 52 imported accessions serves as a basis for breeding. Breeding activities include importation of novel germplasm, polycrossing (5000 seeds) complimented by hand crossing, stringent selection at the seedling nursery from which 80 - 100 lines are selected, followed by several levels of yield evaluation at Roodeplaat as the number of lines is reduced. The most promising ARC lines and imported cultivars proceed to evaluation conducted at various sites. The goal being to determine adaptability of the lines/cultivars and more importantly involving farmers in selection for taste acceptability. The result of trials during 2000/01 – 2001/02 at four sites, is the release of eight new cream-fleshed cultivars for production in South Africa namely: Ndou (1995-13-2), Monate (1989-17-1), Mokone (1987-16-1), Letlhabula (1995-10-1), Phala (1984-2-201), Amasi (1985-6-3) and Mamphenyane (1984-10-340). In terms of orange-fleshed cultivars, the USA cultivars Excel and W-119, and A45 coming from the breeding program at University of Natal, South Africa, are recommended. The neighbouring countries received cuttings from 18 ARC lines/cultivars and seven imported cultivars. Some of the genotypes showed promise for production.</p>

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
S112-1007	S. Laurie	15,000	<p>Title: Regional sweetpotato breeding according to the needs of farmers in sub-humid and dryer agro-ecologies</p> <p>Objective: To develop sweetpotato genotypes in South Africa according to needs of sweetpotato farmers in the sub-humid and dryer climates in Southern SADC including South Africa, Namibia, Botswana, Swaziland, Lesotho and Zimbabwe. Genotypes will be imported from the sweetpotato breeding programs at Ukiriguru (Tanzania) and Mansa (Zambia) to obtain required traits.</p>	Needs assessment conducted and entailed: high marketable yield (must have sweet and dry taste), dry taste, early maturity, keeping ability, tolerance to weevil and nematode, tolerance to drought. The breeding lines and cultivars are maintained continuously in glasshouse with back-up collection <i>in vitro</i> to conserve germplasm. Genotypes were imported from New Zealand (1000 seeds originating from 8 parents), CIP (15 clones mainly orange-fleshed cultivars) and USA (four orange-fleshed lines). Development of improved genotypes is being carried out.
S113-1009	S. Laurie	9,000	<p>Title: Establishment of primary nursery sites of selected improved sweetpotato genotypes in South Africa</p> <p>Objective: To multiply improved sweetpotato genotypes selected by farmers during evaluation of advanced yield trials and disseminate mother plants to target areas in six provinces in South Africa for the establishment of primary nursery sites.</p>	Nurseries were established in order to make available planting material of recommended cultivars. Virus-tested plantlets of 11 improved cultivars were produced in glasshouse and established in primary nurseries at four sites. Cuttings from the nurseries were distributed to farmers as well as to secondary nursery sites. Around 14 secondary nurseries were established and the total size of the primary nurseries is approximately 5450 plants. Farmers and extension officers were trained in cultivation methods of sweetpotato and methods for maintaining and multiplying sweetpotato nurseries.

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
S114-1012	S. Laurie	5,000	<p>Title: Accelerated multiplication and distribution of selected improved sweetpotato genotypes in South Africa</p> <p>Objective: To train trainers and leading farmers on the principles of rapid multiplication and distribution of improved sweetpotato genotypes. To assist in the establishment of secondary multiplication and distribution systems in target areas in six provinces in South Africa.</p>	<p>A training manual on production of sweetpotato was prepared and distributed to farmers during training sessions. Training courses were conducted in four communities.</p>

5. Malawi

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
C114-1009	D. Kanyerere WorldVision	10,000	<p>Title: Expanding production and utilisation of cassava through farmer training, seed multiplication and distribution of improved varieties in Chata, Malawi</p> <p>Objectives: To make improved cassava varieties available to 240 farmers in 8 commitment areas in Chata ADP by September 2002. To institute sustainable seed supply system for cassava in Chata community by 2002. To improve the processing and utilization methods of cassava and add value to the crop by September 2002.</p>	<p>The project is implemented in Chata under T/A Chimutu of Lilongwe district in Central Malawi. The project started with 5% of the households in 2000/01 in the target communities. By 2002/2003 season, 34% of the households are growing cassava. An average of 0.8 ha is grown to cassava with a range of 0.25-2.0 ha per household and an estimated yield levels of 15-18mt/ha. Reduction in hungry months from as high as 6 months to 2 and zero in some cases, high income from sales of tubers and stems ranging from \$28-\$785 that has enabled asset creation (livestock, bicycles, building durable houses).</p>
C211a-1011	J.D. Kalenga Saka	7,000	<p>Title: Processing and marketing of high quality cassava products</p> <p>Objective: To promote cassava processing and marketing by women and their households in the rural and peri-urban areas of Malawi.</p>	<p>The project was initiated in Milonde (EPA), Mulanje RDP in Blantyre ADD. A farmers group called Mwangalira Cassava Processors (MCP) was formed. These were trained in agribusiness and processing as well as marketing of cassava chips and flour. Market search for cassava products was also done using interview approach and desk search. Marketing tours were organised and cassava sample products were exhibited. The MCP was linked to industries especially Universal Industries who expressed willingness to buy the processed products as raw materials for their company and they gave their quality requirements.</p>

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
S111b-10XXM	F. Chipungu	US\$11,658	<p>Title: Scientist-Farmer participatory sweetpotato selection for the different production seasons and for year round supply - by Mrs. F. Chipungu - Bvumbwe Research Station</p> <p>Objectives:</p> <p>To characterise sets of newly released and promising sweetpotato cultivars and breeding lines for yield potential and stability, pests and diseases, consumer acceptability and storability under local conditions.</p> <p>To identify key environmental factors that limit sweetpotato production and make recommendations of varieties.</p> <p>To link the formal sector breeding with farmers breeding, selection and evaluation of the released and promising varieties.</p> <p>To attempt to combine the best scientists and farmers knowledge in research and development in an innovative way.</p>	<p>The research was carried out in sweetpotato growing areas of Mulanje, Blantyre, Mzimba, Lilongwe, Thyolo and Chiradzulu. Clones used were 420240, 1941/121, Tainoni, Semusa, Mugamba, Zondeni, and Local best. Observations were done on root yield and root yield components. The root yield performance of the genotypes was generally poor due to erratic rains. The promising clone 1941/121 yielded highest followed by Mugamba. But in the previous season, Semusa yielded highest followed by 1941/121.</p>

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
C211b-1014	Mrs A. Mwangwera	15,000	<p>Title: Commercial Processing of Cassava and Cassava-Maize Blended Flour.</p> <p>Objectives</p> <p>To develop a consumer acceptable cassava - maize blended flour</p> <p>To commercialise cassava flour</p>	<p>Consumer knowledge, preference and acceptance of cassava-maize blended flour were studied in order to determine the potential of adoption for commercially processed cassava-maize blended flour among consumers whose staple food is maize. One hundred and two respondents, whose staple food was predominately maize, were issued with cassava-maize blended flour samples. A structured questionnaire covering knowledge and experiences with cassava flour was administered before and after preparing the blended flour into <i>nsima</i>. The study showed that 63% of the respondents have adequate information on cassava processing, utilization and characteristics of <i>nsima</i> prepared from cassava flour. Sixty five percent of the respondents had previously consumed <i>nsima</i> made from cassava flour or its blend mainly due to food shortage. The cassava-maize (20:80) blended flour had preferred taste, aroma, appearance, and consistency and was acceptable to more than 75% of the respondents. The respondents indicated that they did not have problems in using the flour to prepare <i>nsima</i>.</p>

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
N/A	C.C. Moyo	7,000	Title: SARRNET II Baseline Studies in Malawi	Survey conducted and report written. The results showed that farmers mostly grow local varieties of cassava with own gardens being the major source of planting material. Yields ranged from 13.1t/ha – 31.4t/ha. Unavailability of improved high yielding varieties, high pest and disease incidence and poor cultural practices are major causes of low yields. Most farmers donot store fresh roots but process them into <i>makaka</i> or <i>kanyakaska</i> or sell fresh. Likewise, farmers grow local varieties of sweetpotato with Kenya being most popular. Root yield ranges from 10.2-14.0 t/ha. Processing is limited to boiling and roasting. Most farmers store sweetpotato but storage is limited with weevil and rotting.

7. Zimbabwe

Project Code	Project Leader	BUDGET (US\$)	Project Title and objectives	FINDINGS/STATUS
C211-1018	Rukuni/A. Mutungamiri	15,000	Title: Cassava product development & marketing studies in Zimbabwe Objective: Improve the profitability of cassava production through exploitation of post harvest technologies	Studies were conducted on consumer preference of cassava/maize composite flours, recipes for cassava products were developed and suitability of cassava in poultry feed was also tested. Sadza made prepared from 100% maize flour was the most preferred seconded by that made from 25% cassava and 75% maize flour. The least preferred sadza was that made from 100% cassava flour. A number of recipes of cassava were prepared such as cassava flakes, cassava muffins and cassava bread. All these were liked by consumers except the cassava bread (20% cassava flour and 80% wheat flour) where texture and taste was good but appearance and volume were not acceptable to consumers. For poultry feed, high levels of cassava in the diets reduces performance, quality, viability and growth and development of the internal visceral organs. However, it is economically viable to substitute maize for cassava but at minimal levels.

Annex 2: MINUTES OF SARRNET STEERING COMMITTEE MEETING HELD AT COURTYARD HOTEL IN DAR – ES - SALAAM, TANZANIA

14TH-17TH MAY 2001.

1. GENERAL MEETING

A two-day meeting preceded the SARRNET Steering Committee (SC) business meeting where progress reports and other technical papers were presented. A total of 33 participants from the private sector, NARS, NRI-UK, CIP and IITA attended the general meeting and the proceedings will be published soonest.

The meeting was opened by the Honourable Deputy Minister for Agriculture and Food Security, Professor Pius Mbawala (M.P.). Representatives of IITA, CIP, SACCAR and USAID presented brief opening remarks as they relate to SARRNET terms of reference and scope of work.

In his opening speech, the Honourable Minister noted that since its inception in 1994, SARRNET had played a key role in the exchange of germplasm in all the SADC countries, in developing and distributing improved resistant varieties of cassava and sweetpotato, in pest and disease control and more importantly, in strengthening capacities of national root crops research programs. The Minister stated that he was happy to learn that SARRNET Phase II had shifted its strategy by placing greater emphasis on demand-led technologies. In order to sustain cassava and sweetpotato production for food security and income generation, farmers and other producers should look at these crops not only as subsistence crops but also as cash crops by processing them into value - added products. The increased income from cassava and sweetpotato products would stimulate increases in their production. He thus commended SARRNET by adopting a more market-oriented approach to its research agenda in partnership with the private sector and NGOs.

2. ISSUES FROM THE GENERAL MEETING

A total of 25 presentations were made including progress reports and theme papers. The following issues were derived from the presentations and after discussions:

2.1. In his 2000/2001-chairmanship report, Prof. Lekule indicated that the SC members should play a participative and active role rather than that observed in the past. From his participation in the monitoring tour, he observed that the “small grants scheme” opted in SARRNET II needs to be streamlined in order not to lose the national focus as some projects did not fit in the national and regional priorities. The activities by individual scientists need more transparency. He encouraged SARRNET to keep on the momentum reached and to take advantage of the synergetic effort of all the stakeholders than working in isolation.

2.2. Dr. Graham Thompson, Assistant Director of ARC-Roodeplaat Vegetable and Ornamental Plant Institute, Pretoria, was elected SARRNET Steering Committee Chairman for 2001/2002 term.

2.3. In 2000/2001 season, SARRNET conducted several activities including the initiation of IITA – CIAT collaboration on SARRNET for market-led activities, the involvement of private/industrial sector in cassava and sweetpotato promotion, the award of 33 small grants to SADC scientists, the initiation of the regional market sub-sector analysis, the initiation of baseline studies in target areas in lead countries, a monitoring tour in selected countries, the procurement of processing machines, two regional training courses, and the restructuring of the Coordination office with 3 staff/office for Documentation, Integrated Project, and Monitoring and Evaluation.

2.4. Regional germplasm development strategy should be reactivated with emphasis to breed and select varieties for specific uses (food, feed, industrial uses etc.) and with participation from main stakeholders.

2.5. Research should still remain the cornerstone for the SARRNET mandate in view of the emerging threats like the cassava brown streak virus disease and the need to generate technologies and information required by industry and the private sector.

2.6. Production of cassava and sweetpotato should continue to receive attention as the development of industries and markets depend to a large extent on readily available raw materials.

2.7. It has been reported that in 2000/2001, the price of maize on the local market in the SADC region is less than half the price of cassava and so there is need, for cassava to be competitive as a commercial crop, to substantially increase its dry yield per unit area from the present generally low levels in order to reduce the production cost per unit area.

2.8. There is need to pay attention to issues of soil fertility and land management where cassava is grown. Cassava varieties with potential yield of over 30 ton/ha have been developed but they cannot be expected to produce sustainable high yields without a package of improved agronomic practices including soil fertility and land management.

2.9. The private sector concerns are on the competitiveness of cassava due to agronomic difficulties to reach its potential production. Cassava roots production costs should not exceed US \$ 20.00 per ton to be competitive on the market. Experiences with C.S. Manufacturing Company (pyt) Ltd. in South Africa revealed that an investment of about US \$ 4.5 millions are needed for a production of 20 000 tons of starch per year. The investment could be recovered in 2.5 years. Inconsistent supply of cassava products is also one of the constraints faced by the private sector such as with Universal Industries in Malawi for cassava flour in their confectionery factory.

2.10. The emergence of the cassava brown streak virus disease in the SADC region was discussed at a special session of the steering committee meeting and a long-term solution was mapped out with the ultimate hope of producing resistant varieties to the disease. In the medium term the problem is particularly acute in Northern Mozambique where the introduced improved varieties have succumbed to the disease. The use of tolerant/resistant best bets local cultivars was discussed as a palliative measure. The use of open plant quarantine in Mozambique was brought up and the issue is to be discussed by SACCAR and SARRNET with the Government of Mozambique.

2.11. The spending rate of the SARRNET II grant at present was said to be between \$75,000 - \$100,000 per quarter and is anticipated to result in an unspent balance of approximately \$1,000,000 by 30 September 2002. The unspent balance is a result of low down draw by the NARS and late initiation of project activities. It was proposed that the money in the pipeline should be used as a platform for the request for a no-extra cost extension, which should factor the following:

- i. The market opportunities identified during the steering committee meeting (Fresh market for roots and leaves; Flour for direct human consumption; Flour for food industry; Flour for non-food industry; Dried leaves for feed; Starch and starch derived products; Improved quality products at household level). Development of technologies to enhance the commercialization of such products has to be well defined.
- ii. The recent change in SARRNET leadership for the implementation of market-led activities.
- iii. The limited absorptive capacity of the NARS.
- iv. Epidemiological issues of the cassava brown streak virus disease including open plant quarantine facilities in the countries of the SADC region.
- v. Generation of market information needed by the private sector.
- vi. Generation of new technologies that will respond to expanded markets.

2.12. The problems for non-achievement of the commercialization targets need to be identified and to achieve this, a follow-up Phase III proposal should be initiated following SARRNET's immediate mission which consists of facilitating trade opportunities for selected cassava and sweetpotato germplasm to expand demand for the varieties and other technologies/services. Phase III scope of work could include:

- i. The changing around of the network activities and objectives towards commercialization (local, regional and global markets).
- ii. The need to have a healthy balance between research, production and development. Research and development need to go hand in hand with the commercialization drive in view of the emerging pests and diseases and the need to increase cassava and sweetpotato productivity through improvement of varieties with specific uses, agronomic practices including soil fertility and land management.
- iii. The emerging new threats e.g. the cassava brown streak disease and the spread of the Uganda variant of mosaic disease.
- iv. Availability of choices for technologies to sale.
- v. Emerging markets and emerging problems.
- vi. The potential demand of cassava and sweetpotato by large scale feed, flour, starch and starch-derived products manufacturers cannot be met solely by small scale farmers, thus SARRNET

- should promote the cultivation of these crops by commercial farmers through development of technologies appropriate to such farming systems.
- vii. The capacity for the stakeholders to utilize funds.
- viii. Strengthening the steering committee by streamlining its functions and terms of reference.
- ix. Support to the team leadership for SARRNET.
- x. The need for SARRNET to be in line with new USAID priorities as to their medium term plans for the support of agricultural and rural development and for the proposal to be oriented accordingly.

2.13. In general, it was felt that commissioned studies were better and more focused with a good rate of expenditures than small grants.

2.14. The seriousness of data reporting from SARRNET countries should be improved. Most of the indicators have a bias on crops, thus new indicators may be needed. Some of the figures reported previously were difficult to explain on how they were derived from and this has to be audited by IMPACT/USAID-RCSA.

2.15. Training of staff and other stakeholders should be assessed and the training needs prioritized within the SARRNET region. Group training courses should now focus more on area of needs with less emphasis on regional training courses and more on regional workshops.

2.16. The links between SARRNET and other regional/bilateral projects on cassava in SADC countries were discussed. These include CFC project in Tanzania, Mozambique and Zambia, FOODNET in Tanzania and CPHP (Crop Post-Harvest Program) project of NRI funded by DFID in Tanzania. Among issues raised were the inclusion of other SARRNET countries in CFC activities, the inclusion of Irish potato / yams in SARRNET, the sharing of the learned lessons, to improve the complementarities in activities as all projects are dealing with the same collaborators etc.

3. BUSINESS MEETING

Only the SC members attended the business meeting and the following issues were discussed.

3.1. Relationships between SARRNET and the private sector

The private sector representatives invited to the meeting expressed their wish for SARRNET to have a continued and dynamic type of linkage with the private sector. Some of the private companies like C.S. Manufacturing Co. in South Africa are ready to assist those interested to work on starch and flour. They could conduct feasibility studies on the possibility of mounting a starch factory. As such, SARRNET should play the following roles:

- Information provider on agronomic, processing and market studies for business development.
- Technology development for immediate and long-term needs.
- Medium for business to business forum and linkages by playing a coordinating role.

3.2. Status of small grants

◆ Target Areas

Most approved small grants projects are operating outside the countries target areas where baseline II surveys are being carried out, rendering the monitoring of progress difficult and project impact measurement inappropriate.

Approved competitive small grants

	Year 1	Year2	Total
1. On-going projects on cassava (16) & on both crops – IITA	180 000	70 000	250 000
2. On-going projects on sweetpotato (17) & on both crops – CIP	150 000	20 000	170 000
3. Other activities handled by CIP – Baseline surveys, Market studies etc.	200 000	72 000	272 000
Total	530000	162000	692000

About US \$ 100,000 were noticed as a difference between the above total (692 000) and the funds approved for the small grants projects. Funds for the projects to be reconsidered will be sourced from this balance.

◆ Reports and financial returns

It was noted that most projects had not submitted technical reports let alone financial returns. Therefore, no funds would be disbursed to projects until the returns and reports to justify the earlier disbursements are made. All grantees should be well informed about this. (Action: SARRNET Coordinator)

◆ Projects that require reconsideration

- a) Title: Regional cassava variety development based on farmer/consumer needs in SADC countries. Code: C112a-1006 by Dr. Edward Kanju. In collaboration with the SARRNET Coordinator as a scientist, this project should be rewritten with emphasis on CBSD screening and expanded as a regional project to cover Malawi, Tanzania and Mozambique. An amount of \$25,000 was earmarked for the project. The project should also utilize the germplasm from Mr. Bothma's project - Facilitating the regional exchange of the best improved varieties and land races of cassava and sweetpotato among SADC countries Code: B111c-1003 (Action: SARRNET Coordinator and Dr. Kanju)
- b) Title: Introduction and demonstration of processing equipment and product development of cassava and sweetpotato through promotion of recipes in South Africa. By Mrs. Sunette Laurie. Sicco should be part of the team. About US \$ 10,000 were earmarked for this. (Action: SARRNET Coordinator And Mr. Koliijn)
- c) There is no need to reconsider the projects in Mozambique as there is a recently SARRNET bilateral project funded by USAID, and CFC project will also cover the country.
- d) Due to poor staffing, Angola activities need to be backstopped by SARRNET including World Vision activities. The Coordinator should also reactivate the activities in Namibia. Africare would also like to start cassava and sweetpotato in Angola. (Action: SARRNET Coordinator)

3.3. Commissioned studies

The Coordinator presented the list of activities and corresponding budget discussed during IITA - CIAT collaboration on SARRNET meeting held in Lilongwe, 6 – 11 November 2000. The SC remarks are appended in the last column of the Table below.

Budget (US \$) for commissioned studies (November 2000 to September 2001)

Activity	Year 1	Year 2	Total	Remarks by SC
1. Sustainable production systems adopted by farmers with emphasis on recommended varieties for target markets and improved crop management practices	15,000	15,000	30,000	- Approved
2. Commercial and community based seed supply systems for cassava and Sweet Potato initiated in at least 2 countries	15,000	15,000	30,000	- Approved
3. Flexible regional quarantine regulations developed and established to enhance regional germplasm development and exchange	25,000	25,000	50,000	- Approved; - concej note to SACCAR; - allocate some funds Bothma study.
4. Detailed understanding of the sub sector and marketing opportunities to increase awareness among stakeholders of potential opportunities of the crops in the region.	25,000	25,000	50,000	-Support SARRNET economist activities; - complement mark studies, no bonus to team, - revise budge upward.
5. Sustainable and appropriate processing technologies adopted by farmers and industrial processors	80,000	30,000	110,000	- Develop detailed workplan for review the Coord., Chairma Drs. Lekule, Sundst and Ewell
6. Information system of project activities developed and made available to project stakeholders through Internet	15,000	10,000	25,000	- Approved, seek otl sites from USAID, SACCAR or IITA
7. Stakeholders trained in new skills to support the market driven strategy regional	45,000	15,000	60,000	- Detailed workplan needed
8. Establish a private– public sector consortium to support Research and Development of Sweet Potato and Cassava in at least 1 country	100,000	50,000	150,000	- Relocate part of fu to other activities - Detailed workplan
9. CIAT backstopping (6m/m) incl. Travel costs etc.	45,000	45,000	90,000	- Approved
Sub-total	365,000	230,000	595,000	

3.4. SARRNET phase II indicators

Following the presentation by Mr. Joseph Mwangi of IMPACT/USAID/RCSA project, there is a need to review the indicators. These should be circulated to SC members for comments and in consultation with IMPACT/RCSA project. (Action: SARRNET Coordinator).

3.5. SARRNET II evaluation

The SC referred to the discussion after the presentation of Mr. Joseph Mwangi of IMPACT/USAID that the concept of managing results removes the need for evaluation. The monitoring of data/indicators could indicate the need or not to call for an evaluation. This should be confirmed with USAID/RCSA. (Action: SARRNET SC Chairman and Coordinator).

3.6. SARRNET II no - cost extension and SARRNET Phase III

The no – cost extension period of one year (October 2002 to September 2003) and a Phase III follow on proposal were briefly discussed. The details discussed during the general meeting as reported above were adopted. The Coordinator was mandated to take the necessary steps to start preparations for the draft documents. This should be done following USAID thinking and its Regional Strategic Objectives. The Chairman will convene ad-hoc SC meetings to review and approve the project documents pertaining to the no-cost extension and phase-III proposal (Action: SARRNET Coordinator, SC Chairman, USAID, CIP and IITA).

3.7. Membership to steering committee

- ◆ **Rotation:** The membership to the SC for SARRNET II is well described in the project document as discussed at the Harare stakeholders meeting in 1999. The SC felt that the time span of phase II is too short to apply an effective rotational basis. In addition, the project document is not explicit on who should vote for new members. However, the SC discussed the replacement of members who have left their institutions or have declined their memberships to the SC. Mr. Pascoal Muondo, NARS Representative from Angola, left IIA - Angola and normally his replacement at IIA becomes the SC member. Mr. Fred Winch – Commercial farmers Rep., Zimbabwe, declined his membership to the SC and it was suggested to replace him by Dr A.I. Robertson, of AGRI-BIOTECH(PVT), Zimbabwe, who was also selected as SC member at the Harare meeting. A letter should be written to Mr. Cosmos Magorokosho, WVI – Angola and NGO Representative to confirm his interest as a member of the SC. He seems not to respond to all correspondences on the SC issues. Mr. E. Madisa, NARS Botswana, has retired from the Government and thus from the SC as well. Mr. Isaac Bok has replaced him and ipso facto becomes a SC member (Action: SC Chairman).
- ◆ **Active participation:** The members were requested to be instrumental to assist the Chairman and the Coordinator by actively participating and reacting to issues when seeking their view. Feedback should be given once an issue has arisen and sent to members. A list and addresses of the steering committee members will be produced and sent to all members to improve on information dissemination. (Action: SARRNET Coordinator).
- ◆ **Small sub-committee:** A small ad-hoc sub committee should be formed and called for urgent matters. The Chairman, the SARRNET Coordinator and 2 members according to the specificity of the issue will be part of this sub-committee (Action: SC Chairman).
- ◆ **Communication:** In addition to quarterly and annually progress reports, the Coordinator was requested to inform on a monthly basis, main events/activities of the network to the Chairman and other members in order to keep them updated and stimulate their regular participation on network activities (Action: SARRNET Coordinator).

3.8. National coordinators for SARRNET activities

It was observed that, unlike in phase I, national coordination of root crops activities in general and of SARRNET in particular has become very difficult in phase II as individual grantees activities are not nationally coordinated. The national root and tuber crops coordinators have encountered problems when requested to provide information at national level, as they do not coordinate individual SARRNET projects being implemented in their respective countries. The SC therefore has recommended that national coordinators should be requested to coordinate SARRNET activities for reporting to the Coordinator and the SC as funds and logistics will not allow to invite all the grantees to attend the SC. Thus, it was recommended that the SARRNET Coordinator should sub-warrant funds to them depending on the size and activities of the country at a minimum of US \$ 1 000 per year with budget details in line with USAID/IITA/CIP allowable expenses. The national coordinators should also be informed of SARRNET activities. (Action: Chairman and SARRNET Coordinator).

3.9. Support for participation to Workshops

The ISTRC-Africa Branch workshop for 2001 will take place in Yaounde, Cameroon, from 12 to 16 November 2001. SARRNET has set aside US\$30,000, which can sponsor 10-15 scientists from the SADC region. The same funds can also co-sponsor one scientist to Lima for a sweetpotato conference (26 – 29 November 2001) for a maximum contribution from SARRNET of US \$ 2,000 for a return air-ticket and CIP Regional Office will meet other expenses. For both workshops SARRNET will give preference to the grantees of the competitive projects (Action: SARRNET Coordinator, CIP and SC Chairman).

3.10. Monitoring Tour for next year and study tour to Latin America or Asia

The monitoring tour in selected SARRNET countries is important and should include a sizeable number of NARS and other stakeholders in addition to IITA and CIP backstopping. The terms of reference and the membership of the study tour should be well defined and a report circulated after the tour. However, it was decided to put on hold the proposed study tour to Latin America or to Asia till full clarification of the main achievable objectives are made (Action: SARRNET Coordinator).

3.11. Broadening of SARRNET funding

To sustain SARRNET activities, it was decided to encourage, through SACCAR, bilateral funding in some countries with potential donors such as USAID, CFC, IDRC, EU etc. (Action: SACCAR Representative, SC Chairman, CIP, IITA and SARRNET Coordinator).

3.12. Date and venue of next SC meeting for 2002

The next Steering Committee meeting will be held between late March and early April 2002 in Pretoria, South Africa. The meeting should be for 5 days: the first 2 days for progress reports and scientific papers, the 3rd day for the field tour, 4th day all the other participants can leave while the steering committee can conduct their normal business meeting up to the 5th day. In addition, it was decided to modify the term of office for the Chairman. The incumbent Chairman should conduct the business up to the end of the SC meeting and the next chairman, to be elected during business meeting, should start thereafter (Action: SC Chairman and SARRNET Coordinator).

**List of participants to SARRNET SC Meeting held in
Dar-Es-Salaam, 14 –17 May 2001.**

- Kampala, Uganda; Tel; 223445; E-mail:
khizzah@infocom.co.ug
- 1) Dr. Andrade, Maria Isabel,
IITA/SARRNET/USAID
BI/CITERAL, P.O Box 2100, Maputo,
Mozambique. Tel.258-1-461610, E-mail:
MANDRADE@ZEBRA.UEM.MZ
- 2) Dr. Ajayi, Michael T.,
IITA, Training Department, P.M.B 5320, Ibadan,
Nigeria. Tel. 234-2-2412626;
E-mail: T.AJAYI@CGIAR.ORG
- 3) Dr. Best, Rupert,
Centro Internacional de griculturaTropical,
Apartado Aereo 6713, Cali, Colombia; Tel : 57 2
450022.
E-mail: R.Best@cgiar.org
- 4) Dr. Bokanga, Mpoko,
IITA, PMB 5320, Oyo Road, Ibadan, Nigeria; Tel.
234-2-2412626; E-mail:
M.BOKANGA@CGIAR.ORG
- 5) Mr. Casey, Jim,
Managing Director, C.S. Manufacturing Co. (Pty)
Ltd, P.O. Box 1837, Parklands 2121 Gauteng, South
Africa, Tel. +27-11-880-3886; Fax +27-11-442-
9071
- 6) Dr. Dixon, Alfred,
IITA, PMB 5320, Oyo Road, Ibadan, Nigeria; Tel.
234-2-2412626;
E-mail: A.DIXON@CGIAR.ORG
- 7) Dr. Ewell, Peter T.,
International Potato Center (CIP), Tel; +254-2632-
054; P.O Box 25171, Nairobi, Kenya. E-mail:
P.EWELL@CGIAR.ORG
- 8) Dr. Ferris, Shaun,
IITA-Uganda, P.O Box 7878, Kampala-Uganda;
Tel. 000256-41-221416;
E-mail: s.ferris@imul.com
- 9) Mr. Fungulani, Thomas, David Whitehead and
Sons, P.O Box
30070, Chichiri, Blantyre 3, Malawi; Tel.
265-670191/337/568;
E-mail: whitex@malawi.net
- 10) Dr. Kanju, Edward,
ARI-Ukiriguru, P.O Box 1433, Mwanza, Tanzania.
Tel; 255-28-2550215/2550214;
E-mail: ekanju@yahoo.com
- 11) Dr. Kasele, Idumbo Nsongi,
IITA/SARRNET, Horticultural Research Centre,
P.O Box 810, Marondera,
Zimbabwe; Tel; 263-79-24085 E-mail:
kasele1@mweb.co.zw
- 12) Dr. Khizzah, Bill Williams, IITA/EARRNET,
P.O Box 7878,
Kampala, Uganda; Tel; 223445; E-mail:
khizzah@infocom.co.ug
- 13) Mr. Kolijn, Sicco,
IITA/SARRNET, c/o ARI-Mikocheni, P.O. Box
6226, Dar-Es-Salaam, Tanzania, Tel. 255-22-
2700092
E-mail: sarrnet@cats-net.com
- 14) Prof. Kwapata, Moses B.,
University of Malawi, Bunda College, P.O Box 219,
Lilongwe, Malawi. Tel; 265 277 222 /420
E-mailM: mbkwapata@malawi.net
- 15) Dr. Legg, James,
IITA/NRI, P.O Box 7878, Kampala, Uganda. Tel;
256-41-223460; E-mail: jlegg@infocom.co.ug
- 16) Prof. Lekule, Faustin P.,
Sokoine University of Agriculture, P.O Box 3004,
Morogoro; Tanzania, Tel. 255-23-260 4576; E-
mail: lekule@suanet.ac.tz
- 17) Dr. Mahungu, Nzola M. IITA/SARRNET,
Chitedze Res. Station
P.O. Box 30258, Lilongwe 3, Malawi, Tel. 265-
707014;
E-mail : n.mahungu@cgiar.org
- 18) Dr. Morton, Raymond H.,
Regional Center for Southern
Africa, USAID, P.O Box 2427, Gaborone,
Botswana. Tel.+267-324-449, X - 399;
E-mail: rmorton@usaid.gov
- 19) Mrs. Mtunda, Kiddo J.,
Root and Tuber Crops Programme, SRI - Kibaha.
P.O Box 30031, Kibaha, Tanzania; Tel. 255-23-
2402017/2402038;
E-mail : sri@twiga.com
- 20) Mr. Mwale, Costa,
IITA/SARRNET, Chitedze Res. Station ; P.O. Box
30258, Lilongwe 3, Malawi, Tel. 265-707014,
E-mail : sarrnet@malawi.net
- 21) Mr. Mwangi, Joseph, IMPACT/USAID/RCSA,
P.O. Box 2427,
Gaborone, Botswana, Tel. +267-373-969, E-mail:
jmwangi@impact.info.bw
- 22) Mr. Nkini, Nelson,
Av. DE ANGOLA NR 2475, Maputo,
Mozambique; Tel; 000258-1-465258/465911; E-
mail:
agroalfa@agroalfa.uem.mz
- 22) Dr. Nyange, David A.,
Sokoine Univ. of Agric., Dept. Of Agric. Econ &
Agribusiness, P.O.Box 3007, Morogoro, Tanzania.
Tel; 255-744-272573;
E-mail: davidnyange@hotmail.com
- 23) Dr. Phiri, M. Alexander R.,
Bunda College of Agric., P.O Box 219, Lilongwe,
Malawi; Tel 265-277441/277419;
E-mail: marphiri@hotmail.com

- 24) Mr. Salisbury, Jeff,
Universal Industries, Factory Manager, P.O Box
507, Blantyre, Malawi. Tel. 265-670055;
E-mail: jnibisco@malawi.net
- 25) Dr. Simwambana, M.S.C.,
Mutanda Research Station, P.O Box 110312,
Solwezi; Zambia. Tel.260-08-821242/ 821230; E-
mail: RTIP@zamnet.zm
- 26) Dr. Sundstol, Frik,
SACCAR,Private Bag 00108, Gaborone, Botswana.
Tel; 267-328847;
E-mail: fsundstol@gov.bw
- 27) Dr. Temba, Joseph,
Africare Zambia, P.O Box 33921, Lusaka, Zambia.
Tel; 260-01-264406/261981;
E-mail: drjtemba@zamnet.zm
- 28) Dr. Thompson, G.J.,
ARC-Roodeplaat VOPI, P/Bag X293, Pretoria
0001. South Africa. Tel. 27-12-8419617; E-mail:
GTHOMPSON@VOPI.AGRIC.ZA
- 29) Dr. Uriyo, Andrew P.,
IITA, c/o Lambourn and Co. Ltd, Carolyn House,
26 Dingwall Road, Croydon CR9 3EE, England,
Tel; 234-2-241-2626;
E-mail: A.URIYO@CGIAR.ORG
- 30) Dr. Van Oirschot, Quirien,
Natural Resources Institute, Food Systems
Department, Natural Resources
Institute, Central Avenue, Chatham Maritime, Kent
ME4 4TB, United Kingdom. Tel; 44 1634 88 35 64;
E-mail:
Q.VANOIRSCHOT@GRE.AC.UK
- 31) Dr. Westby, Andrew,
NRI, University of Greenwich, Central Avenue,
Chatham ME 44TB, UK. Tel; +44 1634-883478,
E-mail: a.westby@gre.ac.uk

SC MEMBERS PRESENT for SARRNET business meeting (16 and 17 May, 2001)

1. Prof. F. Lekule - Past chairman (2000/01), Univ. Representative: lekule@suanet.ac.tz
2. Dr. G. Thompson – Chairman (2001/02), NARS Rep.: gthompson@vopi.agric.za
3. Dr Joseph Temba - NGO Representative: Africare@zamnet.zm
4. Dr. Edward Kanju - NARS Representative: ekanju@yahoo.com
5. Dr. Moses Simwambana – NARS Representative: rtip@zamnet.zm
6. Prof. Moses Kwapata – Univ. Representative: MBKwapata@malawi.net
7. Mr. Nelson Nkini - Private sector Repr.: agroalfa@agroalfa.ucm.mz or aalfamute@tropical.co.mz
8. Mr. Jim Casey – Private sector Rep., Fax + 27 (11) 442-9071 (Invitee)
9. Mr. Jeff Salisbury – Private sector Rep.: unibisco@malawi.net (Invitee)
10. Mr. Thomas Fungulani – Private Sector: whitex@malawi.net (Invitee)
11. Dr. Ray Morton – USAID Representative: rmorton@usaid.gov
12. Dr. Frik Sundstol - SACCAR Representative: Ffundstol@gov.bw
13. Dr. Peter Ewell – CIP Representative: p.ewell@cgiar.org
14. Dr. Andrew Uriyo - IITA Representative: A.URIYO@CGIAR.ORG
15. Dr. Nzola Mahungu – Secretary, SARRNET Coordinator: sarnet@malawi.net

Absence with apologies:

1. Mr. Wilson Sikhondze - Farmers/Extension Rep.: Hortecrops@africaonline.co.sz (delayed Government travel clearance)
2. Mr. Pascoal Muondo - NARS Rep., (left IIA Angola and new replacement on board)
3. Mr. Fred Winch – Commercial farmers Rep., Zimbabwe (declined its membership to the SC).
4. Mr. Isaac Bok – NARS Rep.: dar@info.bw (was erroneously omitted on the list).

Absence without apologies:

1. Mr. Cosmos Magorokosho – NGO Rep.: c-magorokosho@yahoo.com or Cosmos-Magorokosho@wvi.org

Annex 3: MINUTES OF SARRNET STEERING COMMITTEE MEETING HELD AT AGRICULTURAL RESEARCH COUNCIL IN PRETORIA, SOUTH AFRICA

29TH APRIL TO 3RD MAY 2002.

1. GENERAL MEETING

A two day general meeting was conducted on 29th and 30th April 2002 where presentations of 10 country reports, 12 papers on commissioned studies and 4 progress reports for small grants were made. The meeting was attended by a cross section of 37 participants from the private sector, NARS, sister networks, CIP, IITA and USAID (Annex 1). The business meeting conducted on 1st and 3rd May 2002 was attended by 14 members who deliberated issues that arose from the general meeting and the previous minutes.

The meeting was opened by the Group Executive Officer of Agricultural Research Council, Dr. Malope. Representatives of IITA, CIP, and USAID made brief opening remarks.

In his opening speech, the Group Executive Officer (GEO) noted that sweetpotato receive a lot of research attention after potato which is a major agricultural crop in South Africa. He indicated that sweetpotato was a very good crop because of its drought resistance and is also a good crop to be produced by people with limited resources such as irrigation water and fertilizer. The GEO also noted that South Africa has serious problems of micronutrient deficiency especially vitamin A. The possibility of production of orange-fleshed sweetpotato with very high vitamin A can alleviate these problems especially in the rural areas. He alluded to cassava crop as being less known in South Africa but more and more interest has started being shown in the crop because of the drought resistance and the possibility of the crop to alleviate hunger in certain rural areas. He added that the recent interest in the crop was not only for human consumption but also because of its industrial value for the production of starch giving reference to the starch extraction factory in the Limpopo Province. At this point, he indicated that root crops are also a major food source in all SADC countries. He commended SARRNET for playing a major role in bringing researchers and other interested people together to exchange information and discuss issues relating to these crops. He added that SARRNET activities fit in with the New Partnership for Africa's Development (NEPAD).

2. ISSUES FROM THE GENERAL MEETING

A total of 26 presentations were made including progress reports and theme papers. Issues that were noted and raised from the presentations and after discussions were as follows:

- 2.1 In his 2001/2002-chairmanship report, Dr. Graham Thompson indicated that the year was full of challenges that included new management at IITA, SARRNET and USAID, new research grant system and the issue of No-Cost Extension. The market - led and increased private sector participation were some of the activities that SARRNET needed to continue with IITA-CIAT collaboration. From his participation in the monitoring tour, he observed that there are threats of diseases such as Cassava Brown Streak Virus and Cassava Mosaic Diseases which require continued efforts. The Open Quarantine facility has to expand to all countries. He also added that for increased regional activities, there is need to include other root and tuber crops in the program.
- 2.2 In 2001/2002 season, the Coordinator report indicated that SARRNET conducted a number of activities including the IITA – CIAT collaboration on SARRNET for market-led activities, the involvement of private/industrial sector in cassava and sweetpotato promotion and production through 4 models, the monitoring of 33 small grants awarded to SADC scientists, the monitoring of the regional market sub-sector analysis in the three target countries. Also strengthening of information dissemination through workshops and symposia, production of Roots Newsletters and web site creation were some of the achievements. A No-Cost Extension was also produced and submission made for consideration by the donor. The new approach of SARRNET requires the initiation of Task forces.
- 2.3 Germplasm development should be participatory and target specific end users such as the fresh market, the food and feed industry and many others. Breeding work on various genotypes should consider nutrition aspects to include orange-fleshed sweetpotato and

yellow-fleshed cassava. The need to prioritize products and focus on a few countries will strengthen and provide regional market support and diversification.

- 2.4. Partnerships with private sector remain the most important approach for the development of commercial production systems including the promotion of a decentralized farmer-based planting material production and distribution system. The use of various media such as TVs, radio, newsletters, the press should be explored to disseminate market information to ascertain the markets to the private sector.
- 2.5. The guiding principles of SARRNET research and development should still continue to consider poverty alleviation, food security, environment, and gender issues including HIV/AIDS pandemic.
- 2.6. Disease and pest problems and efforts to address them through germplasm development and quarantine facilities are vital for the root crops sub-sector development in SARRNET countries. Detailed control strategies for CBSD, CMD, CBB, CGM, *Bemisia* white flies and termites should be defined including IPM strategies and other multiple control options such as the biological control measures.
- 2.7. Progress for root crops production is hampered by civil wars and political interference in such countries as Angola, DR Congo and Zimbabwe. Nonetheless, production of cassava and sweetpotato should continue to receive attention as the development of industries and markets depend to a large extent on readily available raw materials.
- 2.8. The issue of data reporting from SARRNET countries was discussed and was noted that an improvement was made from the coordination office only and not in other member countries. It was felt that new impact farmer-level indicators be developed for ease of monitoring and uniform reporting.
- 2.9. The inclusion of other activities in SARRNET such as Irish potato, yams, taro and non-root crops among others was thoroughly deliberated. The sharing of the learned lessons from other networks became very apparent that the suggested activities besides sweetpotato and cassava will widen SARRNET collaboration and its funding base.
- 2.10. Discussions on four different thematic topics were done thoroughly in four separate groups (Annex 2) with outcomes as outlined below.

2.10.1. Marketing and Enterprise Development

The group came up with the following issues for consideration in the research and development for root crops marketing and development.

- 2.10.1.1. Continue with cassava and sweetpotato
- 2.10.1.2. Wider range of roots and tubers including irish potato and yams
- 2.10.1.3. Expand to root and tuber crops but other crops such as grains & legumes to be location and study specific
- 2.10.1.4. Open competition for crop selection by clients and provide greater support to policy analysis and business support services

2.10.2 Integrated Pest and Production Management (IPPM).

During their discussion, the group arrived at a four-point strategy for research and development on IPPM as follows:

- SARRNET should be looking at an overarching program for Southern Africa not a specific project for a particular donor.
- Focus root crops but incorporation of other crops/elements if required for sustainability
- Improve livelihoods by supporting farmers to move from subsistence to commercial operation

- The need for integration of markets – processing – production should be the focus of any further activities for SARRNET.

2.10.3 Biotechnology

The issues pertaining to Biotechnology were also discussed in one of the thematic groups. In order to have an enabling environment for implementing Biotechnology in root crops R&D, the following points were noted for consideration:

- Support efforts for regional harmonization of biosafety regulations
- Facilitate stimulation of self-sustaining activities involving biotech activities.
- Foster sustainable preservation and distribution of pathogen - tested germplasm for the region.
- Application of biotech solutions to regional constraints and opportunities
- Regional capacity building

2.10.4 Broad and specific germplasm development

The group that deliberated on this theme came up with the following areas to be considered in germplasm development:

1. Developing and promoting genotypes for specific end-users e.g. food, feed and industries.
2. Developing genotypes for enhanced nutritional quality and for niche markets
3. Developing of genotypes for targeted agro-ecological zones
4. Developing resistant to biotic and abiotic stress
5. Developing sustainable multiplication and distribution systems
6. Strengthening the capacity of NARS and other partners to undertake research and development
7. Enhancing the public-private partnerships for realization of common objectives
8. Establishing open quarantine facilities for efficient germplasm exchange.

The general plenary adopted the presentations from the thematic groups as being relevant for future SARRNET plans and activities.

3.0 BUSINESS MEETING

The business meeting was attended by the SC members only and the following issues from the previous minutes and the general meeting were tabled and discussed.

3.1 Confirmation of the previous minutes

The previous minutes were tabled and the SC members confirmed the minutes as a true reflection of what was deliberated last year in Dar es Salaam.

3.2 Matters that arose from the previous meeting

3.2.1 Commissioned studies

Members of the meeting felt that there was satisfactory reporting from Mozambique, Tanzania and Malawi while other SARRNET countries such as Zimbabwe, Swaziland, Lesotho and Botswana reported fewer activities as evidenced by country reports. The SARRNET Coordinator clarified the issue by indicating to the meeting that those countries with unsatisfactory reports are affected because the scientist responsible for them (Dr. Kasele) had left SARRNET because his contract came to an end. He also indicated to the meeting that even justification of funds for such countries has been a perpetual problem.

USAID/IMPACT representative confirmed that reports were being submitted. However, there was a need to strengthen "Results reporting" including success stories. In order to accelerate close contacts with USAID office, the SC members suggested that SARRNET should invite USAID officials to visit selected countries to see and appreciate SARRNET activities and accomplishments.

It was also agreed that summary reports of commissioned and small grant studies be circulated to members of the steering committee before subsequent meetings. The Coordinator should be obtaining summary reports from NARS with impact at farmer level and with reliable data. However, it was felt that this may be a problem as no funds are remitted to NARS root crops team leaders for execution and monitoring of the activities since the project does not provide for any budget line for NARS team leaders .

3.2.2 Open Quarantine Facility (OPQ)

In order to enhance regional germplasm development and exchange, the meeting agreed to introduce OPQ into SARRNET countries. The concept note which was submitted to the defunct SACCAR board was discussed and submitted by SACCAR to SADC phytosanitary council. The Coordinator should follow up with this office based in Harare.

3.2.3 Private-Public sector consortium

This activity was planned for purposes of supporting Research and Development on cassava and sweetpotato in at least 1 country. The meeting was informed that the activity was under way and progressing well. However, some funds have been included in the No-Extra Cost Extension. Nonetheless, it was indicated that Malawi and Tanzania were allocated \$15,000 each. The countries have established processing centers and farmers has been provided with clean planting materials, processing equipment and have received training in production and processing.

3.2.4 No-Extra Cost Extension (NCE)

The SC members requested USAID representative to work with other representatives from CIP and IITA with the facilitation of the Chairman and the Coordinator to accelerate the approval of the NCE. Since the actual funds available for the remaining current phase were not exactly known, the Coordinator will request the Financial Controller at IITA to provide the information.

The members also requested to have the document of NCE so that they look at the proposed activities that will continue in the NCE to be executed by September 2003. The activities in the past Phase II should be put into a detailed work plan and revised to the NCE.

3.2.5 Membership to steering committee

- ◆ **Rotation of members:** After a brief discussion on the issue, the committee felt that rotation of members has no mechanism as of now. Although the 1999 Harare General meeting indicated that members should be elected from a general meeting, the SC felt that this might be an expensive exercise. It was agreed that the general meetings could be replaced by national stakeholders meetings where elections for members and representatives could be done.

The next round of the members to represent NGOs and the private sector was considered and the SC resolved that the next meeting should have Mr. J. Salisbury to represent the private sector while the Regional Agricultural Officer of Catholic Relief Services should represent the NGOs. The Coordinator was actioned to inform these members and also ask each participating countries to send the names of national coordinators for purposes of correspondences. These have to receive copies of the follow-up proposal.

- ◆ **Stakeholders meeting:** During the discussion on the meetings, the issue of holding a stakeholders meeting involving some representatives from the SC and various donor community to table the follow-up project proposals for SARRNET arose. The framework for the phase can be derived from consultation meetings with national task forces where priority setting could be done. Also a line item could be included in the NCE to fund the activities of follow-up proposal. It was therefore, agreed that a concept note of the proposal should be developed and submitted to the donors 18 months before the actual proposal. This concept note should first of all be circulated to the SC members before tabling it

at this stakeholders meeting. The SC proposed to seek assistance from donors such as USAID, the EU, Rockefeller, etc to fund the meeting.

3.2.6 National coordinators for SARRNET activities

It was observed that in the last meeting in Dar es Salaam that national coordination of root crops activities in SARRNET Phase II became difficult as countries with small projects dealt with individual grantees. The national root and tuber crops coordinators have encountered problems when requested to provide information at national level, as they do not coordinate individual SARRNET projects being implemented in their respective countries. The SC therefore has recommended that national coordinators should be requested to coordinate SARRNET activities for reporting to the Coordinator. During the last meeting in Dar es Salaam, it was recommended that the SARRNET Coordinator should sub-warrant funds to them depending on the size and activities of the country at a minimum of US \$ 1 000 per year with budget details in line with USAID/IITA/CIP allowed expenses. This was not carried out as a new budget line could not be created without approval from the donor. The suggestion to include US\$1,000 in the small grants was not viable either because some countries do not have small grants and that the budget for each small grant is meant for a specific activity. Finally, it was agreed that the coordinator's office should review this with USAID and that future SARRNET projects should have a line item for national coordination.

3.2.7 Broadening of SARRNET funding

The issue of funding was also discussed in the SC meeting. In order to sustain SARRNET activities, the members recommended that SADC countries/ scientists should be submitting proposals. SARRNET should also produce and circulate a checklist of potential donors to member countries and scientists. Reports by other projects funded by other donors should also be submitted to SARRNET for sharing of information on the contribution by such projects to SARRNET program.

3.2.8 Monitoring tour report

The SC was informed that the 2002 monitoring tour was conducted and was very successful and the report was ready. The coordinator was requested to e-mail the report to the SC members for their information and comments.

4.0 Issues from the plenary session of 2002 SC meeting

4.1 TARGET Program

The Coordinator informed the meeting that a proposal had been submitted to USAID through SACCAR. Its main objective is to expand the multiplication and distribution of clean planting material for sweetpotato and cassava. SACCAR gave an approval but suggested that other root crops should be included. SACCAR also indicated that SARRNET activities should extend to include Mauritius as a country. He informed the SC that all projects submissions to TARGET go through International centers. CIP has also submitted one through ASARECA. The aim of TARGET is to assist projects that have activities for technology transfer and not for basic research. Hence, this could be an opening for SARRNET to include other root crops that have proven technologies available for dissemination.

4.2 Future activities

The SC discussed SARRNET future activities meant to start from October 2003 onwards. One of the activities is to develop a concept note proposal to be out by July this year which will be developed into the main project in 2003.

It was noted that USAID regional office meets every year from June/July to discuss among other things, project submissions. The SC requested USAID/IMPACT representative to inform USAID office about the new initiatives SARRNET is to undertake. Members agreed that a 3-4 page concept note for future projects with USAID be developed with a tentative budget and send it to SC members for their comments as soon as possible. The chairman requested members to be proactive on this issue and that they should acknowledge receipt of the note. It was therefore, recommended that a special delegation be sent to USAID RCSA to submit the annual report. During this trip, the delegation will also discuss and submit the concept note for the intended project proposal.

4.2.1 Inclusion of other crops

The SC endorsed what the plenary discussed on the inclusion of other crops. It was suggested that these could be included in phases. The crops should include those that are beyond food security such as yams, potatoes, taro etc. However, the crops have to be prioritized depending on country needs, capacity (eg staffing position) and also not to spread too much in order to show impact. It was cautioned that these future plans should fit very well with USAID regional objectives. Nonetheless, SARRNET will continue to concentrate on cassava and sweetpotato. The main focus of SARRNET should be included in the preamble of the concept note proposal to show that other crops can be included but depending on the priorities of member countries and that SARRNET will provide backstopping services. The new activities should be demand driven including that of food security, nutritional aspects, grades and standards, markets among other areas.

4.2.2 Sub-sector studies

The sub-sector studies being conducted in the target areas of the region was briefly discussed. The meeting felt that the consultant engaged was more on a market study than the sub-sector itself. During a special meeting that was called to discuss the issue in Tanzania, it was discovered that the terms of reference were not developed to achieve a sub-sector study but a market study. Some members wondered whether this sub-sector analysis was indeed relevant to SARRNET activities, as the sample seemed not representative. However, after a lengthy discussion, it was concluded that the study was still important and that the data collected be analyzed and synthesized together with other relevant information that is available into a usable form to show the size of the market, limiting factors of the private sector, prices, adoption rates and many other indicators of relevance to SARRNET. The SC requested USAID IMPACT to assist in giving direction for the report. SARRNET was asked to submit a copy of the draft report to USAID IMPACT.

4.2.3 Task Forces Approach

The issue of the need for task forces was tabled. The members felt that member states should have national task forces with a country coordinator to act a secretary of the force. This will be responsible for all SARRNET activities in each country and sourcing of funding. The country representatives were asked to initiate the task force formation in their respective countries. However, the coordinator was actioned to send notes for this issue to all countries including those that are not represented. These task forces should have a cross section of representation. One of the TORs for these task forces is to monitor activities of each country based on indicators and objectives with all related activities that are not necessarily those of SARRNET.

4.2.4 Recommendations of working groups

The SC paid attention to the need of having working groups to focus on specific technical issues. The working groups should be mandated to advise the SC and initiate action on any emanating technical problems such as emerging threats of disease and pest problems. The groups will have no executive powers but to help in setting regional priorities, foster sharing of information, lobbying for policy to strengthen demand driven technologies at regional level while policy advocacy will be country specific and mandated by the national task forces. The working groups will be specific in areas such as *Biotechnology and Biosafety, Marketing and agro-enterprise development, Integrated Pest and Production management etc.* Basically, the groups have to comprise technocrats comprising scientists of similar professions. The SC finally agreed that the concept note, which has to be submitted to USAID, should include the views of these working groups so that it represents a regional focus other than country specific foci.

4.2.5 Termite issues

The problem of termite was taken to be a regional threat and that currently no work is being done to sort it out. It was recommended that some funds from the small grants be used for this work. Further suggestions indicated that Prof. Phillip Nkunika of University of Zambia who had done some work on termites be contacted to find out how much work has progressed and isolate any useful information. The SC recommended the Prof. should submit a regional proposal with a budget to be piloted in selected sites in some countries of the region. This could be included in the NCE proposal. He should also summarize

literature review on the work that has been done so far with results to be tested in the region. The work should be linked to IITA scientists who have experience in biological control among other countries.

4.2.6 IITA-CIAT/CLAYUCA collaboration on SARRNET

The collaboration was initiated in November 2000 as a crash program mainly on cassava. The meeting felt that the collaboration need to be open to include issues on sweetpotato despite those opportunities for cassava are more documented than those of sweetpotato. The Coordinator informed the meeting that funds for this collaboration have not been included in the NCE. Therefore, if the collaboration will continue after September 2002 and that the NCE is approved, the funds will be those that will remain from the \$90,000 budget after 30th September 2002.

4.2.7 COMMERCE-SA project

The proposed COMMERCE-SA project was discussed by the SC thoroughly. It was noted that future activities for SARRNET contain similar activities that are in the COMMERCE-SA proposal as it includes all crops. To avoid duplication of efforts, it was concluded that activities on root crops should be on SARRNET project. All other activities that will be proposed should be an addition to those of SARRNET. If the COMMERCE-SA is to continue, then it must be discussed between IITA and SARRNET coordinator to see how this will benefit or complement SARRNET activities but not to replace or compete with SARRNET. The COMMERCE-SA proposal was therefore not endorsed by the SC.

4.2.8 Proposal writing

The issue of follow-up project proposal writing to succeed SARRNET Phase II was tabled. After a brief discussion, the SC recommended that the proposal writing should be done by SARRNET itself because it has the knowledge of what the donors want and has the expertise in what it is doing. The background for the project should be written by SARRNET with the support of the task forces while USAID/IMPACT will help on indicator formulations. It was appreciated that the Director General is ready to champion and support the proposal to make it sale. Therefore, the issue of consultancy was summarily ruled out and that should any expertise be required, it will be hired from within the region.

4.3 Reporting to USAID (Performance Management)

The SC emphasized the need to have a mechanism of reporting to USAID and they agreed to have a standard reporting format. The Coordinator's office was actioned to come up with at least a one-page summary of reporting irrespective of the type of a project. However, the issue of small grants inclusion in the reporting format may depend on the type of work being done by each scientist. Since the small grants are too numerous to monitor and too small to show impact, it was concluded that SARRNET future project should only allow 3-4 grants with funding of \$50,000 - \$100,000 each. Other activities should be undertaken as commissioned studies. For the whole project, SARRNET should develop a better monitoring system with milestone indicators to show expected results at activity level, process level, outcome level and impact level. Then impact studies should also be planned.

The task forces will be mandated to concentrate their focus on monitoring small grants of each country as these are mostly country specific and make small contribution that can build up on an impact. However, the regional proposal will be based on the identified problems and priorities of each country on which funding and reporting of the project will also be based.

4.4 Non performing small grants

Concerns were raised on the small grants that are not showing any progress. Among which are the baseline studies. In Tanzania, Malawi and Zambia, it was noted that data for baseline studies have been collected but not yet analyzed. The Zambia problem has resulted from lack of staff as some prominent members have left the Government. In Mozambique, only distribution data has been collected and the rest of the required information has not been collected at all. Dr. Maria Andrade was actioned to follow up on the issue. In Angola, it was reported that there was staff change over. In this case, the Coordinator was actioned to discuss the issue with the Director of IITA. The meeting finally agreed in principle that no funds has to be sub - warranted to these grants for this activity until progress is seen. SC members in each country were

asked to take up the issue with their country's NARS responsible including informing Directors of Departments of Research. They have to give them definite dead lines to write up the final reports.

The members agreed to treat the grants case by case. Any committed funds that are not used by 15th July 2002 and upon clear justification can be carried over to the NCE if the work is not completed. However, the Coordinator was requested to remind all small grantees on the deadlines following the agreements and have to justify any need for extension of the use of the remaining funds into the NCE. Any non-performing grant should be stopped.

5.0 Funds to Zimbabwe, DR Congo and Swaziland

The meeting discussed the need to fund cassava activities in the 3 countries above during the NCE. Each country has to be allocated \$5,000 per year annum. In Swaziland, the country representative requested funds for purchase of field equipment. The SC approved the use of the remaining \$2,000, which has not been used yet.

6.0 Publication of SARRNET sponsored studies

It was noted that some scientists publish studies that have been conducted using the funds from SARRNET. Although the findings of the studies are for public consumption, the members actioned the Coordinator to remind all the grantees to recognize and acknowledge the donor and SARRNET in their publications. After compiling all the information from the small grantees, the meeting recommended that a scientific workshop be held before the next SC meeting. The presentations could be published with Africa Journal of Crop Science. CTA, Rockefeller and/or EU should be contacted for sponsorship.

7.0 Translation into Portuguese/English

During SARRNET SC meetings and workshops, it was observed that some members do not participate actively because of language problem particularly those from Portuguese speaking countries. The meeting recommended that these members be sent for English courses under the sponsorship of SARRNET than hiring very costly translators.

8.0 Any other business

The members of the SC commended the past Chairman and the Coordinator for the good job they had done during their tenure of office.

It was emphasized that the coming proposal should put a strong item on capacity building.

The general view was that the number of small grants should be minimal, as these have proved to be difficult to monitor. Commissioned studies should have a bigger portion.

9.0 Election of the chairman for 2002-2003 tenure of office

Dr. J. Temba from Africare - Zambia was elected chairman for 2002-2003 season. He accepted the responsibility and assured the members of his commitment and full support to SARRNET activities. He in turn requested for support from all the members including the past Chairman.

10.0 Date and venue of next SC meeting for 2003

The next Steering Committee meeting will be determined by the status of the NCE. It will be held in April/May 2003 in Lusaka, Zambia. As recommended from the last meeting in Dar es Salaam, the meeting will be for 5 days. The first 2-3 days for scientific workshop where small grants and commissioned studies will be presented. The 4th day for the field tour and 5th day will be for the steering committee members to conduct their normal business meeting. The Chairman and the Coordinator were actioned to come up with the actual dates and communicate to the members for Confirmation.

List of participants to SARRNET SC Meeting held in Pretoria 29th April - 3rd May 2002.

- 1) Dr. Andrade, Maria Isabel, IITA/SARRNET/USAID
BI/CITERAL, P.O Box 2100, Maputo, Mozambique. Tel.258-1-461610; E-mail:
Sarnnetmoz@teledata.mz
- 2) Dr. Ajayi, Michael T., IITA, Training Department, P.M.B 5320, Ibadan, Nigeria. Tel. 234-2-2412626; E-mail:
T.AJAYI@CGIAR.ORG
- 3) Dr. Best, Rupert, Centro Internacional de Agricultura Tropical, Kawanda Agric. Research Institute, P.O. Box 6247,
Kampala, Uganda. Tel: 256-41-567814;
E-mail: R.Best@cgiar.org,
- 4) Mr. Bok, Isaac, Dept. of Agric. Research, P/Bag 0033, Gaborone, Botswana. Tel:092-67-3668100;
E-mail: ibok@gov.bw
- 5) Mrs. Chipungu, Felistus, Bvumbwe Research Station, P.O. Box 5748, Limbe, Malawi. Tel: 265-471206.
- 6) Mr. Cuambe, C.R., INIA, P.O. Box 365, Maputo, Mozambique. Tel: 01-460190.
E-mail: ccuambe@yahoo.co
- 7) Dr. Dixon, Alfred, IITA, PMB 5320, Oyo Road, Ibadan, Nigeria; Tel. 234-2-2412626; E-mail:
A.DIXON@CGIAR.ORG
- 8) Dr. Dorman, John, USAID/RCSA, P.O. Box 2427, Gaborone, Botswana. Tel: 267-324449 E-mail:
dorman@usaid.gov
- 9) Dr. Ewell, Peter T., International Potato Center (CIP), P.O Box 25171, Nairobi, Kenya. Tel; +254-2-630743;
E-mail: P.EWELL@CGIAR.ORG
- 10) Mr. Fadel, Antonio, Halotec-Fadel Industrial Ltda, Rodovia Raposo Tavares, KM 421Palmital-SP, Brasil. Tel: 018-
351-1280; E-mail:halotek@femanet.com.br
- 11) Dr. Ferris, Shaun, IITA-Uganda, P.O Box 7878, Kampala-Uganda; Tel. 000256-41-221416; E-mail:
s.ferris@imul.com
- 12) Dr. Kapinga, Regina E. International Potato Centre (CIP), P.O. Box 22274, Kampala, Uganda. Tel: 256-041-
287571, E-mail: r.kapinga@cgiar.org
- 13) Dr. Khizzah, Bill Williams, IITA/EARRNET, P.O Box 7878,
Kampala, Uganda; Tel; 223445; E-mail: khizzah@infocom.co.ug
- 14) Mr. Kolijn, Sicco, IITA/SARRNET, c/o ARI-Mikocheni, P.O. Box 6226, Dar-Es-Salaam, Tanzania, Tel. 255-22-
2700092
E-mail: sarnnet-tz@acexnet.com
- 15) Prof. Kwapata, Moses B., University of Malawi, Bunda College, P.O Box 219, Lilongwe, Malawi. Tel; 265 277
222 /420
E-mailM: mbkwapata@malawi.net
- 16) Dr. James Legg, IITA/NRI, P.O Box 7878, Kampala, Uganda. Tel; 256-41-223460; E-mail: jlegg@infocom.co.ug
- 17) Prof. Lekule, Faustin P., Sokoine University of Agriculture, P.O Box 3004, Morogoro; Tanzania, Tel. 255-23-260
4576; E-mail: lekule@suanet.ac.tz
- 18) Dr. Lukombo, Singi, INERA,
13 Avenue des Climiques, Gombe Kinshasa, DR Congo. Tel. 243-9944970;
E-mail: inera@rogo.net
- 19) Dr. Laurie, S.M., ARC-Roodeplaat, P/Bag X293, Pretoria 0001.Tel: 2712-841-9639. E-mail: slaurie@vopi.agric.za
- 20) Dr. Mahungu, Nzola M. IITA/SARRNET, Chitedze Res. Station
P.O. Box 30258, Lilongwe 3, Malawi, Tel. 265- 707014; E-mail : n.mahungu@cgiar.org

- 21) Dr. Manyong, Victor, IITA, PMB 5320, Oyo Road, Ibadan, Nigeria. Tel: 234-2-2412626; E-mail: V.manyong@cgiar.org
- 22) Mr. Mhone, Albert, IITA/SARRNET, Chitedze Res. Station ; P.O. Box 30258, Lilongwe 3, Malawi, Tel. 265-707014;
E-mail : sarnet@malawi.net
- 23) Mr. Moodley, D. National Starch, P.O. Box 1452, Wionille, 1422, Colombia.
Tel: 082-4680192;
E-mail: dev.moodley@nstarch.com
- 24) Mrs. Mtunda, Kiddo J., Root and Tuber Crops Programme, SRI - Kibaha. P.O Box 30031, Kibaha, Tanzania;
Tel. 255-23-2402017/2402038;
E-mail: kmtunda@yahoo.com
- 25) Dr. Mutunda, Moniz P. IIA/Angola,
Avenida Deolinda, Rodriques KM 5, P.O. Box 2104, Luanda, Angola.
Tel: 244-2-399868;
E-mail: ia@ebonet.net
- 26) Mr. Mwale, Costa, IITA/SARRNET, Chitedze Res. Station ; P.O. Box 30258, Lilongwe 3, Malawi, Tel. 265-707014;
E-mail: sarnet@malawi.net
- 27) Mr. Mwangi, Joseph, IMPACT/USAID/RCSA, P.O. Box 2427,
Gaborone, Botswana, Tel. +267-373-969; E-mail: jmwangi@impact.info.bw
- 28) Dr. Mbwika, James M. EARRNET/IITA, P.O. Box 437, Uhuru Gardens, Nairobi, Kenya.
Tel: 254-2-892117; E-mail: jmbwika@insightkenya.com
- 29) Mr. Nxumalo, Michael H., Malkerns Research Station, P.O. Box 4 Malkerns, Swaziland. Tel: 268-5-283017;
E-mail: malkernsresearch@iafrica.sz
- 30) Dr. Ortiz, Rodomiro, IITA, PMB 5320, Oyo Road, Ibadan, Nigeria.
Tel: 234-2-2412626;
E-mail: r.ortiz@cgiar.org
- 31) Dr. Ospina, Bernardo P., CLAYUCA, P.O. Box 6713, Cali, Colombia
Tel:57-24-450157; E-mail: b.ospina@cgiar.org
- 32) Dr. Phiri, M. Alexander R., Bunda College of Agric., P.O Box 219, Lilongwe, Malawi; Tel 265-277441/277419;
E-mail: marphiri@hotmail.com
- 33) Dr. Robertson, A.I., Agri-Biotech (Pvt) Ltd, 44 Quorn Avenue, Mount Pleasant, Harare, Zimbabwe. Tel: 263-4-304600
E-mail: agbio@africaonline.co.zw
- 34) Dr. Rukuni, T., Development Technology Centre, Univ. of Zimbabwe, P.O. Box MP 167, Mout Pleasant, Harare, Zimbabwe. E-mail: rukuni@agric.uz.ac.zw
- 35) Dr. Simwambana, M.SC., Mutanda Research Station, P.O Box 110312, Solwezi; Zambia. Tel.260-08-821242/821230; E-mail: RTIP@zamnet.zm
- 36) Dr. Temba, Joseph, Africare Zambia, P.O Box 33921, Lusaka, Zambia. Tel; 260-01-264406/261981; E-mail: africare@coppernet.zm
- 37) Dr. Thompson, G.J., ARC-Roodeplaar VOPI, P/Bag X293, Pretoria 0001. South Africa. Tel. 27-12-8419617; E-mail: GTHOMPSON@VOPI.AGRIC.ZA

**List of participants in thematic groups for the 2002 SC meeting
in Pretoria - 29th April-3rd May 2002**

- 1 Marketing and enterprise development
DR. Peter Ewell, *Chairman*
Dr. Shaun Ferris
Dr. Bernardo Ospina
Mr. Antonio Fadel
Mr. Martin Schumacher
Dr. Joseph Temba
Dr. Alex Phiri
Pof. Faustin Lekule
Dr. J. Mbwika
Prof. T. Rukuni
- 2 Integrated Pest and Production Management - IPPM Group
Dr. James Legg, *Chairman*
Mrs. Kiddo Mtunda
Mr. Mike Nxumalo
Dr. Maria Andrade
Dr. Moses Simbambana
Dr. M. Mutunda
Dr. S. Lukombo
Dr. Rupert Best
Mr. Isac Bok
Mr. Wilson Sikonze
Mr. Sicco Kolijn
- 3 Biotechnology and Biosafety
Dr. G. Thompson, *Chairman*
Dr. A.I. Robertson
Prof. M.B. Kwapata
Dr. R. Ortiz
Mr. A. Mhone
- 4 Broad and specific germplasm development
Dr. A. Dixon, *Chairman*
Dr. N.M. Mahungu
Dr. R. Kapinga
Mrs. F. Chipungu
Dr. B. Khizah
Dr. M. Ajayi
Dr. V. Manyong
Mr. C. Cuambe
Dr. S. Laurie

List of members to SARRNET SC Meeting held in Pretoria,

29th April - 3rd May 2002.

16. Dr. G. Thompson - Chairman, NARS representative, gthompson@vopi.agric.za
17. Dr Joseph Temba - NGO representative, aficare@coppernet.zm
18. Prof. F. Lekule - University representative, lekule@suanet.ac.tz
19. Mrs. K. Mtunda - NARS representative, kmtunda@yahoo.com
20. Dr. Moses Simwambana - NARS representative, rtp@zamnet.zm
21. Prof. Moses Kwapata - University representative, MbKwapata@malawi.net
22. Dr. Peter Ewell, CIP representative, p.ewell@cgiar.org
23. Mr. J. M. Mwangi - USAID/IMPACT representative, jmwangi@impact.info.bw
24. Dr. Rodomiro Ortiz- IITA representative, r.ortiz@cgiar.org
25. Dr. A. I. Robertson - Private Sector representative, agbio@afircaonline.co.zw
26. Mr. Isaac Bok, NARS representative, ibok@gov.bw
27. Dr. Moniz P. Mutunda- member, iita@ebonet.net
28. Mr. Wilson Sikhonze,- Extension service representative, Hortcrops@africaonline.co
29. Dr. Nzola-Meso Mahungu - Secretary, sarnet@malawi.net

Absence with apologies

1. Jeff Salisbury

Annex 4: MINUTES OF THE 10TH SARRNET STEERING COMMITTEE MEETING HELD AT PAMODZI HOTEL, LUSAKA, ZAMBIA FRIDAY, 23RD MAY 2003

Introduction

The 10th SARRNET Steering Committee (SC) meeting was held at Pamodzi Hotel, Lusaka, Zambia on 23rd September 2003. 24 participants (Appendix 1) attended it. Dr. J. Temba, as SC Chairperson, called the meeting to order at 8.35 a.m.

In his opening remarks, Dr. Temba called on the participants to take leadership in translating the outputs of the just-ended scientific workshop into reality. He pointed out that although cassava and sweetpotato production has been promoted, the challenge now is on marketing of these crops if the farmer is to benefit.

1. Review of the agenda

The agenda for the meeting was as follows:

1. Matters arising from the previous SC minutes (Pretoria, May 2003)
2. No-Cost extension implementation
 - Funds up to September 2003
 - USAID/RCSA request on banana
 - Non concluded SARRNET small grants projects
 - Workshop publication
3. USAID/RCSA 2004-2010 action plan
 - IEHA priority countries for RCSA in SADC
 - Ordinary funds for FY 03
4. SARRNET future from October 03 Vs. Tanzania
5. IITA Regional Center for Southern Africa
6. SARRNET External Audit report
 - NARS contribution
 - Funds justification
7. ISTRC Arusha, November 2003
8. Term of existing SC members after September 03
9. Election of SC Chairperson May 03- Sept. 03 and onward to next SC meeting
10. Venue of next SC meeting if SARRNET continues
11. AOB

The agenda was adopted in its entirety.

2. Confirmation of the previous minutes

Apart from a spelling and a grammar correction made on item 3.2.1 (*Commissioned studies*) and on item 3.2.3 (*Private-Public Sector consortium*), respectively the minutes were confirmed to be a true reflection of what transpired at the Pretoria meeting.

3. Matters arising from the previous minutes

3.1. Presentation of minutes

As a way of improving on presentation, the Secretariat was advised to be separating the minutes of business meeting from that of general meeting.

3.2. Commissioned studies and small grants reports

Members were concerned that reports on commissioned and small grant studies had not been circulated to them despite the request made at the last year's SC meeting to have the reports circulated to SC members before subsequent meetings.

The SARRNET Coordinator pointed out that the idea was to have the grantees present their work at the scientific workshop and all of these reports have been presented. He also pointed out that it was very difficult to get the reports from the grantees and hence, appealed for assistance from the SC members in their various countries. The SC requested that full summaries of the reports, including financial reports

were needed and must be made available to the SC members by 15th July 2003. In addition these will be useful for the final report to the donor.

The reports should be prepared according to the guidelines to be provided. Dr. M. Kwapata of Bunda College was requested to develop the format and submit to the SARRNET Coordinator for distribution to the grantees and SC members. The format should cover, among other things, objectives, methodology, achievements, constraints and way forward.

The SC further suggested that better steps should be taken to ensure that grantees prepare reports and submit them as required. To this effect, an example was given whereby those who do not comply to this requirement (report writing) should not attend the scientific workshops.

3.3. Open Quarantine Facility (OPQ)

Open Quarantine (OPQ) can assist in movement of large quantities of planting material from one country to the other and assist in germplasm exchange in case of diseases/pests pandemic or disaster.

To set up an OPQ facility the existing Quarantine Unit in countries in question must be contacted and it is important to see to it that the existing phytosanitary regulations are followed. In addition, there should be free inspection by the quarantine officers. It is estimated that it may require US \$6,000-7000 to set up an OPQ facility in a country. As the concept note submitted to the defunct SACCAR did not yield positively, each country has been requested to initiate this with respective government like done by Tanzania in 2002 using SARRNET funds.

3.4. No Extra-cost Extension

The SARRNET Coordinator informed the house that the No-Extra Cost extension was approved in September 2002 and will go up to September 18, 2003.

3.5. National Coordinators for SARRNET activities

The SARRNET Coordinator informed the meeting that a request to sub-warrant US \$1,000 /year to Root Crops Coordinators for monitoring and coordination of root crops activities in respective countries was not approved by the Donor, USAID, as the Project (SARRNET Phase II) was already coming to an end. It was therefore suggested that in future, similar projects should have a line item on monitoring which National Coordinators should be using for national coordination.

3.6. Inclusion of other crops

After a long deliberation, SARRNET was given a go ahead to also work on banana. However, it was cautioned that this should not be at the expense of the main focus of the mandate of SARRNET, i.e. to work on cassava and sweetpotato. The inclusion of banana, a non-root crop (but a starchy food e.g. plantain in Malawi and Angola) in SARRNET has an implication on coverage and therefore the meaning of acronym SARRNET.

3.7. Termite issues

Termites have been observed to be one of the major regional challenges on cassava in the SADC countries. A sub-committee was set up to look at the termite problem in the region. The sub-committee chaired by Prof. Lema of D.R. Congo met a day earlier and the recommended the followings to the SC:

1. In the short term, funds allowing, a survey should be conducted on the termite problem. This should include a review of literature - what has been published.
2. Dr. Phiri of Malawi or Dr. Matafwila of Zambia should coordinate the work.
3. A probe should be made on why work on termites in SARRNET Phase I was not a success.

3.8. USAID TARGET program

The Coordinator informed the meeting that a proposal on TARGET program submitted in 2002 to USAID Washington through SACCAR was not successful probably due to limited funds (US \$3 million) pledged by the donor to all CG centers. The meeting proposed that the proposal be submitted to other donors such as IFAD, which is now interested in funding Networks.

Prof. Lekule was asked to send the SARRNET Coordinator a brochure on IFAD for him to put up a concept note to IITA who will in turn submit to the donor. Better still it was proposed that more information should be sought from IFAD before other steps can be taken on submission of the proposal

4. No-cost extension implementation

4.1. Funds up to September 2003

The SARRNET Coordinator reported that there is about US \$79,000.00 unspent and available up to September 2003. He proposed the following use of the funds: US \$25,000.00 on the SARRNET impact survey in Malawi and Tanzania, US \$15,000.00 on publication of the workshop proceedings, US \$5,000.00 for work in Zimbabwe (with the University) and US \$15,000.00 for the post-harvest (PH) project in Tanzania, leaving a balance of US \$19,000.00. After a lengthy discussion it was decided that the Coordinator circulate the current status of each grant and a sub-committee should advise on the use of these funds. This will avoid penalizing grants that have committed funds but not yet submitted expenses.

The SC recommended the Coordinator to revise downward the US \$25,000.00 earmarked for the impact survey in Malawi and Tanzania. But for the PH project in Tanzania, work in Zimbabwe and other projects would require a decision after knowing exactly the balances (after reworking the figures). A sub-committee comprising of the SC Chair, the SC Secretary, Prof. Kwapata and Mrs. Kiddo Mtunda for reallocation of funds once a clearer statement of accounts is circulated.

The Coordinator also emphasized on the importance of grantees justifying for the funds they have received. He pointed out that if they will not have justified for the funds received IITA will have to pay back the donor from its own funds.

4.2. USAID/RCSA request on banana

The SARRNET Coordinator informed the house that USAID has shown interest to support SARRNET for work on banana in Malawi and Angola and wanted to seek the view of the SC. Taking into account the endorsement made at the Pretoria SC meeting (May 2002) to include other crops, the Coordinator was given a go-ahead to include banana in SARRNET activities.

4.3. Non concluded SARRNET small grant projects

One non-performing small grant project ("Pilot project for processing biscuits" by Gabriel Ndunguru from Tanzania) was stopped. Tanzania had 13 small grants. Ten were funded. Two small grants on post harvest were not funded as they were awaiting CFC project. Tanzania requested to use the unused funds for rehabilitating the post harvest shed for farmers' training and purchasing post harvest equipment. The SC recommended that this be included as in point 4.1 above.

4.4. Workshop publications

Members asked for the workshop presentations (Power point) to be put on CDs and distributed to SC members and participants. This is important, as some members would use this information for teaching or share with other stakeholders for awareness on SARRNET activities.

The papers presented will peer-reviewed and published in the African Crop Science Journal. Those not accepted may be reported in a book of abstracts.

5.0. USAID/RCSA 2004-2010 action plan

5.1. Initiative to End Hunger in Africa (IEHA) priority countries for RCSA in SADC

IEHA priority countries for RCSA are Mozambique, Angola, Malawi, Zambia and South Africa (for commercialisation). It is expected that other countries will also benefit through spill over from the four countries.

5.2. Ordinary funds for FY 03

USAID fiscal year is October to September. USAID/RCSA has indicated that about US \$1 million may be resourced to share among 3 regional networks/projects as bridging funds for the period October 2003 to September 2004. Clear signals will be received by July 2003.

6.0. SARRNET future from October 2003 Vs. Tanzania

The Coordinator informed the SC that signals from RCSA indicate that Tanzania may be considered by USAID/REDSO rather USAID/RCSA. Tanzania belongs to both SADC (ex-SACCAR) and East Africa (ASARECA) communities. However, so far cassava and sweetpotato have been in SARRNET. The team leader for Tanzania was requested to contact the Director of Research in Tanzania on this issue and advise

SARRNET accordingly after he has consulted SADC-FANR and USAID/RCSA in relation to SARRNET activities.

7.0. IITA Regional Center for Southern Africa

IITA has regional offices in Benin, Cameroon and Uganda. There are plans to open a regional center for Southern Africa by the year 2004. IITA will contact member countries for offers on hosting the regional office. In choosing the site IITA will consider the cost of living in that country, access to international airports, contribution of the host country to the regional office, among others

8.0. SARRNET External Audit Report

SARRNET was audited by KMPG and the report was very positive. However few improvements are needed on the following points.

8.1. Funds justification

Non-justified funds by NARS were disallowed and billed to IITA. IITA has requested the Coordinator to ensure that all funds received by NARS and grantees from Phase 1, bilateral project in Malawi and Phase 2 be justified in time before the end of this Phase.

8.2. NARS and other stakeholders' contributions

Apart from South Africa and Tanzania the physical contribution from other countries was not well documented, as there were no reports. In SARRNET II project document, NARS and other stakeholders (IITA, CIP, NGOs etc) committed to contribute to the project budget in addition to USAID obligated money. SC members were thus urged to take this up with their member countries.

The SC members requested the Coordinator to furnish them with copies of the audit report in form of an executive summary as soon as possible.

9.0. ISTRC Arusha, November 2003

The SARRNET Coordinator was given authority to sponsor some accepted abstracts for the ISTRC workshop in Arusha, Tanzania, in November 2003 should funds be available by then.

10.0. Terms of existing SC members after September 2003

In SARRNET Phase II membership of the SC is supposed to rotate among stakeholders once every 2 years. But this is not clear from SARRNET Phase II project write-up as to who has the mandate to appoint new committee members. In addition, members felt that there was very little time remaining (less than 5 months) before the end of SARRNET Phase II. It was therefore decided that the composition of the present SC should be left intact until the next Phase when it should be tabled at a stakeholders' meeting.

11.0. Election of the 2003/04 SC Chairperson

After long deliberations, it was agreed that the current Chair, Dr. J Temba be retained as SARRNET SC Chair up to 30 September 2003 when the no-cost extension period comes to an end. Thereafter, he should continue as a caretaker committee until a stakeholders' meeting is held when the composition of the new SC will be determined and new office bearers elected.

Dr. Temba expressed his appreciation for giving him another term in office. He assured all members of his commitment and support towards achieving the goals of SARRNET.

11. Venue of the next SC/Stakeholders meeting

The next SARRNET Steering Committee/Stakeholders meeting will be held in Luanda, Angola. Dates for the meeting will be communicated to the participants later.

12. Any other business

Dr. G. Thompson appealed for improvement in communication among SARRNET SC members.

13. Closing

The meeting closed at 14.08 Hours. In his closing remarks the Chairman wished everybody a safe journey home.

List of participants

A) SC members

1. Mrs. Kiddo Mtunda (NARS - Tanzania), email: kmtunda@yahoo.com
2. Prof. Moses Kwapata (University – Malawi), email: mbkwapata@malawi.net
3. Dr. Graham Thompson (NARS – South Africa), email: GTHOMPSON@VOPI.AGRIC.ZA
4. Dr. Moses Simwambana (NARS – Zambia), email: rtip@zamnet.zm
5. Mr. Isaac Bok (NARS – Botswana), email: ibok@gov.bw
6. Dr. A. Ian Robertson (Private sector – Zimbabwe), email: agbio@mnet.co.zw
7. Dr. Moniz Mutunda (NARS – Angola), email: iaa@abonet.net; monitunda@hotmail.com
8. Dr. Alfred Dixon (IITA – Nigeria), email: A.Dixon@cgiar.org
9. Dr. Charles Crissman (CIP – Kenya), email: c.crissman@cgiar.org
10. Dr. Joseph Temba (NGO – Zambia), email: africare@coppernet.zm
12. Prof. Faustin Lekule (University – Tanzania), email: Lekule@suanet.ac.tz
13. Dr. Nzola-M. Mahungu (Secretariat – Malawi), email: N.Mahungu@cgiar.org

B) Non-SC members and observers to the SC meeting

Dr. Regina Kapinga (CIP – Uganda), email:

1. Dr. James Abaka Whyte (IITA – Uganda), email: J.Whyte@cgiar.org
2. Prof. Albert K. Lema (IITA – R.D. Congo), email: kmlema@hotmail.com
3. Mr. Adebayo Abass (IITA – Tanzania), email: a.abass@cgiar.org
4. Mr. Tata Hangy (NARS – R.D. Congo), email: Tatahangy@yahoo.fr
5. Mr. Martin Chiona (NARS – Zambia), email: mtas@zamnet.zm; mchiona@zamnet.zm
6. Mr. Mike Nxumalo (NARS – Swaziland), email:

C) SC members absent with apologies

1. Mr. Jeff Salisbury (Private sector – Malawi), email:
2. Dr. I. Kasele (NGO – Zimbabwe), email:
3. Dr. Gary Mullins/Mr. John Dorman (USAID/RCSA – Botswana), email:

D) SC member absent without apologies

1. Mr. Wilson Sikhondze (Extension – Swaziland), email:

Annex 5: Subcontract Agreement for the Execution of USAID/SADC/SARRNET Grant No. 690–G–00–99–00258–00 between the International Institute for Tropical Agriculture, IITA, and the International Center for Tropical Agriculture, CIAT

1.0. Introduction

The Southern African Root Research Network (SARRNET) seeks to increase income and improve the welfare of the rural poor by increasing small farmer cassava and sweet potato productivity through:

- The adoption of improved varieties and practices,
- The strengthening of national root crops research capabilities, and
- Commercialization to increase added value to the crops.

The subcontract agreement between the International Institute of Tropical Agriculture (IITA) and the International Center for Tropical Agriculture (CIAT) is to provide professional and other related services to meet the overall objective of SARRNET, described above. CIAT will provide these services through its own Rural Agroenterprises Development Project and through its membership of the Latin American Consortium for Cassava Research and Development (CLAYUCA). These services will contribute to achieving the specific objectives of the following four theme areas:

Theme I: Establish of a private–public consortium to support research and development of s
potato and cassava in at least one country.

Theme II: Detailed understanding of the subsector and marketing opportunities to increase awareness among stakeholders of potential opportunities for the crops in the region.

Theme III: Sustainable, appropriate processing technologies adopted by farmers and industrial processors.

Theme IV: Stakeholders trained in new skills to support the market driven strategy at regional level.

2.0. Report on activities undertaken in the subcontract agreement

Following the definition of a work plan for implementation of the IITA/CIAT subcontract agreement, CIAT and CLAYUCA personnel participated in various activities (Table 1). Based on the results obtained in these activities, a description is given in each of the four themes included in the work plan, with explanations about the activities implemented, the results achieved and some conclusions.

Table 1. Summary of major interventions of CIAT & CLAYUCA Consultancy Team. Period November 2000 to March 2003

Action / intervention	CLAYUCA/CIAT personnel involved	# of person-days	Countries visited
Facts finding and planning trip. 1-11 November 2000	Bernardo Ospina and Rupert Best	33	Nigeria, Uganda and Malawi
Contact with current and potential users of cassava and sweet potato in Tanzania, Malawi and Kenya. (February 17 to March 17, 2001).	Bernardo Ospina and Julian Buitrago	30	Tanzania, Malawi and Kenya
Training course in Agroenterprise Development. 2-11 May 2001.	Rupert Best and Carlos Ostertag	13	Uganda
SARRNET Steering Committee Meeting. 14-17 May 2001.	Rupert Best	6	Tanzania
Consultancy mission (October–November, 2001)	Bernardo Ospina	14	Tanzania, Malawi
Consultancy mission (October–November, 2001)	Julián Buitrago	14	Tanzania
Coordination of scientific exchange mission to Latin America	Bernardo Ospina	10	Colombia, Brazil
Information system translation	Jhon J. Hurtado and Rupert Best	4	
II Report preparation	Bernardo Ospina Rupert Best	5 2	
Participation in Steering Committee Meeting, Pretoria, South Africa	Rupert Best Bernardo Ospina	5 5	South Africa
Consultancy mission (April–May 2002)	Bernardo Ospina	15	South Africa, Tanzania, Malawi
Consultancy mission (May 2002)	Julian Buitrago	14	Tanzania, Malawi
Market study review	Rupert Best	7	
Consultancy mission ((March 2003)	Bernardo Ospina	12	Tanzania, Malawi
Final report preparation	Bernardo Ospina Rupert Best	8 3	
TOTAL		200	

3.0. Work plan: What was done? What was accomplished?

Introduction:

CIAT's leading role in cassava research and development in Latin America and the Caribbean region during the last 30 years, allowed the development of a methodology for linking farmers to growth markets, via new processing and product development technology. This methodology aims at coordinating changes in farming systems with changes in the marketing system, within the framework a multi-institutional, interdisciplinary research and development project. This methodology is better known as Integrated Cassava Research and Development Projects (ICRDP).

More recently, CIAT promoted among collaborating countries in the region, the establishment of a novel approach to garner resources and support required for sustaining a long-term research and development effort on cassava. This new mechanism was named CLAYUCA-The Latin American and

Caribbean Consortium to Support Cassava Research and Development. The establishment of CLAYUCA as a joint effort mechanism between public and private sectors was justified on the grounds that it allows countries to have more control on the agenda and the benefits obtained. Each sector contributes with its own capacities and strengths and the work is planned and conducted based on common interests and prioritized problems.

The decision to include CIAT's Rural Agroenterprise Development Project and CLAYUCA's expertise to provide consultancy services to IITA/SARRNET through the USAID/SADCS/SARRNET Grant No. 690-6-00-99-00258 was aimed at helping SARRNET to meet its overall objective of increasing income and improve the welfare of the rural poor by increasing small farmers cassava and sweet potato productivity. The consultancy services of CIAT and CLAYUCA were to be delivered according to a work plan divided in four main themes. The following section presents each theme, the activities conducted, the results obtained and the indicators that can be used to assess the achievement of the objectives.

3.1 Theme I. Establishment of a private-public consortium to support cassava research and development of sweet potato and cassava in at least one country

3.1.1 Expected result

Establishment of a private-public consortium to support cassava research and development of cassava and sweet potato, in at least one country.

3.1.2 Activities implemented:

- a. Cassava and sweet potato workshop (Malawi)
- b. Contacts with Malawian industries
- c. Contacts with Tanzanian industries
- d. Formulation of the Consortium framework
- e. Preparation of materials on root crop processing for business plans development
- f. Meeting for launching the Consortium, in at least one country
- g. Implementation, monitoring and evaluation

Theme I *Establish a private–public consortium to support research and development of cassava and sweet potato in at least one country (2001–2002)*

Activity and dates	Participants	Expected output	Indicator (s) for monitoring progress
Participation in cassava / sweet potato workshop (SARRNET/ ARPTU Bunda College) (Workshop was organized late May 2001)	SARRNET Malawi team	Potential partners identified First by–laws drafted Follow-up agenda defined SARRNET recognized as a ‘technology clearing house’ for cassava and sweet potato production and processing technologies	# Participants Draft document circulated Agenda of the workshop
2. Contacts with Malawian industries identified as having interest in using cassava/sweet potato products	SARRNET Team CIAT / CLAYUCA and local private and public partners	Specific interests identified Action plans developed Information on technology options delivered	Documents available with information about characteristics and needs of potential partners and action plans for proposed actions.
3. Contacts with Tanzanian industries identified as having interest in using cassava/sweet potato products	SARRNET Team CIAT/CLAYUCA and local private and public partners	– Specific interests identified – Action plans developed – Information on technology options delivered	Documents available with information about characteristics and needs of potential partners and action plans for proposed actions.
4. Formulation of the Consortium Framework for at least one country and define a tentative R&D agenda	SARRNET Team CIAT/CLAYUCA and local private and public partners	– Draft document circulated among potential stakeholders – Revised version of document available	Revised version of draft document available Document with first draft of TAFIC bylaws available

***Theme I. Establish a private–public consortium to support research and development of sweet potato and cassava in at least one country 2001–2002
(continuation)***

Activity and dates	Participants	Expected output	Indicator (s) for monitoring progress
5. Preparation of materials on root crop processing (catalogues, prices, layouts, information) for business plan development (On–going activity)	SARRNET CIAT/CLAYUCA	Technology options identified according to specific requests and interests expressed by potential partners Technology package available for cassava flour for animal feeding, starch and croquettes for human consumption, and silage	List of technologies available according to each potential option Documents available with specifications, prices, capacities, etc
6. Meeting for launching the Consortium, if needed, in at least one country	SARRNET Team CIAT/CLAYUCA and local private and public partners	At east one consortium established and operating	Official documents like Acts, by laws of the consortium, list of activities/ work plan.
7. Implementation, Monitoring and Evaluation (On–going, continuous process)	SARRNET Team CIAT/CLAYUCA	Feedback information on project results available Feedback information delivered to stakeholders Make information available through SARRNET Web page, ROOTS, to stakeholders including SC and partners	Progress reports, annual reports, SARRNET WebPages, ROOTS, special documents prepared.

3.1.3 Results achieved:

a. Cassava and sweet potato workshop in Malawi

The cassava/sweet potato workshop was realized in May 21-23, 2001. SARRNET gained recognition in Malawi as a “technology clearing house” for cassava and sweet potato production and processing technologies.

b. Contacts with Malawian industries

- A total of 14 industries, potential collaborators and clients of SARRNET were identified in Malawi, through direct visits and contacts. Detailed information on these industries was presented in previous reports submitted under the present agreement¹⁶
- This group includes private sector industries, NGOs, national institutions, projects and farmers
- SARRNET-Malawi has conducted during the last two years collaborative activities with some of these companies and institutions

c. Contacts with Tanzanian industries

- A total of 32 potential collaborators and clients for SARRNET were identified through direct visits and contacts¹
- This group includes private sector industries, national institutions and programs, NGOs and farmers
- SARRNET-Tanzania is currently conducting collaborative activities with some of these companies and groups

d. Formulation of the Consortium framework for at least one country and definition of a tentative R&D agenda.

- A draft of CLAYUCA’s bylaws was circulated among potential members of a Consortium type of mechanism in Tanzania and Malawi. Very little feedback was received from them.
- In Tanzania, a novel proposal was developed by SARRNET and FOODNET, to create an organization named TAFIC (Tanzanian Animal Feed Consortium)
- A draft of bylaws for TAFIC was written and circulated among potential members
- Two promotional meetings for TAFIC were held at SARRNET’s offices in Tanzania
- The idea of forming TAFIC in Tanzania was dropped due to lack of commitment among potential stakeholders
- Activities conducted by SARRNET in Tanzania and Malawi has led to the identification of few, yet committed private sector collaborators, who are currently engaged in collaborative activities. This group can be the basis for the organization of some type of Consortium in the future

e. Preparation of materials on root crop processing for business plans development.

- Various documents with information about different technologies and quotations for processing equipment were assembled and delivered to SARRNET personnel in Tanzania and Malawi. These information packages were delivered in the form of written documents, catalogues, electronic files (Word documents and power point presentations), and compact disks
- A document on the use of cassava in poultry nutrition, originally in Spanish, was translated into English and delivered to SARRNET as a printed document and also in electronic form (PDF format)
- A document on the use of cassava in dairy feeding, originally in Thai, was translated into English and delivered to SARRNET as a printed document and also in electronic form (PDF format)
- The first draft of the translation to English of the book “Uso de la Yuca en la Alimentacion Animal”, originally published in Spanish, was concluded in October 2003. The draft document was delivered to FOODNET, which has agreed to finance the next step of this work, a scientific editing.

¹⁶ See CLAYUCA, CIAT, SARRNET, IITA, CIP, 2001 and 2002. Report on the Subcontract Agreement for the execution of USAID/SADC/SARRNET Grant No. 690-G-00-99-00258-00 between the International Institute for Tropical Agriculture, IITA, and the International Center for Tropical Agriculture, CIAT. CIAT, Cali, Colombia.

f. Meeting for launching the Consortium, if needed, in at least one country.

- Two meetings were held in Tanzania to try to launch TAFIC as a Consortium-type mechanism
- A Consortium, as a formal mechanism, was not established in neither Tanzania nor Malawi during the duration of the present project

g. Implementation, monitoring and evaluation.

- Conducted as a continuous activity through periodic consultancy visits and permanent e-mail contact with SARRNET technical personnel in Tanzania and Malawi
- Two progress reports and one Final Report were produced during the duration of the project.

3.1.4. Conclusions:

- The formation of a Consortium type of mechanism through which public and private sectors are invited to work together in the definition and implementation of a cassava research and development agenda is not a goal that can be accomplished within a relatively short period of time
- Nonetheless, private sector industries, with genuine interest in the cassava crop, can be attracted and become reliable collaborators, when they are offered concrete technological solutions to the problems that they have prioritized (ex. improved seeds, processing equipments, new products and markets, technical assistance, training)
- The prevailing institutional landscape in Tanzania and Malawi is full of institutions, especially NGOs, that can become important partners in the implementation and dissemination of cassava-based research and development activities
- Activities conducted by SARRNET in Malawi and Tanzania during the last two years, using the linking farmers to market approach, have allowed the identification of an important group of private sector companies, public sector institutions, NGOs and farmer groups, with which collaborative activities have been initiated. The promising results that have started to emerge from these activities could be used as the basis to attract more commitment and support from public and private sectors for cassava research and development activities.

3.2. Theme II: Detailed understanding of the sub-sector and marketing opportunities to increase awareness among stakeholders of potential opportunities for the crops in the region.

3.2.1. Expected result

A detailed understanding of the sub-sector and marketing alternatives to increase awareness among stakeholders of potential opportunities for cassava and sweet potato in the region.

3.2.2. Activities implemented

- a) Collection of demand information for cassava and sweet potato through industry visits in Malawi and Tanzania
- b) Review of the draft and final country sub-sector market studies
- c) Participation in the synthesis workshop to summarise the findings of the market studies

3.2.3. Results achieved

a) Collection of demand information for cassava and sweet potato through industry visits in Malawi and Tanzania

During this phase of SARRNET, a concentrated effort was made to identify the actual and potential demand for cassava and sweet potato in three countries: Tanzania, Malawi and Zambia. This was undertaken in two ways: through an industrial market opportunity identification study, which formed part of the process for establishing public-private partnerships (addressed under Theme I), and through a formal sub-sector characterisation of cassava production, marketing and consumption study. The latter study concentrated almost exclusively on the production and marketing of fresh and processed cassava for rural and urban consumption.

Industrial market opportunity identification in Tanzania and Malawi

The assessment of the potential industrial demand for cassava in Malawi and Tanzania was achieved through primary data collection and backed-up by reference to published literature where this was available. Information was obtained through a systematic process of selecting and interviewing a sample of actual and potential users of cassava and sweet potato products. The methodology and information gathered has been presented in previous reports submitted under the present agreement¹⁷. The principal findings are summarised as follows. The execution of this data collection exercise was greatly facilitated by the participation of technical personnel from FOODNET and IITA – Uganda, with very good expertise and skills

Tanzania

A total of 32 industries were visited, corresponding to the following sectors: 9 animal feed millers, 16 food processors (biscuit, bakery and flour), 4 brewers, 2 non-food industries (chemicals and textiles) and 1 food inspection industry. The complete list is shown in Table 2.

Cassava flour for direct sale to consumers. Analysis of the information obtained showed that in the short term the market with the greatest potential for growth is high quality cassava flour for direct sale to consumers. This product is already on the market, and although the total volume of sales is presently low, informants manifested an increasing demand for a quality product. Cassava flour is preferred flour for some ethnic groups. At present, cassava flour retail price is US\$ 500/t, which compares favourably with a price of US\$ 300/t for maize flour. More detailed studies, specific to this product, will need to be undertaken to ascertain the likely total volume that could be demanded in this market.

Cassava flour for the food industry. Increasing supply of cassava flour for direct sale to consumers, through supermarkets and other outlets, could open up the opportunity of breaking into the food manufacturing industry (biscuit, bread and possibly others that use flour based products). Interest was shown by food processors, but presently there is insufficient production of high quality flour at a competitive price to meet their requirements. Wheat flour prices for industrial food use in Tanzania are now US\$ 220-260/t. Cassava flour would need to be priced below this to be able to compete. Since the wholesale price of high quality flour for direct sale to consumers is US\$ 400/t, and demand is increasing, there is no incentive at present for flour processors to sell to food manufacturers. As in the case of cassava flour for direct sale to consumers, a specific study will have to be undertaken to define more precisely the level of demand in the food industry. This has to be accompanied by collaboration with the industries themselves to ascertain optimum levels of cassava flour in their formulations. Increases in cassava productivity and more efficient processing will be required to improve competitiveness of flour production.

¹⁷ See CLAYUCA, CIAT, SARRNET, IITA, CIP, 2001 and 2002. Report on the Subcontract Agreement for the execution of USAID/SADC/SARRNET Grant No. 690-G-00-99-00258-00 between the International Institute for Tropical Agriculture, IITA, and the International Center for Tropical Agriculture, CIAT. CIAT, Cali, Colombia.

Theme II. Detailed understanding of the sub-sector and marketing opportunities to increase awareness among stakeholders of potential opportunities for the crops in the region.

Activity and dates	Participants	Expected output	Indicator (s) for monitoring progress
1. Review and analysis of information gathered through literature review to make a preliminary identification of market opportunities in Tanzania and Malawi.	SARRNET Team CIAT/CLAYUCA and local private and public partners	Potential market opportunities for each crop identified (done) Preliminary cost structure for each market opportunity elaborated for each country (pending, will be done on the results of the on-going field trials)	List of market options (available) List of cost structure for each option
2. Review and analysis of information gathered through surveys currently being implemented (quantitative data on characterization of market chain for cassava and sweet potato in Tanzania, Malawi and Zambia) (Pending activity)	Consultant teams (Phiri et al.) SARRNET Team CIAT/CLAYUCA CIP	Market chain for cassava flour and sweet potato characterized in Malawi Preliminary data on market chain for cassava products and sweet potato in Tanzania and Malawi available	Preliminary data available for Malawi Preliminary data available for Tanzania

Cassava flour for non-food industries. The contacts established in Tanzania with different industrial sectors interested in cassava and sweet potato included four brewery companies. Although a couple of them expressed interest in conducting trials with cassava flour, during the period covered under this agreement, no testing was conducted with them.

Table 2. List of companies visited in Tanzania.

<i>No</i>	<i>Company Name</i>	<i>Sector</i>
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

Cassava chips and flour for the dairy and poultry feed sector. Both the poultry and dairy sectors are growing as the demand for chicken and dairy products increases. This provides opportunities for dry cassava and sweet potato chips to replace partially maize in balanced feed formulations and direct feeding of silage (roots and leaves and vines) or dry products to dairy cattle. Present maize usage in animal feed manufacture (based on the industries visited) is estimated at 150,000 t/year. The current price of maize is US\$ 160/t (but can fall as low as USD\$ 90/t). This dramatic fall in price can be explained easily if we consider that the maize crop is a commodity highly subject to policy issues. Some years there is plenty of imported maize available, whereas in other years the imported volumes are lower and local prices tend to increase considerably.

Assuming an average 20% replacement of maize in the rations, there is a potential demand for 30,000 t of cassava chips. Pilot trials undertaken by the project have shown that cassava chips can be produced at US\$ 80/t chips, which is competitive although with a very narrow profit margin. Actions needed to capture this potential market demand include the dissemination of chipping and drying technology and further trials to optimise and correct deficiencies in the use of cassava and sweet potato in balanced feed rations. For dairy producers, a motorized combined chopper-chipper for leaves has been introduced but needs to be refined (built through SARRNET-Tanzania and a collaborating machinery producer), and feed trials using root and leaf silage and meal are showing promising results. This technology is appropriate for areas with a long dry season where the availability of forage is a limiting factor in milk production.

Cassava starch. There has been recent interest in the establishment of a cassava starch factory in Tanzania. This interest has come about due to the increasing demand worldwide for native and, in particular, modified starch. dTp Studies Inc.¹⁸ reports annual growth rates in demand of 4.2% for Asia, 3.4% for Latin America and 2.3% for Africa. East and Southern African countries import annually US\$ 3.2 million of glucose and dextrin, with Kenya spending 74% of this total. In particular, one industrial enterprise in Tanzania, Mohammed Enterprises Tanzania Limited (METL), one of the largest agro-production and processing companies in the country, has initiated a diversification program from sisal, based on cassava production on a commercial scale for starch processing. The current plan is to develop a cassava starch farm and factory using their own land facilities near Kibaha (50 km from Dar es Salaam). SARRNET has already initiated cassava varietal trials with them. Additionally, CLAYUCA helped to organize a trip to South Brazil for one of their staff to visit cassava starch equipment factories. The geographical location and edapho-climatic conditions along part of the Tanzanian coast could make this an ideal location for supplying starch and starch derived products to Asian and European markets, while also satisfying the demand of neighbouring countries.

Malawi

A total of 12 industries were visited, broken down in the following sectors: 3 animal feed millers, 2 dairy industries, 1 farmers' association, 2 food processors (biscuit and bakery), 1 brewer, and 3 non-food industries (plywood, packaging and textile). The complete list is shown in Table 3. In a complementary study, it was estimated that 14 industries are presently using 6,500 t of cassava flour and chips with a potential demand of 10,200 t per year¹⁹

¹⁸ DTp Studies Inc. 2000. Global Cassava Market Study: Business opportunities for the use of cassava. IFAD, FAO, CIAT, CIRAD, IITA, NRI.

¹⁹ Anon. A Comparative Analysis of the Marketing of Cassava and Sweet Potato in Southern Africa: The case of Malawi. Main Report (Draft). March 2003

Cassava flour for the food industry. One of the major biscuit manufacturers in Malawi (Universal Industries), is currently employing levels of around 20% cassava flour in their formulation. Use is hindered by poor quality product (colour and insect damage). It is estimated that potential demand by this industry is 500 t/year. The price of *makaka* (local name for dry cassava pieces) is US\$ 111-133/t, which compares favourably with the price of wheat flour. In the interviews conducted with Universal Industries in October 2001, they reported a price for cassava flour of US\$ 140/t, whereas the price for wheat flour was US\$ 440. The industry requires the use of sweet cassava varieties that compete for demand from the fresh market. This suggests that areas of production should be chosen far away from the major urban markets that are demanding fresh cassava. The introduction of improved chipping and drying technology has shown that chips of the desired quality can be produced at a competitive price (approximately US\$ 90-100/t), but cost estimates need to be further refined. An important advantage of the use of good quality chips instead of *makaka* chips is that usually these chips need to be scrapped before milling to improve their appearance and quality thus increasing the final cost. Pilot testing of this technology with farmers' groups is underway and will require continued support (technical, business and market development skills) to ensure that the groups are capable of sustaining the production of quality flour for industry. This experience will also provide a focal point for demonstrating and disseminating the technology to other parts of the country, where local demand for high quality flour may be identified.

Table 3. List of companies contacted in Malawi.

	<i>Company Name</i>	<i>Sector</i>	<i>Location</i>
1	Land O Lakes Inc.	Promotion of Dairy industry/feeds	Lilongwe
2	Press Bakeries	Bakery of loaf	Blantyre
3	Universal Industries	Biscuit Manufacture	Blantyre
4	Transglobe Produce Export, Ltd	Animal feed/commodity trader	Blantyre
5	Chibuku Breweries	Brewery	Blantyre
6	Packaging Industries Limited	Packaging materials	Blantyre
7	International Timbers Limited	Plywood	Blantyre
8	Rab Processors	Animal feed and blended flours producer	Limbe
9	Chitipi Farms	Farmer of root crops	Lilongwe
10	Central Region Milk Producers Association (CREMPA)	EU	Lilongwe
11	Meadows	Animal Feed Miller	Lilongwe
12	NASFAM	Farmer Association	Lilongwe

Cassava flour for non-food industries. Cassava flour has been successfully used in papermaking and plywood manufacture. However, the potential demand for cassava in these industries is very small, in the region of 100-200 t/year. One factory producing plywood (ITL) has stopped using wheat flour and is replacing it with cassava flour for the preparation of the glue. However, total demand is just 50 t per year. The economic impact is very significant considering that prices for wheat flour were around 32 kwachas per kg whereas the cassava flour could be purchased at around 15-20 kwachas per kg (prices of October, 2002).

Cassava chips and flour for the dairy and poultry feed sector. Maize availability for animal feed fluctuates widely in Malawi. During years of drought, maize prices soar and there is a critical need for identifying an alternative energy source. Cassava could become one of these alternatives. Substitution of maize in animal

feed would provide the opportunity to save, during good years, excess maize production that can be stored for human consumption in drought years. The present demand for animal feed concentrate in Malawi is estimated at 120,000 t/year²⁰. Considering a 20% substitution level of cassava for maize, this represents an estimated present demand for approximately 24,000 t of dry cassava chips. The present prices of makaka do not compete with maize prices (US\$ 120/t). In 2002, price of maize was as low as US\$ 90/t. Under these conditions, it is very unlikely that cassava chips can be produced at a competitive price to be used by the animal feed companies. Transglobe Produce and Export, an agricultural products exporter company in Malawi, tried to export cassava chips to South Africa in 2002. After a selling price had been agreed upon, (US\$ 90/t, FOB Blantyre), the deal was called off because of difficulties in purchasing the cassava chips. The company wanted the product delivered in town, transportation costs are excessively expensive in Malawi (5-6 kwachas /km/t), and the final price of the chips was too high to allow for export. In conclusion, this market for cassava will become a reality in Malawi, only if the maize prices become very high or cassava roots can be produced at a lower price. On the other hand, as reported in the case of Tanzania, the use of cassava and sweet potato in vertically integrated dairy production schemes is also looking extremely promising. The size of the demand in this sector has not been determined

Cassava starch. In 1997 the market size for non-food uses of starch was around 780 t/year²¹. This demand was met by importing maize starch at US\$ 650/t from Zimbabwe and South Africa. The sectors reporting the consumption of starch are the packaging industry, carton manufacture, dry cell manufacture, plywood and textiles. This volume of imports would not justify the establishment of a large-scale highly mechanised cassava extraction plant. In local circumstances, it might be worth contemplating a small-scale semi-mechanised and semi-continuous process supplying specific industries, similar to the enterprises contemplated for high quality cassava flour production (see above).

b) Review of the draft and final country sub-sector market studies

The draft country documents of the studies were received in April 2002 and these were reviewed and comments returned to the authors for incorporation of corrections. During the Steering Committee Meeting (Pretoria, 2002), some of the main messages of these studies were presented and discussed.

²⁰ Universal Industries, personal communication, 2002

²¹ Fabian, E. 1998. Cassava in the Malawi economy. Presented at the CFC workshop on local processing and vertical diversification of cassava in Southern and East Africa.

Sub-sector studies of cassava and sweet potato production, marketing and consumption

The sub-sector studies in each country were undertaken in three phases, which included a comprehensive literature review, qualitative assessments (pre-survey) and a quantitative study. These studies are written-up and consolidated in a report for each country. A Summary Synthesis Report²² brings together and compares the principal findings from each country. With the view of complementing the analysis already undertaken, and of providing a few additional objective comments, the following conclusions are drawn from the information that has been gathered.

Production

It was observed that trends in cassava and sweetpotato production are difficult to assess. Data provided by FAO data often contradicts local sources, anecdotal evidence and information generated by research studies. For example, in Tanzania, estimates for the area under cassava are similar, at around 550,000 to 750,000 ha but total production varies by three to fourfold between FAO data and national statistics (6.1 million t versus 1.5 million t). Crop cuts undertaken under the auspices of SARRNET have given three times the yield of cassava and sweetpotato compared to official statistics (Kolijn, personal communication). Care therefore needs to be taken in analyzing the information from any particular source.

In Zambia, the FAO figures, which are considered to be an underestimate, show that cassava area has increased by 50% over the period 1991-2001 and now totals 165,000 ha. Sweetpotato area, on the other hand, has reduced from 3,800 ha to 3,600 ha. The growth in cassava production has been in response to the deficit in maize production, which fell by 30% over the period, occasioned by the repeated droughts experienced in the country and a diversification policy adopted by the government. The combined share in area of millet, sorghum, cassava and sweetpotato increased from 21% in 1990/91 to 37% in 1990/00. Cassava production has expanded from the traditional growing area in the North to cover the entire country.

Similarly in Malawi, over a ten-year period, 1989/90 to 1999/00, recurrent droughts have also caused major declines of maize and rice, and dramatic increases of both cassava and sweetpotato. In 1997/98, total annual production of cassava was over 1.4 million t, rising from under 200,000 t in 1987/88. The equivalent figures for sweetpotato are over 800,000 t and under 200,000 t.

Overall, Tanzania has more favourable climatic conditions and, compared to Malawi and Zambia, is almost food self-sufficient. Maize production fluctuates according to the season but has maintained levels of between 2.3 and 2.7 million t over the period 1998 - 2001. Production of cassava (6 million t) has remained stagnant and sweetpotato (0.4 million t) has a slight upward tendency. Cassava production is concentrated in two major producing areas: the Lake Victoria region and the Southern Region of Ruvuma. However, there has been an increase in production of both cassava and sweetpotato in the Central and Northern coastal regions supplying the urban Dar es Salaam market. Conversely, there has been an observed decline in peri-urban production around Dar es Salaam, as the land is used for higher value crops, such as citrus, pineapples, coconut etc.

This information underlines the vital urban and rural food security role played by cassava and sweetpotato in situations of drought, as in the case of Zambia and Malawi.

²² SARRNET. 2003. A comparative analysis of the marketing of cassava and sweet potato in Southern Africa: The case of Malawi, Tanzania and Zambia.

Consumption and other forms of utilisation

Beyond this fundamental role of cassava and sweetpotato as a food security crop, the present studies confirm the importance of both cassava and sweetpotato in the diets of both rural and urban inhabitants in Tanzania, Malawi and Zambia, especially for lower income groups. Maize and rice are the preferred staples, but cassava and sweetpotato are important and appreciated secondary food sources that play an important role in the diet of rural and urban populations.

Cassava is consumed in both fresh and processed form, while sweetpotato is consumed exclusively in the fresh form. The processing of cassava into dried chips and flour is undertaken at the household level. Both fresh and dried products are prepared into different forms for consumption and consumed with a wide range of different foods at different times of the day. Cassava therefore is more versatile and is perceived as a food staple.

In Dar es Salaam, fresh cassava and sweetpotato are the preferred form of consumption, with cassava flour being of secondary importance as a food source. In Zambia, cassava chips and flour are the principal form of purchase of cassava in Lusaka and Kitwe, with an estimated 90% traded in this form. In Malawi, fresh cassava appears to be a growing form of consumption, especially in the urban areas.

In the case of cassava, there are only a few small-scale drying and milling enterprises in each country. There have been attempts at the industrialisation of cassava as a raw material for starch extraction and animal feed in Tanzania but these have not prospered, due to lack of raw material and low cost of alternative products.

Mechanised industrial processing of cassava and sweetpotato for food, feed or other purposes is non-existent in Tanzania, Malawi and Zambia.

Supply chains studied

The study examined in detail the following cassava and sweet potato supply chains.

In Tanzania:

1. For sweetpotato

- a. Fresh sweetpotato supply to Dar es Salaam from the coastal region.
- b. Fresh sweetpotato supply to Dar es Salaam from the central region.
- c. Fresh sweetpotato supply to district and regional capitals from central region
- d. Local supply of cassava and sweetpotato (from village to village) in the central region.

2. For cassava

- a. Fresh cassava supply to Dar es Salaam from the coastal region.
- b. Fresh cassava supply to Dar es Salaam from the central region.
- c. Fresh cassava supply to district and regional capitals from the central region
- d. Local supply of fresh cassava (from village to village) in the central region.

In Zambia:

- 1. For sweetpotato:**
 - a. Fresh sweetpotato supply to Kitwe (copper belt) from Solwezi
 - b. Fresh sweetpotato supply to Lusaka from Solwezi
 - c. Local supply of fresh sweetpotato in Solwezi
- 2. For dried cassava chips**
 - a. Dried cassava chips and flour supply to Kitwe (copper belt) from Mansa
 - b. Dried cassava chips and flour supply to Lusaka from Mansa
 - c. Local supply of cassava chips in Mansa

In Malawi:

- 1. For sweetpotato:**
 - a. Fresh sweetpotato from Zomba district to Zomba and Malosa/Namwera markets
 - b. Fresh sweetpotato from Mzimba district to Nkhata Bay, Mzuzu and Mzimba Boma markets
- 2. For cassava:**
 - a. Fresh cassava from Mulanje district to Blantyre markets
 - b. Fresh cassava from Dedza district, Chimbiya, to Kawale and Lilongwe markets
 - c. Fresh cassava from Nkhata Bay district to Mzuzu markets

The information was aggregated and presented in a way that it is difficult to establish the competitiveness of each of these chains, and compare between them. Should any future project seek to make interventions to improve the competitiveness of any of these supply chains, the data generated could be further analyzed and disaggregated by each specific set of actors in the chains of interest.

Market demand

Cities: Fresh cassava and sweetpotato. Traders both in Tanzania and Zambia reported no constraints to demand for fresh roots. Consumers only noted lack of availability of sweetpotato during certain times of the year. In Tanzania, farmers report increased sales of cassava and sweet potato in both producing regions studied. This suggests that the demand is increasing. In Malawi, a quantitative estimate of the daily volumes of fresh cassava and sweetpotato entering Lilongwe city was made in the 2000-2001 season. In excess of 40 t/day of cassava and 30 t/day of sweetpotato were recorded. A similar study undertaken in the following 2001-2002 season for cassava showed higher volumes that might suggest an increase in demand for the fresh product.

Cities: Dried chip and flour market in Kitwe (Copperbelt) and Lusaka. The number of traders of cassava chips and flour has increased, and farmers report increased sales over past 10 years. Traders reported increased volumes. This suggests that the demand for dried chips and flour is increasing. In Malawi, 89% of households reported processing cassava into some form or other, including dry chips or *makaka*. However, trade in dry cassava is mainly concentrated in the North and South of the country.

Intermediate towns. There is considerable trading of sweetpotato over short distances in the central region of Tanzania, indicating local demand by persons that do not grow the crop.

Export: Sweetpotato and cassava. The studies did not explicitly address export of sweetpotato and cassava. However, it is known that in the case of sweetpotato there is informal cross border trade, with regional trade opportunities from Zambia to Botswana, Namibia and the Democratic Republic of Congo. For cassava, there is informal cross border trade of chips to the Democratic Republic of Congo from Zambia

Consumer habits and preferences

Fresh sweetpotato. Sweetpotato is still predominantly a food of the low-income consumer group, but is appreciated by higher income earning groups. For example, sweetpotato is available in supermarkets in Dar es Salaam, where consumers prefer sweetpotato from the central region. Sweet potato from the coast tastes salty. The price of fresh sweetpotato is double or triple price of fresh cassava, with a marked seasonality, and larger price fluctuations than fresh cassava. Sweet potato is mainly consumed as breakfast replacing bread and other wheat-based products. It is considered less versatility compared with cassava, with limited processing and product/recipe applications. Additionally, in some stores of a supermarket chain recently opened in Malawi and Tanzania, it is common to find frozen sweet potato slices, coming from South Africa.

Fresh cassava. Cassava is also still predominantly a food of the low-income consumer group and is the cheapest carbohydrate source available. It is versatile, with wide variety of different forms of preparation, being used both as a staple, complementing *ugali*, rice etc, and as delicacy for certain traditional festivals (e.g. Ramadan). In Dar es Salaam, it is increasingly being sold by food vendors/hawkers on the street as a snack roasted, along with roasted green maize.

Dried cassava chips and flour. Mining industry workers in the Zambian copper belt come from cassava producing areas, where they are accustomed to using dry cassava chips as the basis of food preparation. High maize prices in Zambia have meant a shift from the use of maize to dry cassava in the production of *nzima*. This also occurs in Malawi in years when there is a shortage of maize. In Zambia there has been growth in the use of dry chips as a snack sold roasted by street vendors in the copper belt, accompanied by groundnuts.

Trading and transport

There has been a substantial increase in the small trader class as a livelihood activity, and supply chains from farmers to consumers in cities involve between 3 to 8 actors. Grading of fresh sweetpotato and cassava is an important value adding activity undertaken by traders. In general farmers do not grade before sale, except in certain cases in Zambia. The major price factors in all countries are the size of roots and volume. Neither fresh sweetpotato nor cassava are bought or sold by weight at any point along the supply chain. Traders of fresh produce buy the crop in field, organize harvesting, bagging and transportation to the markets (e.g. Tanzania). Transport by road is the only means of transferring the produce from rural to urban areas, and transport costs are the highest proportion of all off-farm costs.

Supply of cassava and sweetpotato

In general, area under cassava and sweetpotato is less than 2 ha per farmer. In Tanzania, fresh cassava and sweetpotato farmers produce for both home consumption and sale. Amongst sweetpotato farmers there are a number that are more commercially oriented, employing commercial practices (mono-cropping, single varieties, seed beds etc.). In all countries, the market orientation of farmers is greater the closer they are to major roads and urban centers. The implication of this is that building roads will improve farmer access to markets.

In Zambia, cassava farmers have accommodated their production practices to produce all the year round. However in all countries, sweetpotato production is seasonal. The studies showed that farmers are producing those varieties most preferred by traders and consumers.

There is no use of purchased inputs, except in very selected cases and by those more commercially oriented farmers (mostly planting material: e.g. sweetpotato vines). Farmers sell their produce in the ground, harvesting is undertaken by the traders that purchase the crop. The price is estimated by field inspection by the trader and based on plant age, variety, health status, etc. The studies could not detect any influence on production practices and relative access to market (except those cases mentioned above).

Sweetpotato has moved from being a largely on-farm home consumption crop to a commercial crop, and as a consequence men have become more involved in production and trade. Beforehand, sweetpotato production was principally the domain of women.

As expected, farm gate prices are higher closer to urban markets. This would preclude the processing of these crops close to urban centers, but provides an opportunity for those areas distant from urban centers with poor market access. In all countries, less than 10% of farmers participate in associations and their access to technical assistance is poor.

c) Participation in the synthesis workshop to summarise the findings of the market studies

A mini workshop was held in Nairobi in November 2002 to finalize the studies and prepare synthesis documents that pulled together information from the comprehensive literature review, qualitative pre-survey assessments and the quantitative sub sector study.

Overall conclusions

1. The studies generated an immense amount of information. The summary document, although it is comprehensive and covers the main components on which information was gathered, is not easy to digest. It could have been more illustrative if it had made greater use of tables and figures to compare information across countries. An example is the comparison of market prices and production cost. In this regard, it was unfortunate that at the meeting held in Nairobi in November 2002, to bring all the information together, the study leader was unable to attend. In retrospect, more time could have been set aside for analyzing the data once it had been tabulated. What this means is that significant further analysis could be undertaken on the data gathered, which could be useful for any further study of sweetpotato or cassava in the respective countries. It would be hoped that the basic data could be made available, should other researchers require it.
2. In all three countries, cassava as a human food (fresh in the case of Tanzania and Malawi, and dry cassava chips and flour in the case of Tanzania) is the predominant market. Demand in the food and feed industries is starting from a low, and almost insignificant, base but appears to have growth potential.
3. The questions that the stakeholders in SARRNET will need to address are:
 - a. Cassava and sweetpotato are critical for food security in Malawi and Zambia, and to a lesser extent in Tanzania where its food security importance is more regional. The governments of these countries should (and probably do) appreciate the strategic importance of these crops and maintain an appropriate R&D investment to ensure that farmers have access to the most appropriate genetic materials, especially those that are tolerant to drought and to diseases, and maintain high levels of farmer and consumer acceptance characteristics. Given the household food security role of cassava and sweet potato, health related characteristics, such as vitamin A rich varieties, could be important but will require appropriate participatory and promotion mechanisms to increase the probability of adoption by farmers.
 - b. Tanzania, because of its strategic location and appropriate edaphoclimatic conditions, could become an exporter of cassava starch to Asia, Europe and within Africa. The private sector has already observed this opportunity and the government could provide supportive policies to encourage potential investors.

- c. The rapid rate of urbanization in all three countries is likely to increase the demand for fresh cassava and sweetpotato. Germplasm improvement programs will need to be proactive in selecting materials that are appropriate for the fresh market. The studies have provided a good indication of the quality requirements sought after by consumers. It would be advisable that improvement programs incorporate regular consumer testing of new materials in their activities, if they have not already done so.
- d. Should the economies of the three countries grow over the next decade, the incomes of urban inhabitants will increase and the demand for cassava and sweetpotato in their present forms will change. Further research should be carried out to determine the preferences of different socio-economic groups for different product forms (many of which could be copied or adapted from other countries). This information would guide new product development activities where national food technology institutes and universities can enter into partnerships with local food and non-food processing industries.
- e. Urbanization and income growth will also increase the demand for cassava and sweetpotato in the food, feed and non-food industries. The most important of these is likely to be the feed industry where both cassava and sweet potato could find important niches. The production regions, and hence the agronomic and quality characteristics of the germplasm required, will be very different from those for the fresh market. Cassava and sweetpotato R&D programs would do well to organize themselves so as to be precise in their research for these different markets and different production zones in each country.
- f. The market for fresh and processed cassava and sweetpotato is fragmented, with the involvement of many middlemen and traders. There are no grades and standards. Products are sold by volume and not by weight. Information flow between retailers, wholesalers, middlemen and producers is informal. This situation is common to many commodities and changes will require actions that go beyond the scope of SARRNET. However, in locations that have a competitive advantage for producing high quality cassava or sweetpotato for the urban market, pilot projects to better organize farmers to meet the demands of purchasers, and to more formally link them to urban wholesalers, with a view to improving the competitiveness and an equitable distribution of the benefits of the supply chain, would generate useful experiences that if successful could be replicated in other regions or countries. Up to now, SARRNET has not explicitly included farmer organisation for enterprise development in its R&D agenda. If it were to recognise this as important, additional and complementary skills to its existing core staff would be required.
- g. The private sector has shown an interest in cassava and sweetpotato and their derived products as a raw material for a range of products. The fostering of this interest will require continued input in terms of providing technical and economic information on production, processing and the physiochemical and functional properties of cassava products for different end uses. Post-harvest processing, product development and marketing components are ideally suited to a regional approach, where the competency and capacity of appropriate national institutions or organisations (those best equipped to provide research and technical assistance services) can be enhanced to play a catalysing and convening role between the private manufacturing sector, the public R&D sectors and cassava and sweetpotato farmers.

Theme III. Sustainable and appropriate processing technologies adapted and adopted by farmers and industrial processors

3.3.1 Introduction

The work plan designed to accomplish this objective was based on the assumption that: a) a methodological approach, the Integrated Cassava Research and Development Project (ICRDP), was available to be tested and adapted in Tanzania and Malawi, and b) the CLAYUCA approach, as a complementary strategy, was also available. In both approaches, the concept of linking farmers to markets is a key component. The methodology also includes technological and methodological interventions. The technological intervention is based on the transfer of an existing processing technology that is further refined and adapted with farmers' participation.

The organizational intervention implies for actors, especially farmer groups, the introduction of changes in their current practices. For example, instead of selling the cassava roots individually to local traders, usually at very low prices, they could establish an alternative commercialization system in which the cassava roots are sold to a processing plant, located within their village, built and owned by them. The roots are processed to transform them into dry cassava chips that are sold to urban markets, or better prices. Private sector markets use this high quality chips to produce cassava flour for human consumption.

3.3.2 Expected result:

Appropriate technologies for cassava production, processing and utilization, adapted and adopted by cassava farmers and industrial; processors in Tanzania and Malawi.

3.3.3. Activities implemented:

- a. Animal feed trials in Tanzania and Malawi
- b. Establishment of at least one pilot project using the integrated product development approach in at least one country
- c. Translation to English of the book "Uso de la Yuca en la Alimentacion Animal" and formatting for web publication
- d. Dissemination of relevant information on cassava postharvest technologies
- e. Translation to English of cassava information system

3.3.4. Results achieved:

a. Animal feed trials in Tanzania and Malawi

a.1. Tanzania

The approach followed by SARRNET team in Tanzania, to try to attract more interest by the private sector on the use of cassava as one of the ingredients in the preparation of animal feed compounds, was to establish feed trials, so that reliable data could be generated with which a sound analysis could be made about costs, efficiencies, constraints and other important factors.

The strategy was to present real cases based on data obtained locally, as a motivating factor to try to promote the use of cassava in animal feeding. Initially, two small-scale experiments were conducted in poultry farms near Dar es Salaam with the main objectives of getting SARRNET staff familiarized with the use of the software used for formulation of the feed as well as to gain some practical experience on the conduction of biological experiments. The lay

out for two experiments, one for broilers and one for layers was described previously²³. The initial idea was to evaluate the effect of a partial replacement of the maize with cassava flour levels of 25 and 50%. Performance of the animals was measured against two commercial diets. The scale of the experiment was small (150 animals) and the conditions were not ideal. Despite these difficulties, some initial data was obtained (Figure 1).

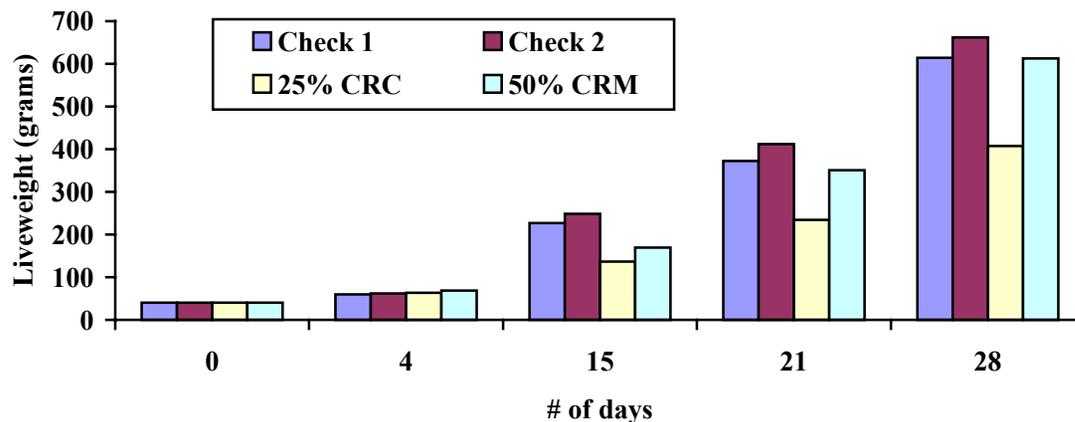


Figure 1. Performance of broilers fed with cassava, Tanzania, 2002

These results were looking promising during the initial stages, considering the high levels of cassava root meal used. Later on, as the experiment proceeded, some mortality, severe in some cases, occurred. This mortality was caused by *Salmonella typhimurium* that contaminated the fishmeal used. Apparently, the infestation of the fishmeal occurred during the drying process. These microorganisms produce diarrhea, poor performance and death. Drying at high temperatures will destroy the microorganisms. Inclusion of another source of protein (soybean meal) is another solution. Unfortunately, in Tanzania some of these options are difficult to implement at the present moment. Additionally, at the time these experiments were conducted in Tanzania, maize prices were very low so that the inclusion of cassava flour in poultry diets was not a financially viable option.

Based on these preliminary results, a more scientific work was planned taking advantage of the presence in Tanzania of the student Debby de Groot from Wageningen University, Holland. The student conducted this work to fulfill her thesis requirements for a degree on Tropical Animal Husbandry. A summary of this work is presented in next section.

²³ CLAYUCA, CIAT, SARRNET, IITA, CIP. 2002. Subcontract Agreement for the execution of USAID/SADC/SARRNET Grant No. 690-G-00-99-00258-00 between the International Institute for Tropical Agriculture, IITA, and the International Center for Tropical Agriculture, CIAT. CIAT, Cali, Colombia. Second report. Period June 2001 to May 2002

Theme III. Sustainable and appropriate processing technologies adopted by farmers and industrial processors.

Activity and dates	Participants	Expected output	Indicator (s) for monitoring progress
a. Undertake feed formulation and industrial trials with private sector partners on the use of sweet potato and cassava in animal feeds with emphasis on poultry and cattle in Malawi and Tanzania.	SARRNET Team CIAT/CLAYUCA and local private & public partners	Animal feed trial using cassava (initiated) Economic analysis of results elaborated (pending)	Biological data available Technical data available Economic data available
b. Establishment of at least one pilot plant project using the integrated product development approach in at least one country	SARRNET Team CIAT/CLAYUCA and local private & public partners	One pilot project in operation in Malawi One pilot project in operation in Tanzania	Pilot project operating Farmer's group working under the pilot project concept. Volumes processed
c. Participation in process of translation of the book "The use of cassava in animal feeding" into English and formatting for web publication ²⁴	B Ospina J. Buitrago	Book on "Use of cassava in animal feeding" translated into English and available for web publishing	Book available on the Web for stakeholders
d. Participation in translation of relevant cassava post harvest handling and processing technology information into English. ²⁵	B Ospina R. Best J. Buitrago SARRNET team	Information system available in English in various electronic and hardcopy documents	* List of publications and documents available at SARRNET Offices in the form of Web Page publications, CDs, Video, Power Point presentation, * Paper documents. * Finish translation of document "Cassava in poultry feeding" (May, 2002) Finish translation to English of document in Thai language on "Use of Cassava in Dairy Feeding"
e. Participation in translation of cassava post-harvest handling and processing technology information system into English. ²⁶	R. Best B.Ospina	Information system translated into English and formatted for web publishing	Information system available in web page of SARRNET

²⁴ This activity is financed by FOODNET

²⁵ Some documents have already been made available at SARRNET offices

²⁶ Some documents have already been made available at SARRNET offices

Feasibility study on the use of cassava in animal feed in Tanzania, with special emphasis on poultry feed – A summarized report²⁷

Overall objective

The overall objective of this study was to evaluate the feasibility of the use of cassava as an alternative animal ingredient to maize in balanced feeds in Tanzania. Due to the dominant role of the use of animal feed for poultry production in Tanzania, the work emphasized broilers and layers. Feeds based on a combination of cassava and soybeans, as an alternative ingredient to fishmeal, were also evaluated.

Specific objectives:

1. To analyze and document the root and leaves production/utilization/system for different products/end users (costing, yields, quality, labor implications)
2. To evaluate the performance of broilers and layers, fed with alternative feeds prepared with cassava products, using feed formulation software.
3. To analyze the acceptance of farmers and feed millers of cassava as animal feed
4. To make recommendations for future research and development activities for poultry and dairy sectors in Tanzania

Feed trials

Data on the current animal feed practices in Tanzania was obtained through review of the literature available and a specific survey designed to obtain information from key stakeholders in the animal feed and livestock sector. A total of 11 different companies were interviewed including feed millers (4), poultry farmers (4), and dairy farmers (3). Table 4 presents a synthesis of the information given by key stakeholders interviewed. Information obtained was used as an input for the formulation of the experiments.

Two experiments were conducted: one with broilers and one with layers. The experiments were limited to the poultry sector because of the low investment and maintenance costs. The following section presents the discussion of the results obtained and some preliminary conclusions.

Discussion

As mentioned before, the survey with poultry sector stakeholders was conducted with the objective of helping to identify opportunities and bottlenecks for a wider use of cassava in the animal feed sector in Tanzania. Even before conducting the interviews, SARRNET had assumed that one important success factor of cassava, as an alternative feed ingredient was its reputation in the animal feed sector. Therefore, the feed trials in this study were not only conducted to obtain information on its nutritional value, which has been demonstrated in numerous previous trials, but also to demonstrate the potential of cassava to the animal feed sector (farmers, feedmillers, consumers of animal products)

²⁷ De Groot, Debby. Thesis work Tropical Animal Husbandry. 790407-284-030, Wageningen University, Holland, 2003. Draft document. SARRNET. Tanzania. 2003

Table 4. Opinions of feedmillers and poultry farmers in Tanzania – A survey.

Question Topic	Answers given by informants
Animal feed problems	<ul style="list-style-type: none"> ▪ Low quality or raw materials makes animal feed unable to reach nutritional values indicated in the feed formula ▪ Cheating of the suppliers on the quality of raw materials ▪ Fish meal is especially subjected to this problem, water and sand are added to increase its weight ▪ Fluctuating prices of raw materials ▪ Prices of feed is maintained the same for fear of losing clients ▪ Animal producers also complain about fluctuating prices of raw materials ▪ Shortages of water is a problem during the dry season
Feed formulation	<ul style="list-style-type: none"> ▪ Some feedmillers employ a nutritionist ▪ Other feedmillers rely on expertise within the family ▪ Top commercial firm has access to the advice of a scientist from Nairobi ▪ Poultry farmers usually purchase their feed from a nearby feed miller and have little knowledge of its composition ▪ Poultry farmers are more concerned about nutritional value of the feed than the price of the feed, providing that there is a certain profit ▪ According to feedmillers, poultry farmers will not be concerned if maize is replaced by cassava, especially if it is cheaper
Objections against cassava in animal feed	<ul style="list-style-type: none"> ▪ Feedmillers are afraid of a decrease in feed quality and low availability of cassava in Dar es Salaam ▪ High cost investment, for example the purchase of a cassava roots chipper ▪ Some feedmillers find cassava root meal (CRM) too dusty and would need it pelletised to be able to include it in the animal feed. A pelletizer will be required and most feedmillers are not willing to invest in machinery ▪ One of the feedmillers did use cassava root meal for a period of six months in broiler and pig feed (60% CRM and 10% maize). Broiler performance was the same and pig performance increased greatly. According to the feedmiler, the inclusion of zinc Bartheracine as a growth promoter was the key for the success of the cassava-based diet. Experience was terminated due to shortage of CRM.

Table 4. Opinions of feedmillers and poultry farmers in Tanzania – A survey (Continuation)

Question Topic	Answers given by informants
Objections against cassava in animal feed (Continuation)	<ul style="list-style-type: none"> ▪ Diseases such as brown streak and cassava mosaic and difficulties with the drying process make feedmillers afraid of using CRM ▪ Planting cassava is too laborious ▪ Feedmillers are demanding that cassava should be chipped and preferably, pelletised; cassava farmers will not be able to make any investment. ▪ Farmers need credit and support to create associations ▪ Main reason for not producing cassava chips is that fresh cassava prices are good and much more profitable, especially if the farms are located near Dar es Salaam ▪ Due to high prices of fresh cassava in Dar es Salaam, poultry farmers use maize bran, which is cheaper. ▪ Some poultry farmers consider cassava roots as an inferior product and will need to see evidence of the contrary before they consider a change in their feed formulas
Opinion about cassava	<ul style="list-style-type: none"> ▪ Cassava leaves have a better reputation than cassava roots ▪ Many dairy farmers use cassava leaves as a replacement for grass ▪ Harvesting cassava leaves is easier and cheaper ▪ Quality of cassava leaves is also considered better, the reason being that employees only cut the tall, older grass and ignore the younger grass because it is more difficult to be harvested and consumes more time ▪ Feedmillers and dairy farmers that used cassava observed an increase in animal performance and cost savings. ▪ Farmers grow cassava because they find it more resistant to irregular rainfall than maize
Alternative feed ingredients	<ul style="list-style-type: none"> ▪ Maize bran is the favorite due to cheap price and good quality ▪ Broken wheat is also used ▪ Sometimes feedmillers use wheat that is no longer useful for human consumption ▪ Due to fluctuating prices of fishmeal, sometimes feedmillers use alternatives such as meat ▪ Feedmillers would prefer to use soybean it is too expensive and not always available. Soybeans need to be imported from India or Brazil and it means higher prices (taxes)
Conditions feedmillers want to see fulfilled before using cassava	<ul style="list-style-type: none"> ▪ Low cost price ▪ Similar or higher feed quality ▪ Good public opinion ▪ Availability ▪ A laboratory test or any other proof of the nutritional value of the cassava formula ▪ A successful feed trial ▪ Cassava roots provided as chips or pellets
Advice/support needed from SARRNET	<ul style="list-style-type: none"> ▪ Technology for drying cassava leaves ▪ Most poultry farmers and feedmillers requested a new, superior feed formula, based on raw material available in Dar es Salaam ▪ Supervision or some control on quality of raw material supply

Adoption-potential for cassava in the animal feed sector in Tanzania

- During the interviews with feedmillers it was mentioned that the cheating with raw materials, by its suppliers, inhibited them to reach the nutritional value indicated by their feed formula. They suggested supervision or quality control on the supplies of raw material in order to be sure of its nutritional value. In the case of cassava, the leaf quality varies greatly with the age at harvesting (HCN), harvesting techniques (leaf-stem ratio / digestibility) and processing techniques (HCN, storage-ability, palatability). Cheating by suppliers with bad quality cassava, low in nutrients and rich in tannins, could seriously damage its reputation. For this reason, its production must be supervised or the final ingredient must be tested and classified into a quality-category before being supplied to the feedmillers.
- Most of the (small-scale, low productivity) feedmillers rely on their own and their families' experiences in feed formulation and do not use a nutritionist or a computer. Usually those feedmillers prefer to stick by their traditional formula and are not very perceptive to the idea of using cassava as an alternative ingredient. They could be influenced, however, by a good reputation of cassava amongst other successful, feedmillers. It seems logical to convince the small group of perceptive, top market-oriented animal feedmillers, to experiment with cassava. Feedmillers could be convinced when the potential profit gain wins from the potential risk. The potential profit gain could be demonstrated with ongoing broiler and layer trials. When the results of feedmillers, who adopt cassava based feeds are good, its reputation will increase, and other feedmillers might be tempted to follow the example.
- Most of the broiler and layer farmers, who utilise up to 80% of the domestic commercial feed produced, purchase their animal feed from feedmillers without knowing its (precise) nutritional content. Assuming that broiler performance will not drop as a result and gain a bad reputation, the cassava-based animal feed will have an immediate market once it is accepted and produced by the feedmillers.
- Dairy and pig farmers usually make their own feed formulation, purchase/grow their own ingredients and mix their own feed. Spreading the reputation of cassava as a potential alternative animal feed ingredient to maize might be more time consuming for this group. Dairy and pig farmers appeared to be less willing to experiment with their feed formulation than the feedmillers, and could need more decision-time before adopting cassava
- Some feedmillers find the cassava-based feed too dusty and insist that it needs to be pelletized before using it in their animal feed. In order to make cassava root chips and to pelletize the cassava based animal feed a chipper and pelletizer are required. Feedmillers are not willing to invest in new machinery and sharing a pelletizer or chipper within a group of feedmillers could prove problematic due to transport costs of the feed and communication difficulties on topics such as time schedules and maintenance.
- An alternative could be to provide the feedmillers and/or farmers with the possibility to hire their personal chipper and/or pelletizer. They would have the machinery on their own domain, eliminating extra transport costs or delay in production. The disadvantage of this solution is that the production costs of cassava diets would increase with the rent costs of machinery. This means that when the rent is high, producing cassava diets will only be possible for highly productive feedmills. The fixed costs of the machinery can then be divided over mass production.
- Another problem is the unavailability of cassava for animal feed. In and around Dar es Salaam and other medium to large towns, cassava is produced mainly for human consumption. The price of fresh cassava is around 90 TSh. Further away from towns and markets cassava is available for a much lower price, which can be as low as 15 TSh. Most of the relatively high productive feedmillers in Dar es Salaam own their own vehicle(s) for the transport of feed (ingredients). When this group of feedmillers will make an agreement with

cassava farmers, who are too far away from markets to sell their fresh cassava for human consumption, they will be able to produce cassava based diets against much lower production costs.

- Aside from having cassava available to them, feedmillers could sell their excess cassava to the smaller feedmillers and animal farmers, against a small profit but still below the price of fresh cassava. The planting and harvesting of cassava is laborious and animal farmers will need to employ more people, usually men due to tough workload, to look after this task. High labour costs and a relatively low price for cassava could be a reason for animal farmers to buy their cassava from elsewhere, instead of growing cassava themselves. In this scenario, feedmillers and farmers will have access to cheap cassava, and cassava farmers in rural areas away from towns will have new income.
- The cassava farmers who are targeted to become the supplier to feedmillers in Dar es Salaam, should be informed of improved planting and harvesting strategies in order to ensure a uniform quality of leaves and roots amongst all cassava farms.
- The amount of labour needed to run a feedmill will not change with the introduction of cassava. The labour necessary for weighing and mixing does not differ amongst ingredients. However, extra labour is needed to pelletize the cassava-based diets. Feedmillers do not see this as a relevant problem. Gender division will not change. If new employees are needed they will be male due to the heavy work of carrying feed to and from the pelletizer.
- Some dairy farmers are already using cassava leaves as a substitute for grass. Harvesting the leaves is far less laborious and the quality is better. Meetings should be arranged, joining dairy farmers who are using cassava and those who are not. This way, the good reputation of cassava leaves will be spread. Scientists with knowledge on growing cassava, harvesting cassava and positive effects of cassava leaves on dairy performance should attend those meetings, possibly with results of a demonstration trial, in order to help the 'newcomers' with getting started and the others with optimising their dairy performance/production costs. During the meetings, the use of cassava roots could be introduced. Cassava root chips can be used as an energy source in lactating dairy cow diets at very high levels
- One feedmiller in Dar es Salaam tested a cassava based diet, by replacing 60% of the maize with cassava root chips, on his own pig farm and was pleased to see a significant increase in pig performance. Meetings such as described above should for this reason also be organised amongst pig farmers. They might prove less effective than the meetings amongst dairy farmers, due to the fact that there is usually less attention being paid to the pig-diet. Pigs are not difficult eaters, and they are usually kept on the side. During the interviews it came forward that the children kept pigs, while the parents controlled the dairy and/or poultry section.
- Aside from cassava, there are other possible alternatives to maize that are currently being used by animal farmers and feedmillers when the fluctuating maize price rises too high. Those ingredients, such as maize bran, wheat and rice, are readily available in Tanzania for relatively low prices. It could be interesting to see in a different study if an alternative feed formula can be found, using readily available ingredients, which is cheaper and has an equal or better nutritional value, resulting in an equal or better animal performance against lower feeding costs.

Comparison of cassava and maize for broiler feed manufacturing

A broiler trial was conducted in order to compare cassava products with the existing feed ingredients for feed manufacturing. As mentioned earlier, the broilers were kept in groups of (initially) 30 broilers each per treatment for two different locations. The results from the statistical analysis were most likely biased due to location and group interaction. This is one of the reasons that the experimental design was unsuitable

for statistical analysis. Another reason is that there was no data available per independent broiler groups. Instead, the mean per week was taken for the whole treatment group. This meant that there were only 12 trials (2 locations* 6 weeks) per treatment group, which explains the very high standard deviation. In other words, the results from the multivariate analysis are not reliable due to bias and high standard deviations.

In the last week of the broiler trial (week 6), the broilers stationed at Mikocheni became sick with Gumboro disease and Mafua bacteria. The first mortality cases were for the 50%CRM treatment group, suggesting it to be the most susceptible group. In a previous study by Ajani (2002), the 50%CRM treatment group suffered from a 42% mortality due to typhoid, with the cause most likely being the *Salmonella typhaurium* that contaminated the fishmeal. This was not the case here, where a high mortality was not confined to the cassava groups. The mortality rate ranged from 19% for the 0%CRM to 38% for control 2. The results from Kigamboni, with zero mortality, confirm that replacing maize with CRM up to 50% has no effect on broiler mortality. The statistical analyses of the results gave no significant difference for mortality between treatments.

Aside from the disease outbreak, there might be some interaction between growth rate and the relocation of the chicks in week 3, giving another explanation to the difference in results between broilers in Mikocheni and Kigamboni. The treatment group, where maize was fully replaced by CRM, suffered from diarrhoea in 1 of the 6 weeks in Kigamboni and 6 out of 6 weeks in Mikocheni, which could have resulted in a relatively low digestibility of the feed. The correlation between feed treatment and faeces abnormality was found to be significant with the multivariate analysis. The treatment where half of the maize was replaced with cassava did not suffer from diarrhoea, except for the last 2 weeks at Mikocheni, due to the disease outbreak.

The Feed Conversion Rates (FCR) in Mikocheni, 3.7 (control 1) to 7.7 (50%CRM), were much higher (more unfavourable) than the FCRs in Kigamboni, 3.3 (control 2) to 5.8 (50%CRM), especially for the 50%CRM groups. This was probably due to the different housing systems, allowing differences in the wasted feed fraction to occur. The CLM used in the broiler trial was not of the best quality. It had a low leaf / stem ratio. The 'stems' in the diets were not liked by the broilers and easily selected and discarded due to the significant size of the stem particles. Therefore, the wasted feed fraction could be higher for the cassava-based diets, overestimating the FCR. During the trial it was attempted to make an estimation of the wasted feed in Mikocheni. However, this proved difficult due to the fact that not all wasted feed was retrieved, underestimating the wasted fraction, and faeces was allowed to drop freely in the bag, overestimating the wasted feed fraction. The adjusted FCRs in Mikocheni are rough estimates. The unadjusted FCRs were used for calculation of feed costs, in order to have the price that broiler farmers will pay. One way to decrease feeding costs would be to introduce a strategy that will make it more difficult for the broilers to waste feed.

Growth depression was visibly noted when broilers were fed with cassava, especially in the last two weeks of the trial. The 50%CRM and 25%CRM diets were similar in composition to that of the 0%CRM batch, the only difference being the inclusion of maize or cassava. Since the growth rate of the 0%CRM batch was not impaired, the depression in growth rate of 48% (kigamboni) to 51% (Mikocheni) for 50%CRM and of 30% to 41% for 25%CRM is probably due to the lack of valuable nutrients in cassava, which needed to be added to the diet. According to previous studies, cassava diets need to be supplemented with methionine to get a similar result to that of maize based diets. Due to the fact that the inclusion of methionine would increase the feed cost significantly and that the results of this trial needed to be of value in practise as well as in theory, it was not included in the diet.

Another significant reason for the depression in growth rate could be the negative effect that cassava appears to have on the feed intake. In previous studies it was suggested that the cassava diets in mash form are too dusty to the broiler taste. For this reason the feed should have been pelletized. Since Dar es Salaam had no pelletizer available, it was not possible to pelletize the feed, resulting in a lower feed intake and a depression in growth rate. The differences for growth rates between treatment groups were significant according to statistical analysis.

Even though growth rates were lowest for the cassava treatment groups, the cost of producing 1 kg of broiler meat in Kigamboni was most favourable for the 25%CRM batch (427.51). The two controls were most expensive (603.64 and 618.99). The feeding costs in Mikocheni were high for all treatments, ranging from 708.91 (25%CRM) to 1095.36 (0%CRM) due to outbreak of disease in week 6 and high wasted feed fractions. These results are somewhat misleading because total output (in broiler meat) should also be taken into account. Even though the production costs are decreasing when using the alternative ingredient cassava, the broilers reach a lower weight. Broilers in Tanzania are usually sold at a weight of 1-1.2 kg. To reach this average weight, broilers need to be kept and fed for 6 weeks when feeding them with 50% maize and 50% CRM of the total diet (25%CRM). The 50%CRM batch did not even reach the 1 kg at the end of week 6. The control groups and the 0%CRM batch reached an average weight of 1 kg in week 5 or even in week 4 for control 2 in Mikocheni. This means that in practise, the batches fed with maize-based diets are ready for sale at week 4 or 5. In other words, in reality the total feed costs for the maize-based diets are lower than the results show.

Still, if the price of maize increases in the future and/or when the feedmillers will purchase their cassava from distant cassava farmers at very low costs, the replacement of maize with cassava could be economical. Pelletizing the feed will, as mentioned before, increase feed intake and growth rate.

Comparison of cassava to maize for layer feed manufacturing

The experimental design of the layer trial made it impossible to conduct any statistical analysis, since there was only one trial or source of data per treatment group. With no repetitive results it was not possible to calculate a standard deviation or the significance of the feed factor

In this layer trial the egg production was negatively effected by cassava. The cassava treatment groups had a lower egg production than the control group, of 27% for the 50-no batch and 19% for the 25-no batch. This might be due to the fact that the feed was offered in mash form and not in pelleted form, as done in the previously mentioned layer trial by Smith (2002). Cassava did not have a significant effect on the egg size or egg weight.

Combining soybean with cassava had an even further negative effect on egg production. Soybean is more expensive, lower in nutrients and higher in fibre than fishmeal. Combining soybean with cassava increased the methionine deficiency. The advantage that soybean had over fishmeal is that it is not easily contaminated with sand and water. Also, as mentioned before, fishmeal can be contaminated with Salmonella. However, the advantages of soybean may not be worth the reduction in egg production of 21% for the 50-yes batch and 27% for the 25-yes batch. It is possible that, because some of the soybean bean particles were relatively large, layers selected the soybean beans and that for this reason soybean -cassava combination groups did not receive the nutrients it needed. When the feed is pelleted, the decrease in egg production may not be as significant as it was now.

To compare the production rates from weeks 1 to 6, resulting from the layer trial, with the original production rate at week 0 at Tazara farm might be misleading. The layers for the trial had been selected on their productivity. The layers that were not (yet) laying were excluded from participating in the trial. The original production rate comes from a batch that includes those unproductive layers. Therefore, even though the 50-no and the 25-yes batches have similar production rates (58%) to that of the original rate at Tazara (59%), the actual production might have decreased.

Cassava had an adverse effect on the health of the layers. In all treatment groups a decrease in the average layer weight was noted from 9% (25-no) to 19% (50-yes). This loss in layer weight and the decrease in egg production for the 50-no and 25-no batches were surprising. The 25-no feed was not only the cheapest but also very well balanced in its nutritional value. Theoretically, the 25-no batch should have had the highest performance. The best explanation that can be given is the mash form in which the feed was offered, which allowed selective feeding. A different trial should be set up, re-demonstrating the same formulas, in pelletized form.

Cassava had a positive influence on the egg quality. Cassava eggs had relatively dark yolk colours. The yolk colour was darkest when cassava roots fully replaced maize. This is surprising due to the fact that the dark yolk colour comes from the natural pigmentation of the cassava leaves, which is included in all cassava diets in equal amounts. There should be no difference between yolk colours amongst the different treatment groups. Another method to increase the yolk colour would be to include, the more expensive, yellow maize in the diet, instead of white maize. Soybean also had a positive effect on egg quality, reducing the occurrence of meat and blood spots in the egg white. In the sensory analysis cassava eggs were much preferred above the control eggs on appearance and taste. The control eggs scored 68% of the time for worst looking and 45% of the time for worst tasting.

Cassava roots can replace 50% of the maize (25-no) in the diets, with similar feed cost per egg produced to the control (28,4 and 26,1 TSh respectively). Final output/egg production is lower and the average weight of the layer is impaired, but this picture will probably change when the feed is pelletized. When the maize price rises and / or when the cassava can be purchased at lower costs, the 25-no diet will quickly become cheaper than the maize-based diet. The inclusion of soybean is not profitable. The feed cost per egg is on average 203% higher than the cost of the control feed.

Recommendations for future experiments

In a next study, the experimental design should allow an accurate statistical analysis of the results. This may not add to the positive reputation of cassava in the animal feed industry in Tanzania, but it is important to conduct a proper statistical analysis to obtain estimates of the significance of differences between treatment groups.

The method of conducting the trials at existing farms should be repeated. The results of such trials are more representative of the result obtained by the animal farmers themselves, than when the results are obtained on research compound. Also, the reputation of cassava could spread more rapidly.

In this study, one of the objectives was to demonstrate the potential of cassava by conducting trials. Unfortunately, the growth rates and egg production were lower for the cassava treatments than for the controls. The reasons for this were previously mentioned. However, it became clear that people could be influenced by the outcome of demonstration trials. The owner of Rulu farm, for example, decided to change her feed to the control feed due to the increase in layer performance. For the demonstration trials to be as effective for the adoption of cassava, the demonstration trials should be repeated with pelletized cassava diets, preferably supplemented with methionine. As mentioned before, pelletized cassava diets are expected to result in a higher poultry performance.

Observations by Julián Buitrago (CLAYUCA consultant) on the results obtained in the feeding trials

- The feeding trials with high levels of cassava root meal conducted under Tanzanian conditions showed erratic results in broilers and layers, both in performance as well as in mortality. Overall performance of broilers and layers was quite poor in all trials, including commercial controls (final weight at 6 weeks is slightly higher than 1.0 kg, compared with 2.0 kg in commercial broiler production). Mortality was quite high in diets with high levels of fishmeal.
- In contrast, high levels (50%) of cassava meal have demonstrated excellent performance when mixed with other high quality feed ingredients in other regions. Broiler diets with 50% cassava root meal and 6% cassava leaf meal resulted in excellent weight gain and feed conversion when mixed with fullfat soybeans (whole seeds) processed by roasting or extrusion. This type of diets did not produce the same results in the Tanzanian demonstrations. Some of the limiting factors may include:
- The type of fishmeal used in Tanzania is of poor nutritional quality (high ash, high fat, low protein) and with a high microbial contamination. The open processing of fishmeal does not provide the minimal sanitary conditions and opens the entrance to Salmonella, E. Coli and Clostridium. These

microorganisms may originate diseases, which will affect performance and produce high mortality. The diets with high cassava are more susceptible to microbial contamination since they will contain higher levels of fishmeal. The high level of fat in fishmeal will also facilitate oxidation and rancidity of the diet, which has a negative effect in animal feeds

- Cottonseed cake (CSC) is not a recommended ingredient for poultry diets. Levels higher than 8 % may produce toxicity because the gossypol content will be dangerous. Poor growth and high mortality may be produced with high CSC in broilers and layers.
- High cassava meal diets should be pelletized in order to obtain best results. Otherwise there is a trend for feed picking which will affect the nutrient balance and will result in poor flock uniformity. Unfortunately there is not a pelletizer available in Tanzania, which is a very important tool when high levels of cassava meal are going to be used in poultry diets.
- Soybeans are an excellent protein and energy ingredient for poultry, especially when mixed with cassava root and cassava leaf meals. Levels up to 60% cassava meal and 30% full fat soybeans may be used with a very high performance and a very low mortality. However the processing of soybeans should be controlled very carefully both in the temperature and the retention time during processing. Under or overprocessing will have a negative effect. Extrusion or roasting has to be carefully controlled in order to obtain the best results. Soybeans is a very complete ingredient with a high level of energy (3,700 kcal /kg) and a high level of protein (38%) in comparison to other common feed ingredients:
- Raw soybeans contain some antinutrients (antitrypsin), which disturb the digestion of proteins. Fortunately a precise heat process can eliminate these antinutrients. Underprocessing does not eliminate the antinutrients and overprocessing destroys part of the feed proteins.

a.2. Malawi

In Malawi, a different approach was followed to establish an animal feeding demonstration trial. Initial contacts with some representatives of the poultry sector were not successful; one of the largest poultry producers expressed his current satisfaction with maize-based feeds and technical assistance from South Africa and refused to conduct any trial incorporating cassava in their formulas. The sector in which there was a positive response was the dairy sector, and more specifically on the possibility of using cassava leaves as a protein supplement for milking cows.

Dairy farmers in Malawi face constraints due to short supply of raw materials. When there is a food deficit in the country, some of the raw materials (maize bran, rice bran) are used to supply the food deficit in rural areas and the availability of raw materials for feeding cows is affected.

After several contacts and meetings with Land O'Lakes (LOL) and the Central Region Milk Producers Association (CREMPA), it was decided to organize a workshop for dairy farmers to demonstrate methods of intensive production of cassava foliage and also the technique to produce good quality silage with cassava leaves. As a follow up of this activity, some trials with milking cows were designed. These trials were to act as a demonstration effect. LOL promotes the production and utilization of milk in Malawi through technical assistance, introduction of artificial insemination techniques, extension services and training. LOL is very keen to technology interventions and has had good results in the past. For example, using improved feed (molasses), milk yields have increased from 3 to 5 liters per day. Formulations were based on the use of molasses, maize, cement and other raw materials. Experiences with cassava were new for them and decided very enthusiastically to participate in the trials. The Figure 2 presents some of the

results obtained. Values represent the average daily milk production of 3 cows that were fed with cassava leaves silage and 3 cows fed with maize/grass silage. Both groups were milked during 80 consecutive days. It can be observed that milk production of cows fed with the cassava silage was, if not superior at least equal, than the production of the cows fed with maize/grass. This could be a very important opportunity to promote a more intensive use of cassava, roots and leaves, in the dairy sector of Malawi. These results, although very encouraging, have to be taken with some caution because they were obtained in Katete Farms, one of the largest milk producers in Malawi, under real life conditions, but the scale of the trial was small. What is important is the indication these results are giving about the great potential of cassava to become a raw material for the dairy sector. Further studies, with more scientific basis need to be conducted in the future.

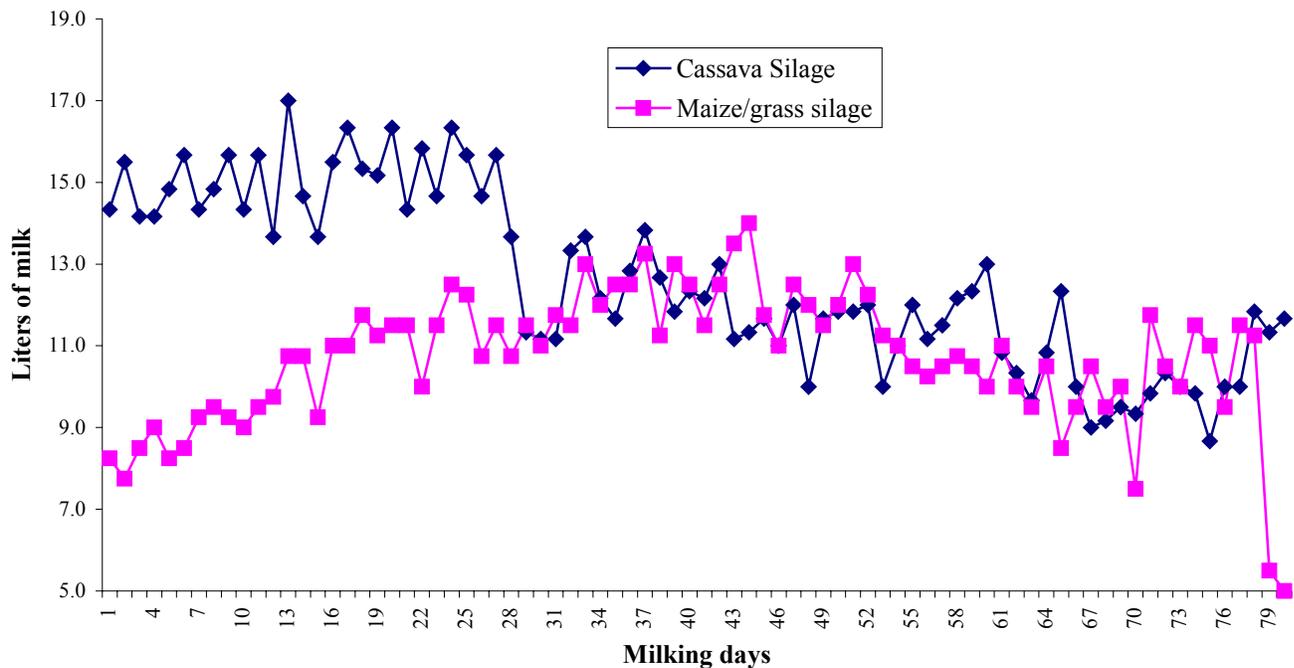


Figure 2. Performance of milking cows in Malawi fed with cassava silage.

b. Establishment of at least one pilot project using the integrated product development approach

b.1. One pilot project operating in Tanzania.

In 2002, the SARNET team in Tanzania initiated a pilot project in the village Bungu located 140 km south of Dar es Salaam. This region was selected as a potential area for transferring improved cassava processing and marketing technologies, based on the difficulties that farmers were facing to sell the cassava roots in the Dar es Salaam market. Cassava traders prefer to buy cassava roots from farmers located nearer the capital, mainly due to poor road communication between the capital and the far distant villages like Bungu. This village was chosen as the pilot project area considering its high cassava production, high yields (20 MT/ha), low pest and disease pressure and the growing importance of the crop as a major cash income for farmers since coconut and cashew nut production are declining in the region.

Prices paid by cassava traders in villages near Dar es Salaam are as high as US\$ 30/ton (March, 2003), whereas in regions like the Bungu village, the prices paid to cassava farmers are around US\$ 15 / ton. Farmers around Bungu village traditionally eat the cassava roots in fresh form or processed in the form of a product called Makopa (medium to large size chips dried for 8 to 10 days). This long processing period

produces some fermentation of the cassava chips and very often the final product contains a lot of dust, fungi and soil particles.

One of the strengths of SARRNET was precisely the availability of chipping and drying technology for cassava chips. These technologies includes: a) a simple chipper motorized with a 3.5 horse power petrol engine, with capacity to produce 400 to 500 kg of fine cassava chips per hour, and with a total cost of around US\$ 400 per unit; b) a drying method usually based on raised drying trays that allow reduction of the moisture in the chips to safe levels within one day of exposure to the sun. These two components represented the technological intervention that was presented to the farmers in the Bungo village. The idea of setting up a pilot project based on this innovation was presented to the farmers during a public demonstration conducted in the village with the help of local agricultural, extension staff and farmers leaders.

During the demonstration, SARRNET officers brought to the village the chipping unit and some drying trays. Both men and women tested the equipment and became very interested in the clean and white cassava chips produced. They later took home the dried chips and have them tested in their traditional foods. Additionally, SARRNET officers took the high quality cassava chips into Dar es Salaam and established contacts with potential markets that became very interested in the product.

After the successful demonstration, building upon the interest shown by farmers, the SARRNET team and collaborating institutions in Tanzania decided to establish a small-scale processing plant, as the pilot project site, with the Mpondi Farmer and Business Group, a very well organized group of farmers engaged in cassava production and very eager to get involved in cassava processing in commercial scale. The deal proposed to farmers was that SARRNET would provide the drying trays and the chipping unit whereas the farmers will be responsible for building the processing shed. The eight members of the Mpondi group contributed with their own cassava roots and provided the labour required for the processing activities. Very soon the pilot plant was operating and the group was in business with urban markets.

The farmers group received direct, learning-by-doing training on the processing technology. Some of the farmers were also taken to the capital to visit major markets and get acquainted with potential buyers. By May 2002, the group was fully operating the cassava processing pilot plant with an output capacity of around 400 kg of high quality cassava chips per day.

A significant economic impact has been achieved with this simple, small-scale, affordable technological intervention. Farmers are now able to sell their cassava roots at better prices to the processing unit, which is located near their cassava plots. Before SARRNET intervention, they were having difficulties selling the cassava roots since the only available market were few traders visiting the region. The prices they received were very low. With the new market, the prices they receive are higher and additionally, the processing activities at the pilot plant are creating employment opportunities, especially for older people and women that take care of peeling the roots prior to chipping and drying. Also, other villages and local traders have started to buy their high quality chips instead of the traditional Makopa. Another very important advantage is that farmers are now able to sell older cassava roots coming from plots that have more than one year of growing cycle. The traders do not buy the roots coming from these old cassava fields. In the processing plant, the old, oversized roots are easily transformed into cassava chips and find a market. In general, cassava farmers in the vicinity of the processing unit are now interested in increasing the size of their cassava plots.

For SARRNET, the success obtained in the establishment of the first cassava pilot project in a Tanzanian village has been very helpful in promoting a better integration among local institutions. The Root and Tubers Crop Research team at Kibaha and the technical personnel from the Rufiji District, for example, are now promoting very enthusiastically the expansion of these results in other cassava growing areas and regions of Tanzania. Technical personnel from the Tanzanian Food and Nutrition Center (TFNC), private sector entrepreneurs and farmer groups have also become very active collaborators.

The impact obtained by SARRNET with the application of the pilot project concept as a strategy to link farmers to markets can be analyzed from two angles. First, is the rapid diffusion of the innovation

among farmers within the village. Early innovators were allowed to use the technology, adapt it, make their own adjustments, and very soon other groups took up the initiative and engaged also in setting up similar processing units. In few months, there were 5 processing plants located in a radius of not more than 40 kilometers around Bungo Village. Secondly, there has also been impact at national level. By March-April 2003, the SARRNET team in Tanzania, together with collaborating institutions were invited to visit other regions, in South Tanzania, to discuss with regional and district level authorities the possibilities of implementing similar work. The discussions moved forward to the extent that plans are underway to establish new pilot projects in this region, based on the same concept and methodology used in the Bungo village. It is expected that by the end of 2003, with financial support coming from the local authorities and districts, these new pilot projects will be functioning. A clear example of the quick adoption and diffusion of an innovation technology when it is meaningful to the main beneficiaries, the cassava farmers. Annex 1 presents additional information and some pictures that illustrate the activities conducted at the Bungo Village Pilot Project.

b.2. One pilot project operating in Malawi

In Malawi, a similar approach was followed to set up a pilot project through which the concept of the “linking farmers to markets strategy” could be tested. The area selected for the pilot project was Phalombe, one of the 27 districts of Malawi, located 137 km east of Blantyre, the most commercial city of the country. In the region, the major source of income for farmers is the sale of agricultural products such as maize, pigeon pea and sunflower. Traders who establish temporary purchasing places dominate commercialization of agricultural products. The agricultural products are transported later to the city of Blantyre for use in human consumption and industrial markets.

Through a strategic alliance with the Christian Service Committee (CSC), an international NGO with operations in Malawi, the SARRNET team in Malawi initiated the pilot project in the Phalombe region. Farmers from eight villages were invited to participate. The initial contact with farmers was made through a sensitization meeting held at Kolowiko village, attended by over 200 farmers, mostly women. The objective of this meeting was to sensitize farmers about the importance of cassava as a cash crop, for food security and also as a strategy for opening and strengthening new markets for their agricultural products. The concept of using improved processing technology to produce improved quality products with which to open new markets was discussed with the farmers. SARRNET staff brought over four motorized cassava chipper units and some drying trays. This initial meeting also allowed farmers to place a strong demand for improved cassava varieties and good quality planting materials. Later on, taking advantage of the existence of cassava planting material nurseries in two research stations (Chitedze and Kasinthula), SARRNET and CSC provided planting material of two recommended varieties. 100 farmers received enough planting material to plant an average of 0.2 ha per family. In addition, 15 demonstration plots were planted using one improved clone.

The results obtained with the pilot project approach were not as encouraging as those obtained in Tanzania. Although the acceptance of the technology by the farmers was very good and the chips obtained were of improved quality compared with the traditional ones, the factor that proved to be the most limiting one was the very long distance between the pilot project site and the main road that communicates with the urban markets. The private sector companies contacted during the surveys were interested in purchasing the cassava chips but they refused to collect them at the village. The high cost of taking the chips from the village to the main road and later to the urban markets made the whole operation very difficult. Although some few tons of cassava roots were chipped and sold, in general, the pilot project strategy required some adjustments. For example, the dried chips can be stored in a place located on the main road, paying lower transportation costs; once a sufficient volume is completed, a buyer could be sought that would be willing to collect the chips at this place. Of course, this will mean additional bargaining abilities and power by the farmers. The final price that farmers will receive for the chips has to account for the transportation costs between the pilot project site and the main road storage place. As part of the pilot project work conducted in Malawi, some cassava production trials were implemented. Results obtained are presented in Annex 2.

c. Participation in the process of translation of the book “El uso de la yuca en la alimentacion animal”, from Spanish to English and formatting for web publication.

This activity has been conducted over the last two years. This book, one of the most important bibliographic references existing in Latin America for this topic was originally published by CIAT in 1990 and has 444 pages in its original Spanish version. During the last decade, the book sold well all over the Continent and is now totally sold out at CIAT’s publication unit. The idea to translate it into English language was originally proposed to CIAT and CLAYUCA by FOODNET, the IITA network operating in East African countries.

To accomplish this objective, CLAYUCA hired a translator who was in charge of producing a first, non-edited translation. Later, Dr. Julian Buitrago made a revision and his corrections were incorporated in the draft text. At this stage, in October 2003, the draft text was delivered to Foodnet (Dr. Shaun Ferris) for a final, scientific editing work. The idea is to format the final document into a web-page style so that it can be easily and quickly disseminated.

In the future, CIAT and CLAYUCA intend to publish a second edition of this book, in English language, adding two or three chapters and changing the style of the book into a more user-friendly format.

d. Participation in the translation of relevant information on cassava postharvest technologies into English language

This activity has been conducted systematically through the duration of the present agreement. Two main documents were translated into English language and were delivered to SARRNET, as paper copies and also in electronic form (PDF documents). The first document translated was “*Cassava in Poultry Feeding*”, originally published by CLAYUCA in Spanish, with financial support from the Colombian Poultry Growers Federation-FENAVI. The English version was delivered to SARRNET in May 2002.

The second document translated was “*Cassava in Dairy Feeding*”, published originally in Thai language and translated to English with financing from CIAT-Bangkok and CLAYUCA. The document is been handled to SARRNET as printer document and also as an electronic PDF file.

Additionally, various presentations and documents were delivered systematically during the period of this agreement, to SARRNET officers in Tanzania and Malawi. These documents contained information on processing technologies, quotations for processing equipment and other general aspects about cassava postharvest technologies. They were delivered in the form of CDs, video, Power Point presentations and paper documents.

e. Participation in translation of cassava post-harvest handling and processing technology information system into English

To accomplish this objective, the following activities were realized:

- a) Collection and incorporation of relevant additional information into the database on post-harvest handling and processing of cassava.
- b) The design of an appropriate format for use in cd rom and Internet format.
- c) Translation of the Spanish version into English.

The Cassava Post Harvest Management and Processing System is divided into the following sections for easy access and visualization of the information.

- i. Cassava: Overall context. This section indicates to the user the scope of the system and general information about the importance of cassava, yields, production and nutritional value.

- ii. Post-harvest handling. This section presents information on one of the principal limitations to increased utilization of cassava, as regards the rapid post harvest deterioration, which often makes the roots unsuitable for human consumption and other uses within 48 hours. Techniques for preventing deterioration are presented.
- iii. Processing and utilization. This section provides technical and economic information on the different agroindustrial uses of cassava: traditional products, dry cassava and derived products, starch, foliage, co-products and solid and liquid by-products. For each process, information is provided on scales of operation, mass balances, equipment and investment costs.
- iv. Quality control. This section includes the available information on the quality standards for fresh and processed products for national and international markets, together with the description of the methodologies needed to undertake laboratory analysis of key characteristics.
- v. Future prospects for cassava. This section presents a synthesis of the most important aspects of the preceding sections, and highlights some of the on-going post harvest research on the crop.
- vi. Contacts and additional sources of information. This section gives details of institutions, data bases, libraries, networks and other systems that can be contacted to obtain additional information related to the post harvest handling and processing of cassava.
- vii. Bibliographic references. This section includes the references used in the development of the system.

The system has been developed to ensure a wide diffusion and information access to cassava farmers and processors, local development agents, rural agroenterprises, NGO's and governmental decision makers. The system has been placed on the website of CIAT's Rural Agroenterprise Development project for consultation using the FrontPage software both in Spanish and English. The English version is available on a cd rom. The front page of the system is shown in Figure 3.

3.4 Theme IV. Stakeholders trained in new skill to support the market driven strategy

3.4.1 Introduction

Participation of CIAT and CLAYUCA technical personnel in the implementation of the present agreement was conceived as an exercise in which, concepts, information and experiences gained throughout the last 20 years of work in Latin America, were to be shared with technical personnel from IITA and SARRNET, in the first instance, and to a lesser extent, with technical personnel from the national institutions and other agencies in Tanzania and Malawi that are collaborating with SARRNET.

3.4.2. Expected result:

Updated knowledge amongst key SARRNET stakeholders about cassava production and processing technologies existing in Latin America and with potential to be adapted to the specific conditions of some African countries.

3.4.3. Activities implemented:

1. Facts finding and planning trip to Africa (Tanzania, Malawi), by CIAT/CLAYUCA personnel (Rupert Best, Bernardo Ospina). November, 2000
2. First consultancy mission by CLAYUCA (Bernardo Ospina, Julián Buitrago).February- March. 2001
3. Training course in Agroenterprise Development. CIAT Instructors (Rupert Best, Carlos Ostertag). May 2001
4. Participation of CIAT (Rupert Best) in Steering Committee Meeting. Tanzania. May 2001
5. Second consultancy mission by CLAYUCA (Bernardo Ospina, Julián Buitrago). October-November . 2001

6. Scientific exchange mission of SARRNET personnel to Latin America (Colombia and Brazil). February-March. 2002
7. Participation of CIAT (Rupert Best) and CLAYUCA (Bernardo Ospina) in Steering Committee Meeting. Pretoria. April 2002
8. Third consultancy mission by CLAYUCA (Bernardo Ospina, Julián Buitrago). April-May. 2002
9. Fourth consultancy mission by CLAYUCA (Bernardo Ospina). March 2003.

Theme IV. Stakeholders trained in new skills to support the market driven strategy.

Activity and dates	Participants	Expected output	Indicator (s) for monitoring progress
1.Consultancy missions of CIAT&CLAYUCA technical personnel to Tanzania and Malawi.	SARRNET Team CIAT CLAYUCA	Updated knowledge of key SARRNET officers about cassava production and processing technologies with potential to be adapted to African countries	Trip report Project Reports I, II and Final
2. Participation of CIAT&CLAYUCA personnel in SARRNET Steering Committee Meetings	R Best B.Ospina	Rupert Best and Bernardo Ospina participated in the Steering Committee Meetings that took place in Tanzania (2001) and Pretoria, South Africa (2002)	Report of the Steering Committee Project Reports I, II and Final
3. Scientific exchange mission of SARRNET team to Latin America	SARRNET Team	Updated knowledge of key technical personnel of SARRNET about cassava production and processing technologies with potential to be adapted to African countries	Trip report Project Reports I, II and Final
4. Training course in Agroenterprise Development.	Rupert Best -CIAT Carlos Ostertag - CIAT	Technical personnel of the national institutions collaborating with SARRNET trained on the basic concepts of design, execution and monitoring of root agro enterprise projects	Training Report Project Reports I, II and Final
5. Participation in the design, preparation and follow-up of a course on integrated root crop agro enterprise projects. NOTE: This training activity was not realized	R Best CF Ostertag M Lundy	Technical personnel of the national institutions involved in the integrated root crops agro enterprise projects trained in project design, execution and monitoring.	
6.Other training activities Two additional training activities proposed were not realized: a) Animal feed sector and technical personnel in Malawi and Tanzania trained on technologies for the use of cassava and sweet potato in animal feeding b) Selected personnel in Malawi and Tanzania trained as facilitators	R Best –CIAT C Ostertag - CIAT B Ospina- CLAYUCA J Buitrago - CLAYUCA S Kolijn -IITA S Ferris - IITA	Formation of a group of key technicians with updated information on strategies to promote market-driven approach for cassava and sweet potato sustainable development	

Solutions That Cross Frontiers



Contact Us News Español

Search the Site: **Go!**

[Products](#) [CIAT Project Web Sites](#) [Information/Services](#) [About CIAT](#)

- The Crop**
 - [Cassava and Its Context](#)
- Postharvest Management**
 - [Economic Importance](#)
 - [Harvesting](#)
 - [Postharvest Deterioration of the Roots](#)
 - [Storage of the Roots](#)
- Processing and Utilization**
 - [Why Process?](#)
 - [Traditional and Industrial Uses](#)
 - [Dried Cassava and Its Byproducts](#)
- Sources of Information**
 - [All the Products on Cassava](#)

[CIAT Home](#) > [Rural Agroenterprise Development Project](#) >

Information System On Postharvest Management and Processing of Cassava

For more information contact: [Rural Agroenterprise Development Project](#)



Cassava is one of the most important food crops in the tropics, where it is the main source of calories for some 500 million people. For this reason, diverse national and international entities have dedicated significant resources and efforts to developing and improving the postharvest management and processing of cassava over the last 20 years.

Despite the fact that extensive information has been generated on this topic, most of this information is not readily accessible because it is disperse, has not been systematized and does not reach most cassava producers, extension agents, small rural businesses, governmental and nongovernmental planners, or those who are interested in the topic.

Taking advantage of the possibility of mass dissemination offered by electronic information systems we developed this System by compiling both technical and economic data, analyses of operational efficiency (conversion rates), machinery used in the processes, processing plant design and investment costs.

You will find this information grouped into four sections: the crop; postharvest management; processing and utilization; and information sources.

Figure 3. Web page of the Information System on Cassava Postharvest Management and Processing.

3.4.4 Results achieved:

After two years of activities it can be said that this objective was fulfilled satisfactorily. The execution of this collaborative agreement became an excellent opportunity for personnel of both International Centers (IITA and CIAT), to make a more efficient, complementary use of each institution skills and comparative advantages on behalf of the sustainable development of the cassava crop in Africa.

Benefits have accrued from this collaborative agreement in both directions. Stakeholders of SARRNET in Tanzania and Malawi have had the chance to know about the experiences of CIAT on cassava development in Latin America but also, CIAT and CLAYUCA technical personnel have gained invaluable experience about the current situation of cassava in this part of Africa, the challenges and the opportunities.

In general it can be said that some of the key stakeholders of SARRNET are now better informed about the potential opportunities that can be derived by applying a market driven approach to cassava research and development activities.

4.0. Conclusions and recommendations

4.1 Introduction

CIAT and CLAYUCA were invited by IITA-SARRNET to provide conceptual and practical input into the process of realigning SARRNET from a predominantly production focus aimed at meeting food security objectives to a more market and enterprise orientation, with a view to satisfying the increasing need for providing income and employment generating opportunities for cassava and sweet potato farmers.

4.2 Major achievements

The major achievements over the period November 2000 to September 2003 have been the following:

Theme IV. Stakeholders trained in new skills to support the market driven strategy.

Activity and dates	Participants	Expected output	Indicator (s) for monitoring progress
1.Consultancy missions of CIAT&CLAYUCA technical personnel to Tanzania and Malawi.	SARRNET Team CIAT CLAYUCA	Updated knowledge of key SARRNET officers about cassava production and processing technologies with potential to be adapted to African countries	Trip report Project Reports I, II and Final
2. Participation of CIAT&CLAYUCA personnel in SARRNET Steering Committee Meetings	R Best B.Ospina	Rupert Best and Bernardo Ospina participated in the Steering Committee Meetings that took place in Tanzania (2001) and Pretoria, South Africa (2002)	Report of the Steering Committee Project Reports I, II and Final
3. Scientific exchange mission of SARRNET team to Latin America	SARRNET Team	Updated knowledge of key technical personnel of SARRNET about cassava production and processing technologies with potential to be adapted to African countries	Trip report Project Reports I, II and Final
4. Training course in Agroenterprise Development.	Rupert Best -CIAT Carlos Ostertag - CIAT	Technical personnel of the national institutions collaborating with SARRNET trained on the basic concepts of design, execution and monitoring of root agro enterprise projects	Training Report Project Reports I, II and Final
5. Participation in the design, preparation and follow-up of a course on integrated root crop agro enterprise projects. NOTE: This training activity was not realized	R Best CF Ostertag M Lundy	Technical personnel of the national institutions involved in the integrated root crops agro enterprise projects trained in project design, execution and monitoring.	
6.Other training activities Two additional training activities proposed were not realized: a) Animal feed sector and technical personnel in Malawi and Tanzania trained on technologies for the use of cassava and sweet potato in animal feeding b) Selected personnel in Malawi and Tanzania trained as facilitators	R Best –CIAT C Ostertag - CIAT B Ospina- CLAYUCA J Buitrago - CLAYUCA S Kolijn -IITA S Ferris - IITA	Formation of a group of key technicians with updated information on strategies to promote market-driven approach for cassava and sweet potato sustainable development	

1. The development and adoption of a systematic process for gathering and analysing opportunities for the industrial use of cassava and sweet potato that is both rapid and efficient in the use of resources. Through the use of this process, potential private sector interest was assessed, both in the use of these crops as raw materials and as partners in R&D activities.
2. Appropriate regions, or ‘territories’, where cassava and sweet potato have a comparative advantage for supplying certain markets were identified and the actors involved have been convened to initiate the process of consolidating value chains focused on specific market outlets.
3. There is raised awareness among the private sector of the potential for the use of cassava and sweet potato roots and leaves in animal feeding, especially for poultry and dairy cattle. Similarly, the competitive use of cassava-derived products in the non-food industry has also been confirmed, and in particular with respect to adhesives manufacture. A number of public-private R&D projects have been initiated where none existed previously.
4. A greater awareness among SARRNET personnel of the benefits that can be derived from enhancing opportunities for South-South interchange of technologies and information, especially with Brazil and other Latin American countries.

4.3 Conclusions

The major conclusions that can be derived from this experience are:

1. The basis has been established for quick and appreciable socio-economic impact through scaling-up of the on-going pilot activities in the areas of cassava flour for direct sale to consumers in Tanzania (Power Foods), and the use of cassava foliage in dairy feed in Malawi (Land O’Lakes).
2. The formation of Public-Private Partnerships is a process that does not occur overnight and is one that requires perseverance and patience. Time is required to consolidate partnerships as trust and confidence is built. Good starting points have been achieved in Tanzania and Malawi. It is evident that in each country at least one PPP needs to be established and consolidated, as show case pilot experience, before contemplating wider national PP consortiums.
3. The relative cost and quality competitiveness of the cassava and sweetpotato sectors is critical to the medium term economic sustainability of the fledgling production and processing enterprises and their respective supply chains. R&D on marketing and processing has to go hand-in-hand with complementary and well-targeted agronomic research and the provision of development services such as seed multiplication and other input supply.
4. An entrepreneurial spirit to program development is essential. This means being proactive in approaching the private sector, not only in terms of potential markets, but also in terms of engaging appropriate technological solutions. Immense benefit can be obtained from South-South exchange of information and technology, with the possibility of enhancing trade among continents. Both public and private sector personnel should be motivated (and perhaps facilitated) to look for novel approaches beyond national and regional boundaries.
5. The present project provided a focused and meaningful opportunity to make use of the complementary skills and comparative advantage of two international agricultural research centers. Much has been learned about the appropriate mechanisms for achieving this type of cooperation. Among the most important lessons are:
 - a. Despite the relationship being contractual in nature, more is accomplished if synergy among the participating institutions can fostered by engendering a climate of mutual respect and trust. This creates a climate of joint ownership of the process.

- b. When this respect or trust is questioned, potential impact can be considerably curtailed, as the motivation for going beyond the immediate terms of a contract are reduced;
- c. Responsibilities and recognition of successes and failures must be shared among partners;
- d. Mechanisms for reorienting and correcting deficiencies in the execution of the contract, should they occur, need to be established and adhered to. Communication should be open and transparent.

These lessons should be taken into account in designing and carrying out future cooperation of this nature.

ANNEX 6: A SUCCESSFUL HISTORY OF SARRNET IN TANZANIA

Topic: **Development of small-scale cassava processing enterprises**

Title: **High quality cassava chips for human consumption: a promising income and employment option for cassava farmers in Tanzania**

Background

- Cassava in Tanzania is a very important crop
- In some regions, with coconut and cashew production declining, it is the major source of food security and income
- Limited market alternatives is one of the principal constraints faced by cassava farmers
- Road access is not very well developed. High transport costs make it very difficult to sell cassava roots and cassava-based products in urban markets. Usually, farmers have to sell their harvest to middlemen
- Farmers use mainly traditional varieties with very little external inputs. Fertilizer use is virtually non-existent
- Traditional cassava processing technologies are common and products obtained (ej. Makopa dry cassava chips) have poor quality and are sold at very low prices
- Farmers work mostly individually with very little bargaining power.



The Intervention
“Technological and organizational innovation”

a. *Results from research in similar areas existed*

- IITA has conducted research and technology transfer activities in Africa, based on improved technologies for small-scale cassava processing agroindustries. These technologies had not been tested in Tanzania before.
- CIAT and CLAYUCA had experiences of the implementation in Latin America of the “Linking Farmers to Markets” and the “Integrated Cassava Development Projects” approaches.



b. *Pilot phase (Field trials of technological and organizational innovations)*

- IITA and SARRNET, with consultancy support from CIAT and CLAYUCA, started a pilot project with farmer groups in Bungu, Rufiji district, a major cassava growing region in Tanzania
- Key stakeholders (farmer groups, NARS) participated actively in the pilot project, evaluating the prototypes provided by IITA/SARRNET and making adaptations.
- Stakeholders accepted the innovation as a “winner”.



**Results of the Pilot Phase
The Adaptation**

A. Technological innovation

- High quality chips are white, clean and can be used to replace partially wheat and maize used in the preparation of biscuits, home baked products and ugali.
- Drying cassava minichips on raised drying racks avoids fermentation and long periods of exposure to soil and dust contamination. Final quality of the product is very good
- Cassava processing activities are facilitated with the use of the prototypes introduced. Instead of chipping the roots with knives, farmers now use a chipper run with a petrol engine. Their efficiency has improved greatly. The quality of the chips (geometry, size uniformity, thickness) is better and drying time has been reduced.



B. Marketing innovation

- Instead of selling the cassava roots individually to middlemen, farmers are now able to commercialize their crop transformed into high quality chips, in larger volumes and at higher prices.
- Besides the benefits of higher prices paid by their roots, farmers are also benefiting from lower transport costs and the possibility of selling old cassava plots

By selling their cassava roots to a processing plant located within their own village, farmers get a fair weight, a better price and payment is usually done on the spot. Their net income from cassava has increased.



**Results of the Pilot Phase
The Adaptation**

C. Organizational Innovation Farmer groups

- Farmer groups now are getting a stimulus to get organized and establish groups that will have as their main business the processing and commercialization of high quality chips.
- As an organized group, they can act on behalf of the larger community group to reivindicate other components such us credit, energy, roads, and more institutional presence.
- By purchasing cassava roots from the farmers members of the group or from other farmers around the village, the farmers group is now able to handle larger volumes of dry cassava chips and their bargaining power to negotiate fair deals with their cassava crop has been improved.



D. Organizational Innovation Local Institutions

- The rapid adoption and impact of the technological and organizational innovation has got farmer groups interested in improved production and processing technologies. Technical personnel from local institutions that works at the village level is now feeling the pressure from farmers to deliver these technologies.
- At national level, technical personnel from the research and technology transfer institutions is benefiting from the innovation in the sense that there is a greater recognition to their work. At central level, the innovation is now considered a viable strategy and plans are been designed to expand the approach to other regions

Local research and technology transfer institutions usually complain about the lack of interest of farmers to adopt new technologies. With an improved, more profitable marketing system, farmers are now getting interested in cost-reduction technology components.



**Results of the Pilot Phase
Economic benefits of the innovation**

Costs of processing dry cassava chips		
Bungu, Tanzania, March 2002		
<p>Cost of fresh cassava (3.5 kg fresh for 1 kg chips, 20 Tsh/kg fresh)</p>	<p>(Tsh/kg dry chips)</p> <p>70</p>	
<p>Cost of peeling (5 Tsh/kg fresh)</p>	<p>17.5</p>	
<p>Operators (3 persons/day ; 1000 Tsh/person; 1,000 kg dry chips 2 days)</p>	<p>6</p>	
<p>Other costs (Depreciation, fuel, bags, loan, etc.)</p>	<p>20</p>	
<p>Total cost</p>	<p>113.5</p>	

Costs of commercialization, Bungu, Tanzania, March 2002		
Target Market: Dar es Salaam		
<p>Cost of processing (1 kg of dry cassava chips)</p>	<p>(Tsh / kg)</p> <p>113.5</p>	
<p>Cost of transportation (25 Tsh / kg dry cassava chips)</p>	<p>25</p>	
<p>Current selling price (Delivered in Dar es Salaam) (Ts / kg dry cassava chips)</p>	<p>180</p>	
<p>Net Profit for farmers (Tsh / kg dry cassava chips)</p>	<p>41.5</p>	

The benefits for farmers participating in the dry cassava chips operation accrue from:

- Higher price for roots
- Employment opportunities for elder people and women
- Less dependence on traders
- Cassava older than 1 year has a market
- Good quality dry cassava chips is allowing them to enter urban markets and demand is increasing

Income opportunities for cassava farmers in Tanzania		
<p>Fresh Market Assuming:</p> <ul style="list-style-type: none"> ➤ Yield of 15 t / ha) ➤ Fresh market price Tsh 15 / kg 	<p>(Tsh/ha)</p> <p>15,000 x 15</p> <p>225,000</p>	
<p>Dry cassava chips market (roots sold at the processing plant gate) Assuming:</p> <ul style="list-style-type: none"> ➤ Yield of 15 t / ha ➤ Processing plant price 20 Tsh / kg 	<p>(Tsh / ha)</p> <p>15,000 x 20</p> <p>300,000</p>	
<p>Farmers Group (Owners of the processing plant)</p> <p>Assuming:</p> <ul style="list-style-type: none"> ➤ Processing costs of 138.5 Tsh / kg dry cassava chips ➤ Selling price of 180 Tsh / kg of dry cassava chips 	<p>Income per kg of dry cassava chips</p> <p>41.5 Tsh</p>	

One group of cassava farmers in Tanzania can now, with the technological and organizational innovation obtained developed by SARRNET, establish a different cassava production, processing and commercialisation system. For example, if 20 farmers get together and organize a dry cassava chips cassava-processing plant, and each farmer sells to the processing plant 15 t of cassava roots, the plant will be able to operate 100 days a year, will process 100 t of dry cassava chips (1 t per day) and net profit would be around 4.950.000 Tsh per year. This amount is equivalent to approximately US\$ 4,620. Divided by 20 members, it means an extra income of around US\$ 230 per farmer.

ANNEX 7: CASSAVA PRODUCTION IN MALAWI–FIELD TRIALS

SARRNET initiated in October 2001 some field trials aimed at evaluating the technical and economic feasibility of intensive production systems for cassava and sweet potato leaves and roots in Malawi. These trials were conducted at the experimental site Kindajani, at the Chitedze research station in Lilongwe. These trials were kept growing for two consecutive years. Throughout this period, SARRNET team in Malawi used this experimental site as a demonstration site, very easy to access, in which several field days and demonstrations took place. Some of the experimental results obtained are presented as follows:

Cassava leaves production trial–Ratooning system

Three varieties (Silira, Mbundumali, Maunjiri)

Four planting distances: (1x 1); (0.5 x 0.5); (0.9 x 0.50) and (0.30 x 0.30) meters

Three repetitions, planting date: October 2001.

Four harvest periods: 15, 24, 44 and 56 weeks after planting

Area harvested: 15,6 sq.mt

Harvest system: ratooning

Table 5. Cassava leaves trials in Malawi–2001–2002. Ratooning harvest system.

Treatment (Variety x planting distance)	Fresh weight (ton/ha)
Silira (1 x 1)	35.7
Mbundumali (1x1)	41.1
Maunjiri (1x1)	39.8
Silira (0.5x 0.5)	40.4
Mbundumali (0.5x 0.5)	39.4
Maunjiri (0.5 x 0.5)	39.2
Silira (0.9x 0.5)	25.1
Mbundumali (0.9x 0.5)	38.9
Maunjiri (0.9x 0.5)	29.9
Silira (0.3 x 0.3)	44.9
Mbundumali (0.3 x 0.3)	46.2
Maunjiri (0.3 x 0.3)	33.0

Fresh weight is the average of five harvests at 15, 24, 44, 55 and 65 weeks after planting

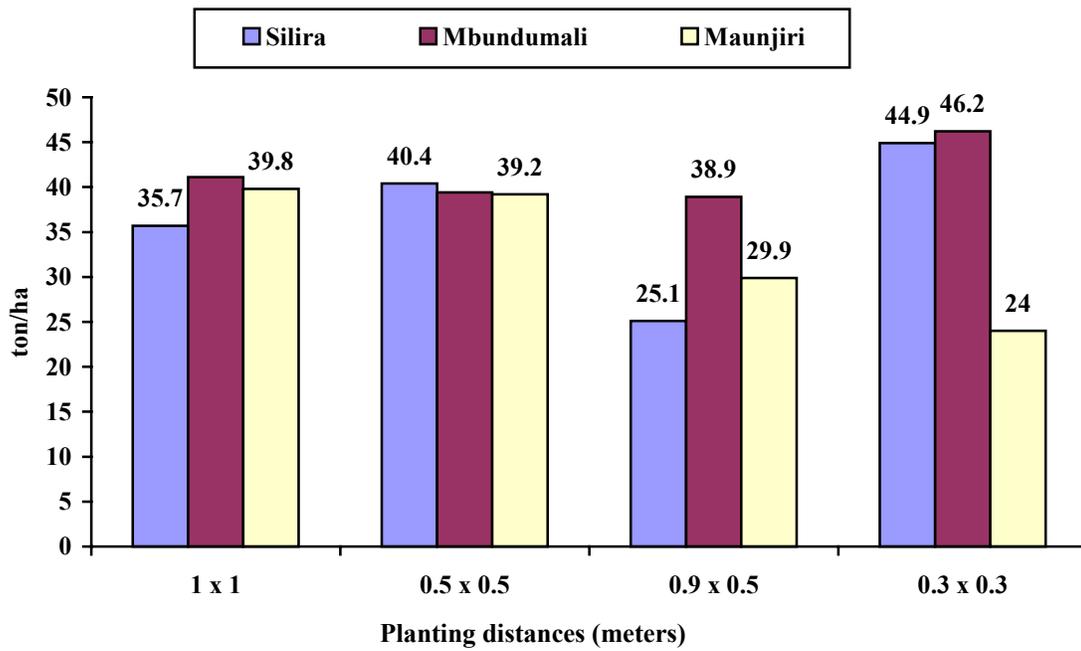


Figure 4. Cassava leaves production trial in Malawi. Ratooning system, total yield in five harvests.

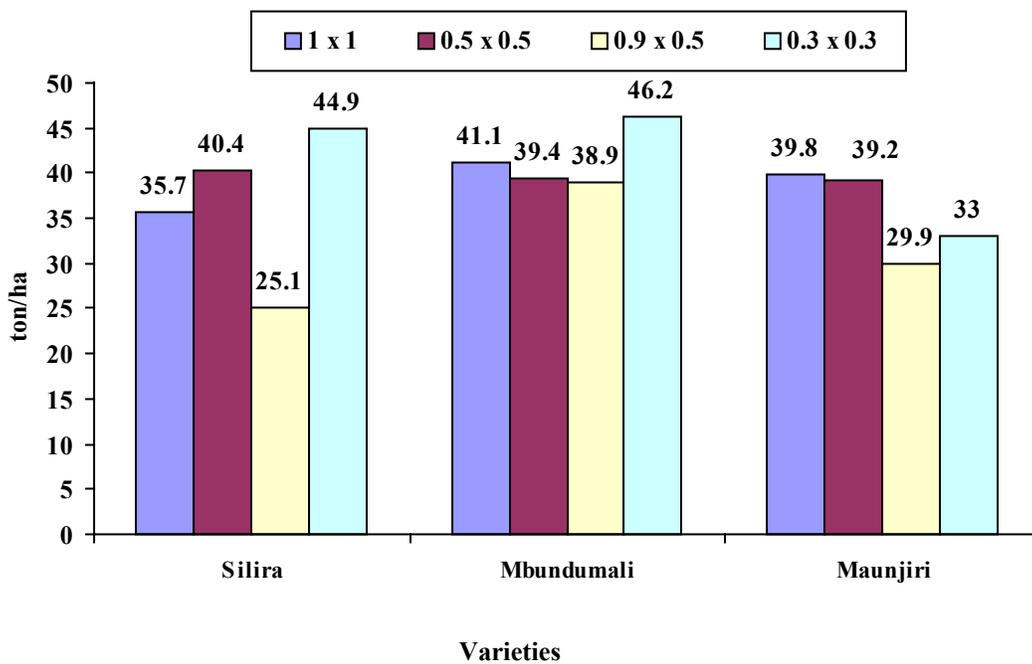


Figure 5. Cassava leaves production trial in Malawi. Ratooning system, total yield in five harvests.

Cassava leaves production trial–Detopping system

The experimental work with intensive cassava leaves systems in Malawi also included a comparison between the ratooning and the detopping system. The main difference is that the height of the plant at which the harvest is done. With the ratooning system, the cutting is done at the same height, about 20 cmts from the floor whereas with the detopping, the height at which the cut is done is usually higher.

The treatments, repetitions, planting distances and management of the crop were the same.

Three varieties (Silira, Mbundumali, Maunjiri)

Four planting distances: (1x 1); (0.5 x 0.5); (0.9 x 0.50) and (0.30 x 0.30) meters

Three repetitions, planting date: October 2001.

First harvest: February 12, 2002

Area harvested: 15,6 sq. mt.;

Harvest system: detopping

Table 6. Cassava leaves trials in Malawi–2001–2002. Detopping harvest system.

Treatment (Variety x planting distance)	Fresh weight (ton/ha)
Silira (1 x 1)	35.3
Mbundumali (1x1)	38.2
Maunjiri (1x1)	30.2
Silira (0.5x 0.5)	35.8
Mbundumali (0.5x 0.5)	30.8
Maunjiri (0.5 x 0.5)	34.7
Silira (0.9x 0.5)	21.2
Mbundumali (0.9x 0.5)	32.0
Maunjiri (0.9x 0.5)	28.0
Silira (0.3 x 0.3)	45.1
Mbundumali (0.3 x 0.3)	40.4
Maunjiri (0.3 x 0.3)	27.8

Fresh weight is the average of five harvests at 15, 24, 44, 55 and 65 weeks after planting

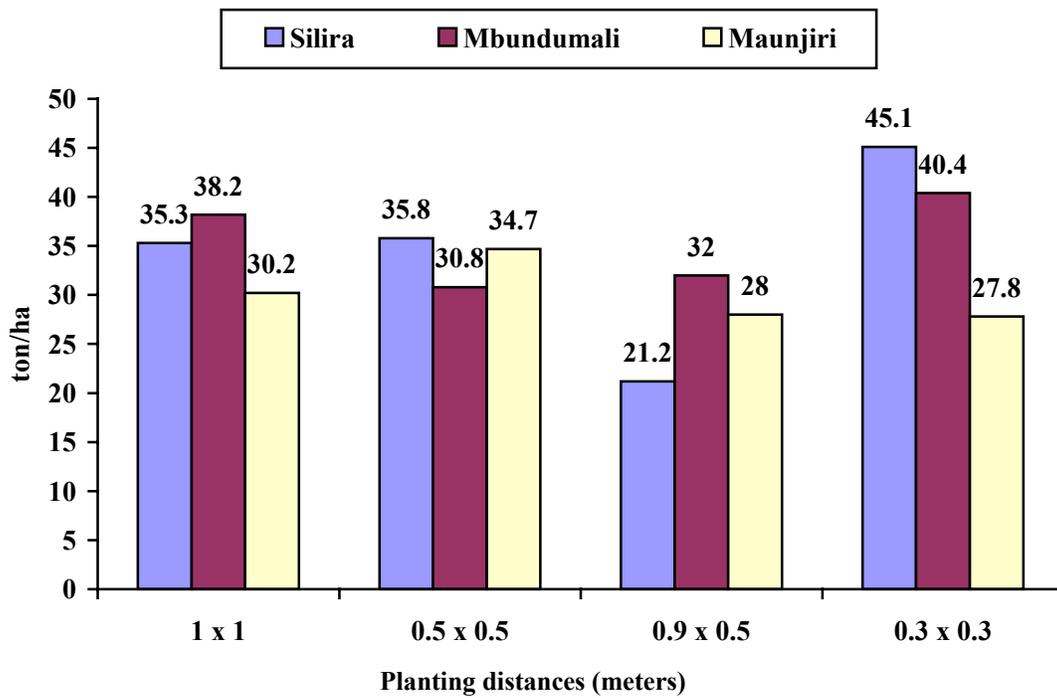


Figure 6. Cassava leaves production trial in Malawi. Detopping system, total yield in five harvests.

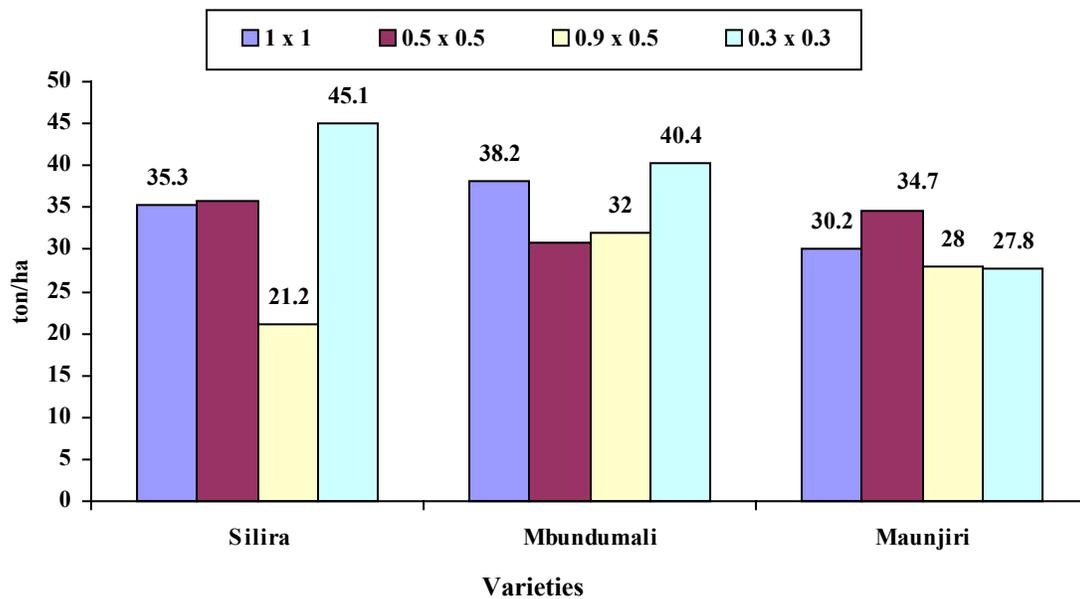


Figure 7. Cassava leaves production trial in Malawi. Detopping system, total yield in five harvests.

The results obtained in the experiments conducted during the last two years allow the following preliminary conclusions:

- The ratooning system was consistently a more productive system for production of cassava leaves. For the three varieties evaluated and with the four planting distances tested, total yield was higher when the ratooning system of harvest was utilized.
- The best results were obtained with the varieties Silira and Mbundumali suggesting a good adaptation of these two varieties to this intensive production system. Planting distances of .30 x 0.30 meters gave the highest yield, for both varieties.
- The rainfall pattern prevailing in one given region is by far the most determining factor in the establishment of intensive cassava leaves production systems, especially in cases where supplementary irrigation is not available.
- From the data obtained it can be observed that cassava plants grow satisfactorily up to the first harvest, then, with the dry season setting in, plant growth is almost stopped and several months later, with more rainfall, plant growth is recuperated. This suggest that in very dry regions, with more than 5-6 months of very low rainfall, the establishment of farming systems for intensive production of cassava leaves could be very risky.

Cassava roots production trial

Taking advantage of the existing experimental plots for cassava leaves production systems; the SARRNET team in Malawi conducted another experiment with the objective of looking at root yield of cassava plants after the last harvest of the foliage, and comparing it with similar plots that have been kept unharvested throughout the period of the experiment (72 weeks, 18 months). Table 7 and Figure 8 present the data obtained

Table 7. Yields of cassava production systems in two growing cycles. Malawi, 2001-2003.

Treatment (Variety x planting distance)	Fresh weight (ton/ha)		
	Detopping system	Ratooning system	Untouched plants
Silira (1 x 1)	18.4	13.0	44.9
Mbundumali (1x1)	28.4	14.3	40.4
Maunjiri (1x1)	33.5	24.6	56.6
Silira (0.5x 0.5)	22.0	11.8	35.0
Mbundumali (0.5x 0.5)	15.2	11.5	31.2
Maunjiri (0.5 x 0.5)	37.2	18.4	48.5
Silira (0.9x 0.5)	18.4	13.5	38.5
Mbundumali (0.9x 0.5)	32.3	17.5	34.2
Maunjiri (0.9x 0.5)	38.2	23.1	45.1
Silira (0.3 x 0.3)	8.3	5.8	20.3
Mbundumali (0.3 x 0.3)	8.8	6.5	13.4
Maunjiri (0.3 x 0.3)	24.8	15.1	44.9

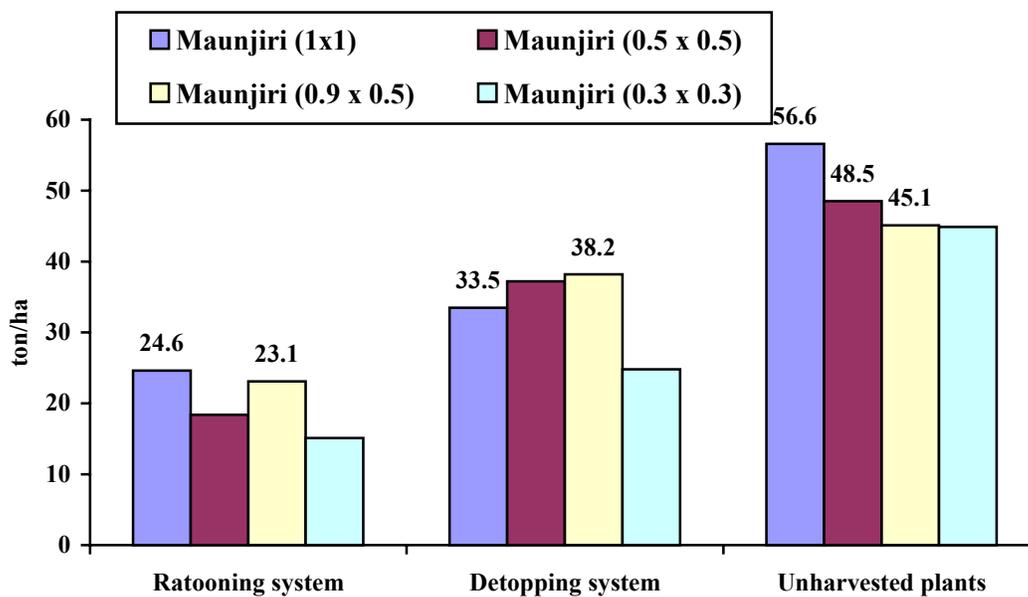


Figure 8. Yields of cassava production systems in two growing cycles. Malawi, 2001-2003.

The results obtained are very interesting. It can be noticed that despite the fact that plants were harvested five times, during the last harvest conducted 67 months later, there was still a significant production of roots. Data on dry matter of these roots was not available at the moment of preparing this report, so the information of the quality of the roots at this moment is missing. However, yields obtained were good and this suggests a crucial question: is it better to let the cassava crop grow for two cycles instead of one?

In a country like Malawi, with a short rainfall season and long dry season, what this preliminary experience is suggesting is that cassava plants when allowed to have two rainy periods, over a growing cycle of 15 to 18 months, could give very good yields (40-50 t / ha). This type of crop management is practiced widely in advanced cassava production systems such as South of Brazil, with average yields of 30 –40 t / ha.

To corroborate this, another piece of information was obtained recently by SARRNET-Malawi. It seems to indicate the same type of data. In November 2001, three farmers in Malawi decided to invest in a commercial scale cassava-growing scheme, and planted 55 has at a farm located in the outskirts of Lilongwe (Chitipi Farms). When it was time to harvest (September 2002), there was a huge demand for cassava planting material in Malawi and many internationally-funded projects, NGOs and even local institutions ended up purchasing cassava cuttings from these three farmers. They made a lot of money ratooning the crop that was presenting a vigorous development. The crop was let to grow for another cycle. Recently, SARRNET did an exercise at this farm to determine quality and yields of the crop. With planting distances of 0.90 x 0.70 (15.873 plants / ha), the yield assessment done by SRRNET-Malawi indicated an expected yield of 39.1 t per ha. The data obtained with cassava plants growing for two cycles deserves to be investigated further. It could be an alternative to develop and establish more competitive, efficient and sustainable cassava farming systems.

ANNEX 8: CASSAVA PRODUCTION IN TANZANIA - FIELD TRIALS

SARRNET personnel in Tanzania also established, in close collaboration with technical personnel from local institutions, a set of trials to test varieties and crop management practices for both, sweet potato and cassava (roots and leaves). The aim of these trials was to determine the potential yield gaps for both crops, when production packages that include external components are used. These components are mainly the fertilizers and the improved varieties. The comparison was made using the local, traditional cropping system as the check.

Data obtained in these trials and some of the preliminary conclusions are presented as follows:

Sweet potato fertilization trial-2001

Treatments: One variety (EIASI)

Four fertilization methods: chicken manure, cattle manure, NPK and without fertilization

Planting date: May 14th, 2001.

Harvest date: October 2nd, 2001

Three repetitions

Table 8. Sweet potato fertilization trials in Tanzania, 2001.

Treatment (Variety x planting distance)	Fresh weight (ton/ha)
Elias without fertilization (check)	5.20
Elias with cow manure	7.04
Elias with chicken manure	6.38
Elias with NPK	5.94

Fresh weight is the average of three repetitions

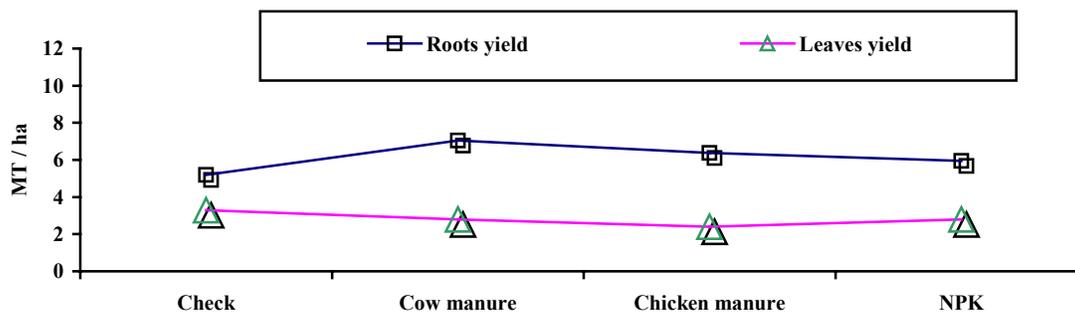


Figure 9. Sweet potato fertilization trial, Tanzania, 2001.

Sweet potato fertilization trial-2002

Treatments: three varieties: Eliasi, Simana, Ukerewe
 Four fertilization methods: chicken manure, cattle manure, NPK and without fertilization
 Planting date: April 4th, 2002.
 Harvest date: August, 30th, 2002
 Area harvested: 42 sq.mt

Table 9. Sweet potato fertilization trials in Tanzania, 2002.

Treatment (Variety x planting distance)	Fresh weight (ton/ha)
Eliasi without fertilization (check)	9.5
Elias with cow manure	12.1
Elias with chicken manure	16.9
Elias with NPK	16.1
Simana without fertilization (check)	5.1
Simana with cow manure	8.3
Simana with chicken manure	8.1
Simana with NPK	9.1
Ukerewe without fertilization (check)	8.4
Ukerewe with cow manure	9.9
Ukerewe with chicken manure	8.0
Ukerewe with NPK	13.5

Fresh weight is the average of four repetitions

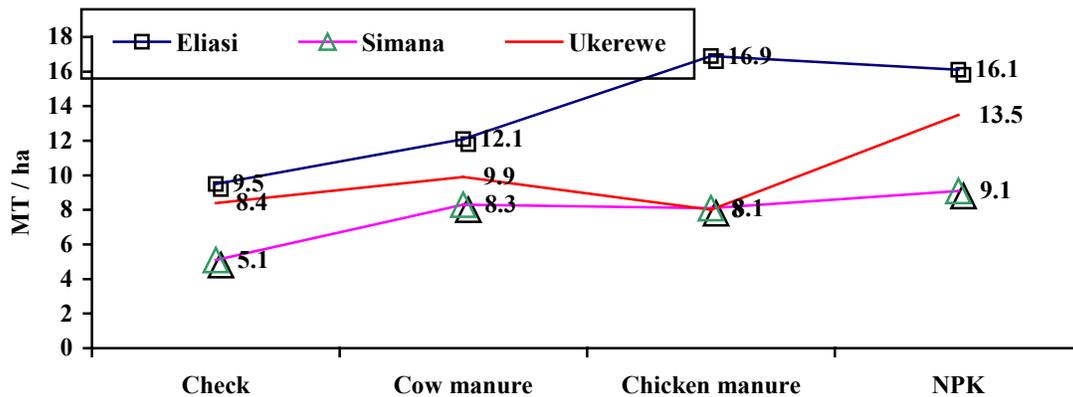


Figure 10. Sweet potato fertilization trial, Tanzania, 2002.

Data obtained in two consecutive years of trials indicates the importance of using fertilizers in sweet potato production systems. The best results were obtained with NPK and chicken manure. The variety Eliasi, one of the most popular in Tanzania, gave the poorest performance in all treatments. The variety Ukerewe gave the best yields, around 16 t/ha, for treatments, NPK and chicken manure. Although planting dates in both years were almost similar and growing period length was similar (19 weeks), yields in 2002 were almost 50% superior to those obtained in 2001, for all treatments. Main conclusion from this work is that with adequate crop management (improved varieties, fertilizer application), reasonable yields of sweet potato

can be obtained in a relatively short period of time. If this production can be used in processing activities for human consumption and animal feed markets, sweet potato can become a very important crop for helping farmers to increase food security, employment opportunities and incomes.

Cassava leaves production trials–Tanzania

The experimental work conducted in Tanzania to evaluate the potential yields that can be obtained with intensive cassava leaves production systems initiated in 2002. Plants were harvested at the same height (ratooning system) and only two varieties, the most popular, *Kibaha* and *Kiroba* , were used.

Treatments: two varieties (Kibaha, Kiroba)

Two planting distances: (0.5 x 0.5); and (0.30 x 0.30) meters

Two repetitions

Planting date: January, 2002.

Four harvests in 14 months

Area harvested: 15,6 sq. mt.;

Harvest system: ratooning

Table 10. Cassava leaves trials in Tanzania, 2002.

Treatment (Variety x planting distance x fertilizer application)		Total fresh weight (ton/ha/14 months)
Chicken manure	Kiroba (0.3 x 0.3)	43.0
	Kiroba (0.5 x 0.5)	33.1
	Kibaha (0.3 x 0.3)	37.9
	Kibaha (0.5 x 0.5)	40.9
Cow manure	Kiroba (0.3 x 0.3)	21.4
	Kiroba (0.5 x 0.5)	17.9
	Kibaha (0.3 x 0.3)	22.4
	Kibaha (0.5 x 0.5)	15.5
Without fertilizer (check)	Kiroba (0.3 x 0.3)	21.9
	Kiroba (0.5 x 0.5)	15.7
	Kibaha (0.3 x 0.3)	21.5
	Kibaha (0.5 x 0.5)	17.6

* Fresh weight is the average of two repetitions

Cassava leaves production trial in Tanzania

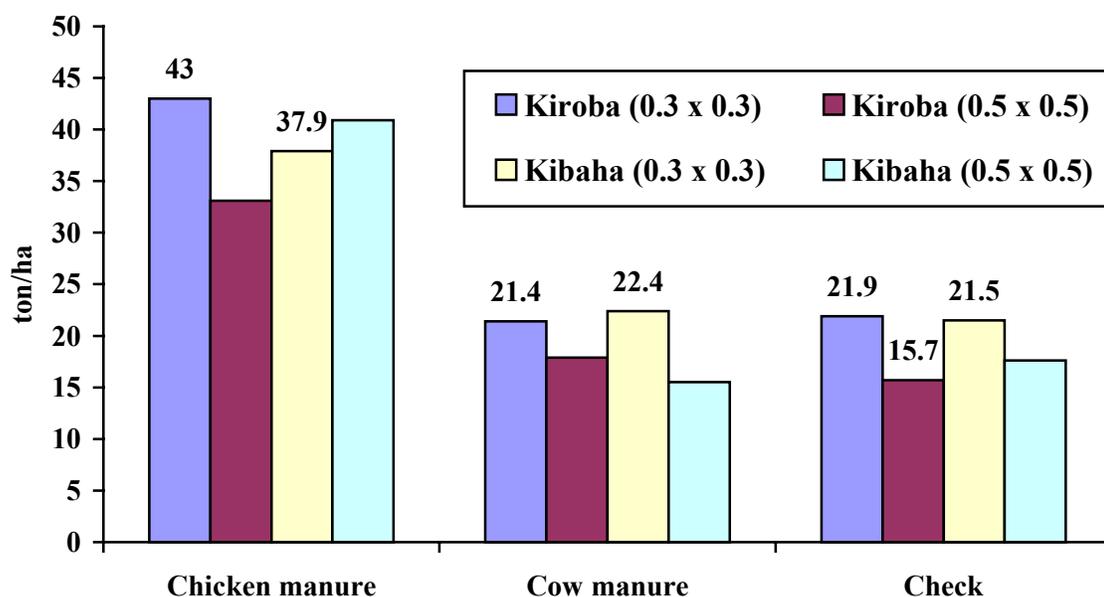


Figure 11. Cassava leaves production trials in Tanzania, 2002.

Yields are the average of the fourth harvests (at 120, 240, 360 and 450 growing days)

Data obtained indicates that in all treatments (varieties, fertilization method), the use of chicken manure gave better results and planting distances of 0.30 x 0.30 gave the best yields. The use of cow manure gave similar results to those obtained with the check.

Cassava root production trials–Tanzania

Some experiments were conducted to determine the effect of fertilization management on cassava roots production. The experiment was harvested with 11 months. Treatments used were as follows:

Two varieties (Kibaha, Kiroba)
 One planting distance: (1.0 x 1.0) meters
 Three repetitions
 Planting date: 26th January, 2002.
 Harvest date: 19th December , 2002
 Area harvested: 100 sq. mt

Table 11. Cassava root production trial, Tanzania, 2002.

Treatment (Variety x planting distance x fertilizer application)		Total fresh weight (ton/ha/14 months)
Green manure	Kiroba	13.3
	Kibaha	7.0
Chicken manure	Kiroba	10.2
	Kibaha	9.8
Without fertilizer (check)	Kiroba	14.7
	Kibaha	4.8

* Fresh weight is the average of three repetitions

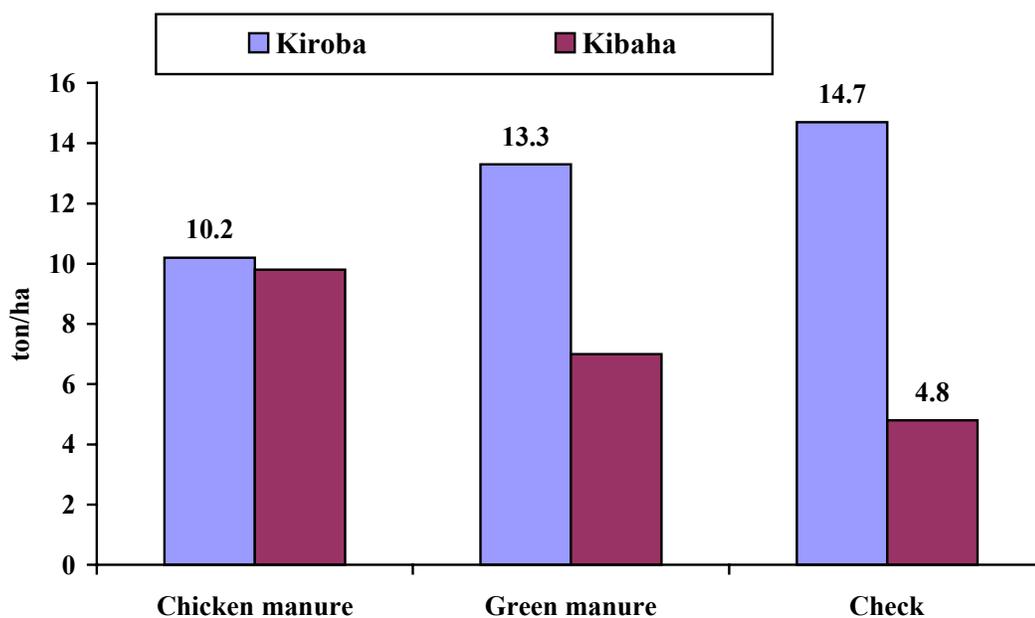


Figure 12. Cassava roots production trial in Tanzania.

Yields are the average of tree repetitions.

Data obtained indicates that yields are relatively low; Kiroba variety responded better to fertilizer application and green manure gave better results than chicken manure. This work could serve as the basis for a more in-depth study about the importance of proper management of soil fertility in cassava roots production systems in Tanzania.

Annex 9 Success story: Cassava enters the estate subsector: The case of Chitipi farms in Malawi

Cassava has always been taken as a poor man's crop in many countries in SADC. Over the years, government policies have sidelined cassava on both policies of food security as well as those of income generation and wealth. In Malawi, more than thirty years have passed since independence in 1964 with no deliberate policy on cassava but with many deliberate policies on other food crops like maize, groundnuts, and other cash crops like tea and tobacco. Traditionally, cassava was a widely grown crop in the lakeshore areas of Lake Malawi for subsistence farming.

The story, however, is changing with the efforts of SARRNET, Ministry of Agriculture and other stakeholders. With technical assistance from SARRNET, one large estate in Malawi (Chitipi farms) has started the cassava race. Chitipi farms is one of the tobacco farm that is now diversifying into cassava production.

Efforts started in the early 1990's on the improvement of cassava through breeding program by the Department of Research and the FAO Cassava Project with backstopping from IITA through the then defunct ESARRN (East and Southern Africa Root Crops Research Network). In 1994, SARRNET took over from ESSARN. In Malawi, several improved/recommended varieties such as *Gomani*, *Manyokola*, *Maunjiri*, *Silira* and *Mkondezi*, were multiplied and distributed. By the year 2000, the crop's economic potential in the country was seen in the commercial sector. With promotion efforts, several industries in Malawi have gone into cassava utilization in the confectionery, milling, plywood and textile industries. However, the main challenge is production and processing of high quality cassava products. Most of the cassava produced in Malawi is for subsistence and for the very profitable fresh market.

To promote cassava production in Malawi, SARRNET visited some estates, one of which is Chitipi farm. The management of the state were convinced to grow cassava as a cash crop and replace tobacco, which its market is dwindling as of late. Initially, the estate allocated only 60 ha of its land to cassava. The estate produced very good cassava with technical backstopping from SARRNET. SARRNET also inspected the planting material and found out that it was disease free and recommended it for sell to various NGOs and individuals who were looking for cassava planting material. The estate sold a lot of cassava planting material and made about US\$47,000. Because of the profits made, the estate has expanded production to 120 hectares. Chitipi farms plans to gradually replace tobacco and maize with cassava. Regarding the roots, the plans are to process them into starch, flour or pellets.



Figure1: Cassava at Chitipi Farms at the time of establishment: Over 70% of the earliest crop survived a month of drought and termite soon after planting.

The farm has become a centre of attraction. Of late, high powered delegations of government officials pioneered by the Principal Secretary (PS) in the Ministry of Agriculture have been visiting this farm. The PS organised heads of all departments in his ministry including research, extension, university and other officials involved in policy and planning to visit Chitipi farms.

After a visit to the farm, the PS invited all the visitors and the directors to a round table discussion on strategies and policies' regarding cassava development due to it's many opportunities. There attitude towards the crop was positive with the heads in the Ministry of Agriculture discussing ways of trying to promote cassava with all their resources. SARRNET was assured of full support of its major aim, which is commercialisation of the crop to tackle poverty through food security and income generation among the rural farmers. This aim was featuring high among the participants at the round table discussion who were trying to find ways of boosting cassava production from the smallholder farmers and how the estate and the industrial sectors can take advantage of smallholders' production capacity. Officials of Ministry of Agriculture showed total commitment to boost the crop.

They were open enough to say that the developments in cassava in Malawi by SARRNET are a shining example. They expressed that SARRNET commitment to promote the crop that has great potential but very little was known must be commended. The ministry pledged continued support for this initiative. For example heads of various departments expressed commitment that they would promote availability of seed through irrigation; extension programs, and support all programs that contribute to sustaining the developments in cassava through research, production and commercialisation.



Figure2: Gov't officials at Chitipi Farms. The PS (Dr E. Malindi) 2nd left between two of the farm's directors Mr Davids left and Mr Nazil 3rd left. 4th left is SARRNET coordinator Dr N.M Mahungu followed by Bunda College Dr S. Khaila and USAID Rep. Mr Dixie Kampani



Figure 3: Round Table discussion after the field visit at Chitipi Farm.

Annex 10 Success story: Promotion of cassava silage as a feed for dairy animals- Katete farm.

The development of livestock industry in Malawi is constrained by several factors. One of the most important limiting factors is feed. Production of livestock feed from folders, cereal or grain legume is limited by such factors as land, management, market, and competition with human food.

Dairy farmers in Malawi are faced with an ever-increasing constraint of feed to their livestock. The problem is there because Malawi imports most of its concentrate feed rations or their raw materials. The problem is compounded with the food deficit problem that is starting to be chronic in Malawi. When there is a food deficit, the maize bran usually used as a high energy based feed for livestock, is consumed by the food deficit farm families.

Cassava is a crop that can be used to prepare a balanced ration for feed for livestock. The cassava roots are a good source of carbohydrates while cassava leaves are a good source of proteins. A farmer who adopts cassava may save a lot of resources because of the high yield advantage that cassava has over other crops and also its low-cost field management characteristics. The farmer may get adequate food, adequate feed for his animal and save much more from a piece of land put to cassava than the yield equivalent that he obtains with a cereal-based crop for his feed alone.

A dairy animal needs 15 tones of cassava silage per year made from four parts cassava leaves and one part roots. One ha of land with cassava can harvest 100tones of leaves per year planted closely (40cm by 40cm) and 1ha of cassava planted at 90cm by 90cm following recommended management can harvest 25-30 tones of roots per year. This means that 15% a hectare of cassava (0.15ha) can roughly feed a dairy animal if planted for leaves and 0.15 ha for roots. A single dairy animal therefore requires 0.3ha of cassava. Although this land size is equivalent to the resource poor farmer's land holding it is much below the average land holding of cattle keepers and dairy farmers in Malawi.

In view of these facts SARRNET in collaboration with CIAT and CLAYUCA conducted cassava feed trials in Malawi and Tanzania with livestock farmers. In Malawi, for example, trials were conducted with Katete farm (One of the commercial dairy farms). The research was aimed at determining the acceptability of cassava silage by dairy animals, the effect of feeding cassava root and leaf silage on the health of the animals and milk yield. Six animals were used of which 3 were fed from cassava silage (80% leaves and 20% roots) and the other 3 were controls fed on grass and maize silage. Weight of the animals and date of birth were taken before the experiment and body observations were taken. Fresh leaves and roots were chopped using pangas and tractor-operated chopper to make the silage. Results indicated that the animals accepted the cassava silage and that their body conditions/health were improved. The cassava silage increased milk yield from an average of 6 litres/animal/day to 13 litres (Figure 1). Economic analyses of feeding cassava on dairy animals indicated that every Kwacha invested in cassava silage brought a return of K49.20 in milk as opposed to investment in maize/grass silage which brought a return of K14.00 only. There seems high potential for improving the dairy industry by using cassava silage in Malawi.



Cassava at Katete farm

Because of these convincing findings, Katete farm has adopted cassava production. Now, 5 hectares of cassava are grown on the farm for making cassava silage for the dairy animals.

Figure 1. Graph showing the effect of feeding cassava silage on milk yield

