Association for Strengthening Agricultural Research in Eastern and Central Africa

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ANNUAL PERFORMANCE REPORT

EAST AFRICA ROOT CROPS RESEARCH NETWORK

(EARRNET)

REPORTING PERIOD: October 2004-September 2005

Association for Strengthening Agricultural Research in Eastern and Central Africa

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PART A

TECHNICAL PERFORMANCE REPORT

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ACRONYMS

ASARECA : Association for Strengthening Agricultural Systems in East and Central Africa
AYT : Advanced Yield Trial
BECA : Bioscience in East and Central Africa
CGS : Competitive Grant System
CFC : Small Scale Cassava Processing and Vertical Integration of the Cassava Sub-Sector in Southern and Eastern Africa
CMD : Cassava Mosaic Disease
CRS : Catholic Relief Services
DMC : Dry matter content
DRC : Democratic Republic of Congo
EARRNET : East Africa Root Crops Research Network
ECA : East and Central Africa

ECAPAPA	: Eastern and Central Africa Programme for Agricultural Policy Analysis
FCR	: Food Convention Rate
KEPHIS	: Kenya Plant Health Institute Services
MEAPU	: Monitoring, Evaluation, Analysis and Planning Unit
NARS	: National Agricultural Research System
NAARI	: Namulonge Agricultural and Animal Research Institute
NARO	: National Agricultural Research Organisation
NGO	: Non government organization
PYT	: Preliminary Yield Trial
SAARI	: Secretariat of Agriculture & Animal Resources
SAARI	: Serere Agricultural and Animal Production Research Institute

Executive Summary

The East Africa Root Crops Research Network (EARRNET) has ended the year 2004/2005. EARRNET mission is to transform cassava into a broad-based commercial commodity for sustained food security, poverty alleviation, and income generation through integrated regional production, utilisation, marketing and trade. The network's overall objective is 'increased economic growth and improved livelihood in the East and Central Africa (ECA) region while enhancing the quality of the environment. Its strategic objective is to expand potential utilization of cassava through the provision of market-oriented technologies to public and private sector stakeholders with strengthened capacity to identify and exploit local, regional and international market opportunities. EARRNET is being implemented by the International Institute of Tropical of Agriculture (IITA) on behalf of ASARECA in direct collaboration with NARS of Burundi, D R C, Kenya, Madagascar, Ethiopia, Rwanda, Sudan and Uganda. Tanzania officially joined the network in May 2005.

Following the competitive grant system introduced, EARRNET submitted two projects proposals to ASARECA CGS but their assessment took longer than anticipated. The projects were officially approved in May 2005 and yet they were submitted in October 2004. The development of agreement contracts and their signature administrative procedure between IITA/EARRNET and different NARS took another time. .All these delayed the start of the implementation of the projects.
Due to these problems, again very limited activities were accomplished and that is what is reported in this document.

Adding value to cassava through feeding chicken experiment was completed with Ugachick. Results confirmed that 10 and 20 % substitution of maize by cassava dry chips did not show any significant difference from the normal feeding of chicken with 60% of maize. The impact study of introduction of improved CMD resistant cassava varieties in Western Kenya was accomplished. The study assessed the gain and distribution of farmers' wealth through the new varieties as well as the efficiency of the breeding and dissemination process. The results show that the new varieties significantly increased production and marketing potential in the farmers fields

compared to the old varieties, but the adoption rate was only 30 percent. Explanations are higher potentials of competing crops like maize and beans in terms of cash income and productivity, and problems with the new varieties' characteristics, like little drought resistance and long cropping cycles. Large commercial farmers rather switch to other crops, whereas subsistence oriented small farmers are likely to adopt. Access to information and social capital highly affect adoption, with farmer-to-farmer propaganda being the most efficient means of dissemination.

The cassava germplasm maintenance and evaluation continued at Serere Research Station. Also a new seedling of 550 families containing a material that has a source of tolerance to cassava brown streak disease (CBSD) was established.

Two technical workshops were organised to review and redesign appropriate implementation strategies for the two projects given the time lag between submission and approval. Backstopping national programs and regional training for capacity building were implemented by the coordination unit. In collaboration with IITA projects proposals were developed and funded to support NARS activities.

1. EARRNET Programme Performance

1.1 Progress Achieved during Reporting Period

1.1.1 Evaluation of cassava in animal feed with Ugachick

Most of feed manufacturers in Africa rely on cereals, especially maize whose production is dependent on rainfall leading to scarce supply and competition between human and animal consumption. Stability of cassava production in drought-prone areas is prompting feed manufacturers to adopt cassava as the alternative energy source in feed formulations. In addition, foliage and other plant parts are a source of protein, vitamins and minerals which could reduce cost of animal feed production. In a bid to diversify cassava utilization, EARRNET in collaboration with Ugachick Poultry Breeders Ltd. took the lead in testing the potential of incorporating cassava into animal feeds in the region. The specific objective is to replace a reasonable percentage of maize by cassava in feed formulation and increase provitamin A content in egg through feeding layer chickens on yellow root cassava based feeds

Methodology /Progress

- Evaluation and multiplication trial of yellow root cassava clones has been established at Ugachick
- Chicken feeding trials using feeds with differing proportions of cassava have been carried out.

Results

Broiler growth rates from all feeds followed a similar trend with approximately 2 kg (body weight) at 42 days of age (Figure 1).

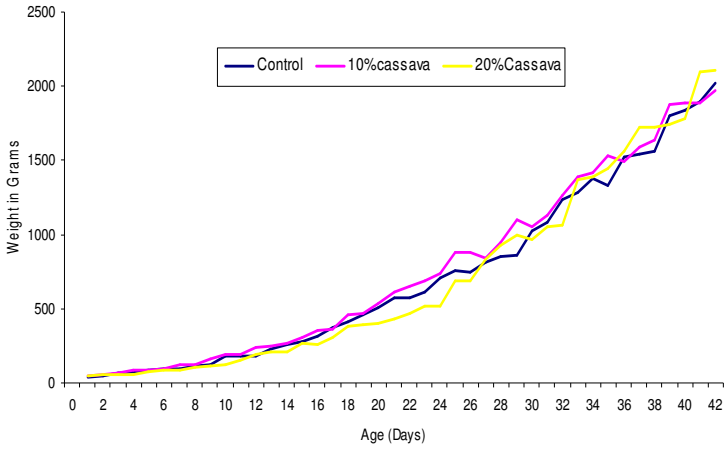

Fig. 1: Performance (weight gain) of broiler chickens fed on feeds with 10% & 20% cassava against maize based feed

Maize based feed gave a better feed conversion ratio (FCR) (1.9) than 20% cassava (2.0) and 10% cassava (2.2) (Figure 1). The high cassava based feed FCR could have resulted from the low digestibility and dustiness of the feed visa-a-vis maize particles, preferred by birds. To increase efficiency of cassava based feeds, manufactures may consider pelletizing other than mashing the feeds and with this form Ugachick is projecting to use up to 40% cassava in palletized feeds. Meanwhile Ugachick acquired a feed pelletizer to ensure that cassava based feeds are free of growth

inhibitors of microbial origin that contaminate cassava during storage. This will also reduce the dustiness of cassava.

1.1.2 Impact study of the use of improved varieties in Western Kenya

In 1995, there was an outbreak of Cassava Mosaic Virus Disease (CMVD) pandemic in western Kenya, which caused about 60% drop in cassava production with an estimated loss of USD 10 million per annum (Thresh, 1997). In an effort to re-establish productivity of the cassava systems, in 1997, KARI, IITA and EARRNET in collaboration with various research and development stakeholders responded by selecting high yielding CMVD resistant varieties and accelerated multiplication and distribution of these varieties to mitigate the scourge under the project: "Accelerated multiplication and distribution of improved cassava varieties".

An impact study was then carried out in six administrative districts: Busia, Teso, Siaya, Homa Bay, Rachuonyo and Kuria of Western Kenya with objectives to a) determine pattern of diffusion and adoption of the introduced improved cassava varieties; b) determine technological and socio-economic factors that affect diffusion and adoption; and c) assess impacts of the introduced improved cassava varieties.

In particular, the objectives were:

- To determine the increase in producers' income and consumers' utility through the productivity increase induced by the new varieties
- To assess the possible future impact on cassava markets and revenues of a further productivity increase in the cassava sector
- To determine spill over effects on cassava markets in regions adjacent to Western Kenya
- To determine the equity and distribution effects across economic and social strata of farmers in the region.

In summary the results indicated the following:

Adoption

The results show that Migyera was the most widely grown variety and therefore the variety of interest among improved varieties. Of all the varieties grown in Teso district, 81.8 percent was Migyera (Table 1). In other words, Teso district had the

highest proportion of Migyera whereas Homabay and Rachuonyo had no Migyera at all. On the other hand, the two most common local varieties – Magana and Matuja, and these were mostly grown by 63.6% households in Busia district. Serere seemed to be very important in Homa Bay and to a lower extent in Busia, whereas SS4 is almost exclusively grown in Busia. Other improved varieties like the two MM96 varieties are grown in a very small proportion in Busia. Nase 4 is grown exclusively in Teso. Most of the farmers who initially adopted Migyera and SS4 are still growing the varieties, whereas those who initially adopted Serere have stopped growing this variety after some time due to CMD.

Table 1: Distribution of cassava varieties by district in Western Kenya

District / Variety	Busia	Teso	Siaya	Homabay	Rachuonyo
Migyera	9.1	81.8	3.8	0	0
Serere	6.1	0	0	55.6	0
SS4	12.1	0	0	0	0
MM96/1871	3.0	0	0	0	0
MM96/5280	6.1	0	0	0	0
Nase4		12.1	0	0	0
Total improved	36.4	93.9	3.8	55.6	0
Local varieties	63.6	6.1	96.2	44.4	100

Figures in percent grown. No cassava plot data available for Kuria.

Source: Field survey 2004.

Distribution patterns

The improved varieties were introduced by a joint cassava project of KARI, IITA and EARRNET. About 20 percent of the farmers of the farmers in the study sample participated in the cassava project. The different information sources provided for the farmers are of different importance. The most important source of information is fellow farmers (17 %), followed by the extension agents (10 %), and NGOs (8 %). Researchers play a minor role (7%), as well as seed dealers (4 %) and demonstration

plots (3.5 %). Of little or no significance as sources of information for farmers are print media, such as scientific publications or posters.

Of interest is the source of planting material, as it apparently differs from variety to variety, as the example for Migyera and SS4 shows. Most of the Migyera is bought from remote markets, possibly from adjacent Ugandan markets. Further, free exchange from other farmers and purchases from other farmers played an important role. SS4 is mainly obtained free from other farmers, extension and research organisations. Purchases from markets, both remote and local, play a minor role.

Socio-economic factors influencing adoption

Socio-economic factors were integrated into the logit model analysis, as well as preferences by the farmers on characteristics of cassava varieties. The latter set of variables indicates whether or not the farmers had their needs for specific characteristics satisfied, as the adoption of new varieties follows the preferences. Cassava related socio-economic factors influencing adoption very strongly and positively are participation in the cassava project, and experience with the CMD, indicating that the new varieties have not yet spread beyond the range of the project.

Higher educated male led households are more likely to adopt than lower educated and female headed households. Household size does not seem to be a significant factor influencing adoption.

Distance to town is an important factor influencing adoption: The closer the farms are to major towns, the higher is the probability of adoption. The above variables also indicate that adoption highly depends on characteristics attributed to human and social capital. Smaller farms seem to have higher adoption probability than large farms, and farms with a high proportion of off-farm income as well. Large farms with sole dependence on farm income and thus presumably more market oriented farms are not among the adopters. The improved cassava varieties seem to be of higher interest for small farmers with rather home-consumption or subsistence oriented production, as they obtain their income from off-farm sources.

Considering farmers' preferences for characteristics of improved varieties, it can be said that farmers who are more likely to adopt that are those looking for high yields, disease resistance, low cyanide content and long storage life. Farmers that have looked for early maturity and drought tolerance have apparently not been satisfied and did not adopt. These attributes are found rather in adapted local varieties, which would explain the still high significance of the local varieties in the cassava production portfolio and indicates the need for breeding efforts in that direction.

On farm effects on cassava productivity

The cost benefit analysis for the two different cassava types yields the respective figures (Table 2). For the cassava yields, a price of 10 Ksh per kg was assumed as observed in the survey. Although largely similar, the costs differ slightly for the production systems. Improved varieties have a higher cost of planting material, but lower costs in management, with similar harvesting costs. The latter might be due to the fact that despite lower yields, similar efforts have to be made to harvest smaller roots. The gross margins for the improved varieties are, as a result of the similar costs structure and the double yield compared with the local varieties, twice as high as the gross margins for the local varieties. It can thus be said that the improved varieties are highly beneficial to the farmers in terms of revenues and food production.

Table 2: Gross margins for local and improved varieties in western Kenya

Variable	Local	Improved
Costs of production (Ksh per ha)	13,027	13,214
Revenues for fresh tubers (Ksh per ha)	43,580	73,349
Gross margin (Ksh per ha)	30,553	60,135

Source: Own calculations

Welfare effects

Adoption rate by acreage

In addition to the adoption rate by farmers, the adoption rates in terms of acreage covered were estimated using a logistic function estimated for 15 years (1997-2012)

of the adoption process on the basis of the observations made in the seven years of dissemination (Figure 2).

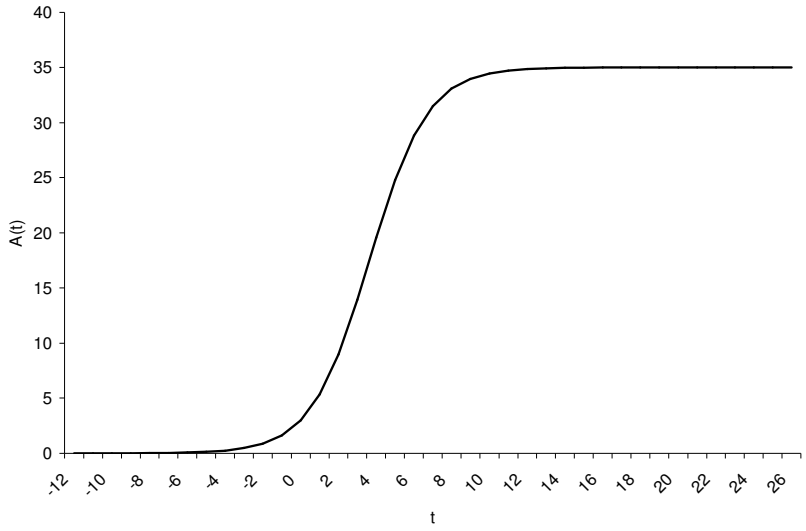

Figure 2: Adoption process by acreage

It can be shown that the maximum share of acreage covered lies at around 35 % of the total cassava acreage. Nonetheless, as the total cassava acreage, i.e. local and improved varieties has also been growing during the observation period, 35 % of the total acreage would translate into about 37 % of the initial acreage covered by cassava in the study sample. When looked at it by comparing the most severe year, 1999, to the future in 2012, the picture is even more drastic. Compared to 1999, the increase of acreage in cassava will amount to 61 %, with the increase of area under improved varieties of more than five times.

Market effects of adoption

Market effects are analyzed by shifting a linear supply function along a linear demand function (Figure 3). The supply shifter is calculated on the basis of the acreage adoption function. Through this shifts, consumer and producer surpluses are calculated, with the consumer surpluses separated according to benefits for subsistence consumers (consumption from own production) and market consumers.

Table 4 shows a summary of the market analysis. The welfare loss in Kenya through 1996-1999 was estimated at slightly above 8 million US $, thus lower than originally

estimated. So far, the recovery from 2000-2003 amounts to more than 17 million US $ and will reach around 5 million US $ annually up to the year 2012.

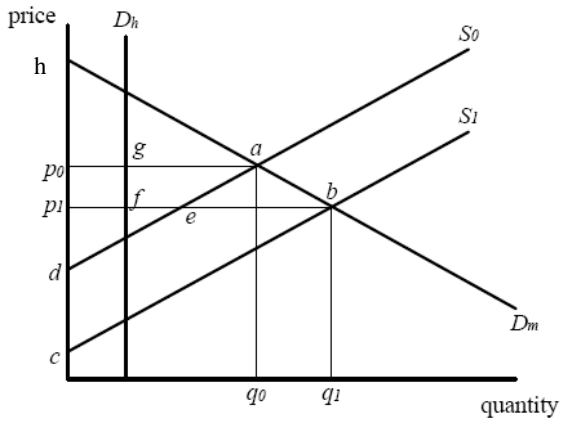

Figure 3: Market effects of technical innovations

Real cassava prices, as predicted by the model, are to drop by around 20 % due to the introduction of the new varieties. This is relatively low and probably due to the overall food price increases in Kenya during the late nineties. As at the same time investments into developing and disseminating the new varieties have been relatively low, the internal rates of return on this investments amounts to 635 % (Table 3).

Table 3: Developments in the cassava sector 1999-2012

	Absolute values	Change in %
Area under cassava 1999	25,050	
Projected area under cassava 2012	40,209	61
Area under improved varieties 1999	2,248	
Projected area under improved varieties 2012	14,065	526
Cassava production 1999 local varieties only (metric t)	167,835	
Cassava production projected for 2012 with improved varieties (metric t)	372,071	122
Real cassava prices (kshs/kg 1999)	5.93	
Real cassava prices projected for 2012	4.78	-19
Consumer surplus gains assigned to improved varieties 1999-2012 (US $)	32,894,392	
Producer surplus gains assigned to improved varieties 1999-2012 (US $)	36,370,136	
Investments in CMD resistant varieties breeding and dissemination (US $)	300,000	
Internal rate of return (%)	635	

In conclusion, the study shows that through the introduction of improved varieties, the losses that had been caused by the CMD have been more than compensated. The improved varieties show a good performance, with double the yields and hence gross

margins than the local ones. However, adoption rates are lower than the ones that have been reported elsewhere, they are presently at 30 percent only and expected not to increase beyond 40 %. This might be due to stiff competition from other cash and food crops, which also show increasing profitability due to increasing food prices in Kenya, but also due to some characteristics in which the improved varieties perform not as well as the local ones, namely adaptation to the local environment and taste.

Concerning the target groups, the new varieties seem to have reached the more vulnerable small scale farmers, yet the ones that have more human and social capital. Market orientation still goes towards other crops, and not to cassava, which indicates a lack of post harvest systems' performance in the region.

The wealth generated by the new varieties is quite high, and so are the returns on investments. The positive market effects are induced by the relatively low price reaction to the increased supply, resulting from an elastic demand. This again is due to the relative food shortage in the reference period, which resulted in similarly high prices for other crops like maize. Had the innovation come at another time, price effects could have been more severe and thus decreased welfare and adoption. Another point is the low investments that were necessary to cope with the situation. This shows comparative advantages of the present cassava breeding and dissemination systems, and its capability to react quickly and efficiently.

1.1. 3 Technical Projects Meetings

Through the ASARECA CGS, EARRNET secured funding for two projects developed last year. To kick start implementation of these projects two technical meetings were organised. The meeting of project 1 (Promotion of appropriate production technologies [varieties and production practices] for food, flour and feed for the ECA region) was held in Nairobi, Kenya on 18-19 August while that of project 2 (Promotion of improved cassava chipping and drying technologies for enhanced utilization of quality chips in animal feed) was organized in Kigali, Rwanda on 30-31 July 05..

The main objectives were to: a) to explain the purpose, methodology, activity, budget and work plan of project to enable participants have an in-depth picture of the project and b) to review and redesign appropriate implementation strategies for the project given the time lag since the project was approved.

Research teams were composed and responsibilities were assigned. Project 1 meeting was attended by 16 participants whilst project 2 meeting was attended by 12 participants.

1.1.4 Development of quality standard and policy for cassava and cassava products

The Network, in collaboration with East and Central Africa Programme for Agricultural Policy Analysis (ECAPAPA) has embarked on developing and harmonizing cassava quality standards and policy environment in the ECA region. This initiative is expected a) to develop quality standards and policy of cassava-based products at national and regional levels, b) to harmonize the quality standards of cassava and cassava-based products in the region; c) to increase awareness on the benefits of harmonized quality standards at national and regional levels , and d) to increase use of cassava-based raw materials in food, feed, pharmaceutical and other related industries in the region.

The first regional EARRNET/ECAPAPA consultative meeting of experts on quality standards and policy of cassava sub-sector in the ECA region was held on 31st March 2005 at the IITA/ESARC head office, Kampala, Uganda. This meeting drew experts from six countries in the East and Central Africa (ECA) region i.e. Burundi, DR-Congo, Ethiopia, Kenya, Madagascar and Uganda. The meeting was organized to review cassava quality standards and policy related issues within the ECA and develop a roadmap for harmonizing them across the region. A questionnaire was developed and the survey was conducted in the three participating countries (Madagascar, Kenya and Uganda) and a report is being compiled so as to hold the second consultative meting to discuss the findings.

1.1.5 **Capacity buildings**

a) SAS Training

The Network in collaboration with the International Institute of Tropical Agriculture (IITA) organized a two weeks regional training course on data analysis using SAS from 20th June to 1st July 2005**,** at the National Banana Resource Centre, Kawanda, Uganda**.** The training attracted 38 participants from 8 countries.

The course was specifically designed for persons who are involved in handling experimental data from field/laboratory and surveys that involve ordinal and/or continuous data. The aim was to enable participants acquire skills in designing and analysing experiments using SAS package. After the course, participants were expected to have a better understanding of SAS and its features in designing, analyzing and interpretation of experimental results.

b) IPM Training

This was also organized in collaboration with IITA at Namulonge Agriculture and Animal Research Institue (NARRI) Uganda. Ten participants were trained from five countries, (Burundi, DR Congo, Ethiopia, Rwanda and Tanzania), two from each county. The training objective was to expose the participants from NARs on Cassava Integrated Pest and Disease Management (IPM/IDM) techniques and how to collect, assemble, analyse pest and disease data

c) Training of extension agents from Uganda and Southern Sudan

The Network in collaboration with CRS Sudan and WV-Uganda organized a training of field extension staffs on a) cassava rapid multiplication technique, b) agronomy and production of cassava, b) pest and disease management, c) post harvest handlings and d) on-farm trials. For Uganda, a total of 37 extension agents (9 female and 28 males) were trained while the 14 trained in Sudan were all men.

1.2 Performance towards Achieving Purpose/Objective and Results

Although there has been a delay of getting projects started, the network members are now better organized and are in good mood to implement the research programs activities planned.

2. Research & Development Highlights

2.1 Germplasm improvement, conservation and exchange

2.1.1 Evaluation of yellow root cassava genotypes for Pro-vitamin A content at Serere Agricultural and Animal Production Research Institute (SAARI)

Cassava is widely consumed in sub-Saharan Africa and parts of Asia where it is the major source of carbohydrates for 70 million people, obtaining more than 500 calories per day from cassava. With its productivity on marginal soils, ability to withstand disease, drought, and pests, and flexible harvest dates, cassava is a remarkably adaptable and hearty crop consumed where drought, poverty, and malnutrition are often prevalent. Increasing the levels of provitamin A compounds in cassava could mean healthier immune systems, better eye health, and less blindness in areas most in need .

As such, improved yellow root cassava germplasm, believed to have higher amounts of β carotene than white fleshed cassava, has started being selected from the cassava germplasm based at Serere . The objective is to evaluate the new germplasm for β carotene content and integrate them into our breeding materials.

Methodology

A total of 56 yellow root cassava clones were selected from the germplasm at Serere plus introductions from IITA-Nigeria were planted at Serere in 2004. The experiment was planted in randomized complete block design and replicated two times. Plot size was 15 m^2 with a spacing of 1 m x 1 m. At harvest (10 months) yield parameters were taken and β carotene content of the tubers estimated qualitatively using a visual chart.

Progress results

Overall, the yields were generally low because plant establishment was poor. This could have been caused partly by the fact that the site of the trial that was stony and general poor climatic conditions of the seasons. The clone MM01/3004 had the highest score (8) for carotene content but it had a poor fresh storage root yield (8t/ha)

and a low dry matter content (24.6%). It was followed by the clone 97/4678 (6) with relatively high fresh storage root yield (29t/ha) and relatively high dry matter content (28.6%). Generally the high yielder did not show high content of carotene. From the visual chart scores, beta carotene content varied from 2-8mg/g of fresh root. The Clone with highest score for carotene was MM01/3004 (8) followed by 97/4678, MM98/1020, and 97/5197 with a score of 6 each. Most of the genotypes were sweet or slightly bitter when raw-tested while a few were bitter with a score of 3 (Table 4).

From the evaluation, 37 genotypes with visually good levels of beta carotene and yield were selected for further evaluation and incorporated into the breeding program aiming at producing genotypes with high levels of beta carotene for various end users. After the evaluation, the storage roots were collected and taken to Ugachick Poultry Breeders Limited for test in chicken feeding trials.

Table 4: Ranking of the best ten yellow cassava genotypes with high beta carotene content using the visual chart

Clone	CMD Severity	Dry matter Content Mean ± SE	Carotene content score	Total tuber wt (t/ha)	Marketable Tubers/plant	Taste Score
MM01/3004	1	24.6± 0.6	8.0	8.0	8	1
97/4678	1	28.6 ± 0.3	6.0	29.0	4	1
MM98/1020	1	21.7 ± 0.4	6.0	12.0	2	2
97/5197	1	31.5 ± 0.7	6.0	11.0	3	3
MM96/1760	1	29.8 ± 0.3	5.5	8.0	2	1
MM96/2862B	2	34.2 ± 0.2	5.0	13.0	3	1
MM01/0133	2	35.3 ± 0.3	4.5	6.0	2	1
Unknown 1	1	34.6 ± 0.0	3.5	23.0	4	1
MM96/2820	2	22.3 ± 0.4	3.5	22.0	4	3
MM96/0469	1	31.1 ± 1.2	3.5	15.0	4	1

**Taste: 1=sweet, 2= slightly bitter, 3 = bitter,* (n=37)

2.1.2 Preliminary Yield Evaluation Trial (PYT) at Serere Agricultural and Animal Production Research Institute (SAARI), Uganda

Continued efforts are being directed at germplasm development for the mid altitude-medium rainfall areas through performance evaluation trials at SAARI. In 2004, two

hundred and sixty nine (269) genotypes that were selected from PYT I trials were advanced as PYT II at the same location. Selection was based on reaction to biotic stresses especially cassava mosaic disease as well as yield traits (dry matter and tuber quality).

A total 269 genotypes selected from performance I trial (2003) were planted in 2004 at SAARI in plots of 15 m^2 in a randomized block design in 3 replications. Biotic stresses data were recorded at 3, 6 and 9 months after planting (MAP) while yield evaluation was done at 10 MAP. Harvest parameters included marketable tubers per plant, non-marketable tubers per plant, total tuber number, total weight as well as dry matter content of the tubers.

Storage root yield ranged from 12-48 t/ha. Genotype MM02/0848 gave the highest yield of 48 t/ha, followed by MM02/1806 with 45 t/ha, while the lowest was MM02/0471 (12 t/ha). The checks, Nase 10 and Nase 3 (very popular with farmers) yielded 40 t/ha and 23 t/ha, respectively. The dry matter content of the genotypes was generally low for most clones possibly because of the severe drought that hit the location between November and February, just before the evaluation was done. However, the highest DMC was 42% recorded for genotype MM2/0579, while the lowest DMC was 15% recorded in genotype MM02/1354. The local checks Nase 10 and Nase 3 recorded DMC of 38% and 39%, respectively. The top ten high yielding varieties were resistant to CMD with mean CMD score of 1 (Table 5).

After evaluation, a total of 155 clones were selected for a re-evaluation as performance trial III in 2005. This is being done to ensure stability of the genotypes. In addition, 8 of the genotypes selected were also advanced for on-farm trial testing for 2005.

Table 5: Performance (yield) of the ten best cassava clones in PY trial II at SAARI, 2004

Clone	Mean CMD Severity ± SE	Yield (t/ha)	No. of Tubers/plant	Dry matter %	Comment
MM02/0848	1±0.1	48	11	37	Taken on farm
MM02/1806	1±0.2	45	9	32	
MM02/1458	1±0.3	44	15	-	
MM02/0993	1±0.3	42	9	35	Taken on farm
MM02/2099	1±0.1	42	12	33	Taken on farm
MM02/1350	1±0.2	41	9	27	
MM02/1872	1±0.3	41	12	-	
MM02/0664	1±0.2	41	10	33	
MM02/0260	1±0.2	41	12	30	Taken on farm
MM02/1880	1±0.4	40	11	33	
Nase 10	1±0.1	40	9	38	
Nase 3	2±0.7	23	8	39	

A seedling of 550 families was established at Serere in April, 05 and it contains 9 families of cassava seeds from the material tolerant to cassava brown streak from Tanzania. The assessment of germination was poor (25-30%) due to bad whether condition after establishment.

2.1.3 Regional collaboration with NARS in germplasm evaluation

In Kenya

Two advanced yield trials **(AYTs**) of 30 clones each were harvested and evaluated at KARI-Alupe in August 2005. EARRNET program assistant participated in the exercise of evaluation and selection of clones for advancement to on-farm trials.

18 clones out of sixty clones were selected for advancement to on-farm trials (Table 6). The basis for selection were : No CMD symptoms, High Yields, Low cyanide level, High dry matter and low disease incidence of cassava bacterial blight (CBB) and cassava anthracnose disease(CAD).

Table 6. Clones selected from AYT at KARI-Alupe

	CLONE	Mean yield (t/ha)	DM (%)	CNP
1	MM98/3567	23.7	45.3	2.5
2	MH97/0284	20.9	31.7	2.0
3	I96/1642	20.7	41.1	3.0
4	MM97/2634	19.5	40.2	2.0
5	MM98/1596	17.9	35.6	2.5
6	MH96/0398	16.9	43.7	2.0
7	MM98/1669	16.8	37.8	2.5
8	MM98/4105	16.2	42.6	2.0
9	MM98/2636	15.7	41.2	3.0
10	MM98/3572	15.6	41.5	3.0
11	MM97/2335	15.5	41.7	3.5
12	MM96/0983	15.0	37.1	2.5
13	MM98/3569	15.0	41.7	3.0
14	MM96/0398	14.7	46.7	2.0
15	MH97/0848	14.5	42.7	3.0
16	MH97/1744	14.3	41.1	2.0
17	MM98/1194	13.9	41.8	2.5
18	MM98/0669	13.6	41.2	3.0

The above eighteen selected clones had the following desirable characteristics

(a) Fresh yields of over 13 tons/ha

(b) Dry matter percentage of >35%

(c) Cyanide potential of ≤ 4

(d) No CMD symptoms throughout the growing period

(e) CGM and CBB severity of <2 score

A number of on-farm trials were conducted in various districts of cassava growing during the period of 2005. On-farm trials were conducted in Bungoma, Busia, Butere/Mumias and Teso districts in Western province. In Nyanza province, on-farm trials were conducted in HomaBay, Nyando, Rachuonyo and Kuria districts.

For the part of Uganda, the on-farm and multi location trials are still under observation. However with the outbreak of the Cassava Brown Streak Disease (CBSD) at Namulonge, a meeting of IITA scientists, those of Namulonge and EARRNET has been organized to draw strategies of combating the new threat. A

baseline survey has been finished in Uganda to evaluate the spread of the disease. EARRNET contributed financially ($2500) to carry out the study. More research planning meetings were intensified. A joint evaluation and characterization of the local germplasm has been initiated.

In collaboration with World Vision-Uganda, EARRENT has moved 320 bags of improved cassava (TME 204, TME 14 and TMS I 92/0067) cuttings for multiplication with contact farmers in 3 districts of Tororo, Mukona and Mpigi.
In collaboration with IITA/CFC project and the national program, a feed millers meeting was organized in Jinja in April 2005 to sensitize them in the use of cassava in their business. Thirteen feed millers general managers attended.

In Burundi, 7 varieties that have shown good tolerance to CMD and good agronomic performance are being multiplied at large scale using rapid multiplication techniques by the Ministry of Agriculture in collaboration with ISABU and different NGOs. These include MM96/5280, MM96/0619, MM96/7688, MM96/2266, ABBEY-IFE, MM96/2352 and MM 96/5533.

In Ethiopia, the cassava material introduced in 2004 has been transplanted into the field. EARRNET in collaboration with IITA introduced more 117 clones from Nigeria of 10 plantlets each in April 2005.

In Rwanda, 51 advanced genotypes were selected from IITA/EARRNET germplasm at SAARI were introduced in April 2005. Irrigation system was used to facilitate sprouting.

In Sudan, the 10 genotypes that were introduced in 2002 were taken to on-farm trials for evaluation. A baseline survey has been planned and is going to start in mid October 2005. More partnership is being developed with the new government through the assistance of CRS.

2. 3 Profiling of Serere germplasm for project 1

About 54 advanced genotypes including released varieties have been sampled from Serere research station and taken to Jomo Kinyata University of Agriculture and technology for profiling. Regional trial for G X E study has been established in Kenya, Rwanda, DRC, Burundi and Uganda.

2.4 Baseline study for project 2

Implementation of the project on promotion of improved drying and chipping technology has kicked off with baseline survey in Uganda. Rwanda and Kenya are following suit. This will be preceded by pilot site and farmer/processor group selection and establishment of two pilot sites per country. Processing equipments for processing sites are being fabricated.

2.5 Backstopping, capacity building and partnership development

The Coordinator visited the Burundi cassava program three times, in March together with Dr Peter Ewell to forge partnership, in May with Dr James Legg to evaluate the multiplication process and strengthen the collaboration among stakeholders and plan for the next year and again in August while attending the OFDA regional meeting which was evaluating the CMD mitigation effort in the region.

The coordinator visited KARI Mtwapa in backstopping the cassava program in screening the seedlings for CBSD. He visited also KARI Katumani and Kakamega to discuss the modality of implementing the project 1 and 2 in the country. The EARRNET assistant program participated in evaluation ATY trials at with KARI Katumani scientists. KEPHIS was also visited to review the cleaning and conservation of the EARRNET germplasm to facilitate the exchange.

3. **Significant Contributions to ASARECA's Guiding Principles**

Progress Achieved during Reporting Period

Two projects developed along the production to consumption continuum with 16 research activities were planned but only limited activities were initiated due to the non availability of funds with NARS.

3.1 Sub-result 1.1 Demand driven technologies/innovations generated

One major activity done is the evaluation of the use of white cassava and yellow cassava in feed poultry with Ugachick. Experiment was concluded confirming the use of 10 and 20% of cassava substituting maize in animal feed production. Yellow cassava continues to show the same trend. More work is being done in identification of CMD resistant genotypes.

3.2 Sub-result 1.2 – Demand driven regional research and development portfolio identified. Opportunities and challenges identified

The two projects that are presently being implemented were developed following the EARRNET priority setting done in 2003. During 2005, two technical meetings were organised to redesign and review the work plan. Research teams were formed along the two projects.

3.3 Sub-result 3.3 – Strategic partnership established.

The coordinator represented the network at a number of regional meetings, established more contacts with scientific partners through emails and visits /backstopping like, BECA, NAARI-NARO, ISABU, and SARI (Ethiopia). A new partnership was established with the World Vision Uganda in strengthening the cassava production by proving improved seeds and post harvest technologies. EARRNET is developing strong partnerships with feed millers in Uganda, Rwanda and Kenya.

3.4 Sub-result 3.4 – Human and physical resources for agricultural research for development strengthened

Two regional trainings in statistic analysis and cassava IPM were successfully conducted. A second impact study is being carried out in Uganda. A team composed

of national staff and IITA/EARRNET was formed, trained and is presently collecting out data in 16 most growing cassava districts.

4. Major Problems and Constraints

Following the competitive grant system introduced last year, EARRNET submitted two projects proposals to ASARECA CGS but the evaluation process took longer than anticipated. The Projects were officially approved in May 2005 and yet they were submitted in October 2004. The development of agreement contracts and their signature administrative procedure between IITA/EARRNET and different NARS took another time. .All these delayed the start of the implementation of projects.

5. Network, Programme and Project Management

5.1 Managerial staff, stakeholders and steering committee members

The coordinator, the program assistant and the driver are still working. Change only happened with the administrative assistant who left abruptly and then a new one was recruited. She is four months old and she is copying with the system. IITA/ESARC continued to provide administration and accounting support to EARRNET during the reporting period.

5.2 Documentation and reporting

EARRNET, 2005. EARRNET contribution to Agricultural Research and Development in East and Central Africa: Cassava perspectives. In: Agricultural review. Journal of the Agricultural Industry in Africa. June /August Vol. 11 No 2, 2005. Pg 11-13.

EARRNET, 2005. Strategies, choices and programme priorities for the ASARECA's East Africa Root Crops Research Network (EARRNET). In Press

Ntawuruhunga P., Dixon A.G.O., Anneke F., Okidi J. and Otim Okello F. 2004. Cassava the crop of the future in East and Central Africa. Paper presented at

9th International Society for Tropical Root Crops - Africa Branch Triennial Symposium held at Mombsaa, 31st October to 5th November 2004

P. Ntawuruhunga, F. Oliveira1, C. Kanobe, J. Okidi and P. Sserumaga1, 2005. Incorporation of cassava into animal feeds in Uganda: Collaboration between IITA-EARRNET and Ugachick Poultry Breeders Ltd. A poster presented at the 3rd FARA General Assembly, held on 6 - 8 June 2005, Entebbe, Uganda

Ntawuruhunga, P. and Okidi J. 2005. EARRNET organized a cassava quality standards and policy consultative meeting for the East Africa and Central (ECA) Region. *Roots 9 (2), 2005*

5.3 Partnerships formed to implement research projects

EARRNET maintained strong partnership with IITA to prepare proposals for submission to donors and backstop the NARS. Partnerships initiated in Burundi, Ethiopia and Uganda with NGOs are being strengthened. In collaboration with IITA, a proposal titled "Cassava Mosaic Disease Pandemic Mitigation in East and Central Africa was submitted to OFDA where a budget of $250,000 was approved for Burundi. Also a small Rapid response to the pandemic's impact on Bujumbura, Burundi: Bujumbura emergency response" proposal worth $75,000 was submitted and approved for funding by USAID/ OFDA.

Still in collaboration with IITA another project proposal: "The study of the impact of the IITA/EARRNET work on cassava in Uganda" worth $20,000 was submitted to IITA and approved. Data collection data is going on in collaboration with the Uganda cassava national program.

5.4 Major changes required to programme inputs, budget and schedule

No major changes can be suggested at the moment after the development of two years proposals submitted to ASARECA-CGS have been approved. However, there is

strong need to continue to encourage stakeholders to use CGS to compete for research funds.. The network 3 years funds will end by September 2006. The coordination unit should start preparing the end of the project and look beyond. It is very important to review sub-agreement contract signature process between IITA/EARRNET and NARS to avoid the experience of the two previous years. The sub- agreement contract should be simple and clear.

5.5 Report on the findings of review evaluations and audits

No reviews or audit was carried out during the reporting period. In line with budgeting and budgetary control, requests for statements of expenditure were done according to the ASARECA IITA agreement for the first quarter of the year. However, due to changes in staff at IITA in Budget and Finance section, there has been a delay in submitting the financial reports for the last two quarters. Efforts are being made to submit them. Expenditures were incurred in line with budget heading with their allocations.