

Emergency Programme to Combat the Cassava Mosaic Disease Pandemic in East Africa

A SYSTEM-WIDE WHITEFLY IPM AFFILIATED PROJECT



Fourth Quarterly Technical Report

Phase 1

July-September 1999

International Institute of Tropical Agriculture

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Summary

Virus diagnoses were completed for samples collected during the monitoring and diagnostic surveys in Rakai and Masaka districts, Uganda, which were conducted in the third quarter of the Project. Results from the surveys indicated the virus infections were predominantly UgV. ACMV was detected in a small number of samples. These results suggest a reduction in the occurrence of ACMV in comparison with earlier surveys conducted in late 1997. No mixed infections were recorded. In Tanzania, a CMD monitoring survey carried out in June 1999 in southern Kagera region, revealed that CMD was less prevalent in Biharamulo (incidence <20%) than in Muleba district (incidence 41-100%). A July survey conducted in Kagera and Mara regions indicated CMD incidence was high (80-100%) for many locations surveyed in both regions. Whitefly counts remained high in much of Kagera region, in contrast to Mara where they were significantly lower. Overall, monitoring and diagnostics results indicated a further southwards expansion of the pandemic of severe CMD in Kagera region. Muleba and Karagwe districts were newly affected during this quarter. Newly affected areas experienced increases in both the incidence and severity of CMD. Although no diagnostic surveys were conducted in western Kenya during this period, no reports were received of any significant change in the situation in the lakeshore area of southern Nyanza, the zone under most imminent threat from the pandemic.

Cassava multiplication activities continued in all three countries, although there was limited new planting since the July-September period is dry through most of the region. A new 8 ha block of cv. Migyera was however established at KARI-Kakamega using planting material from Siaya FTC. A monitoring visit to multiplication plots in Rakai and Masaka districts revealed a generally satisfactory status, although lower than average rainfall has continued to restrict growth of the November planted crops and hinder the establishment of the May planted plots.

Preliminary analysis of results from variety screening trials in Bukoba indicated that half of the varieties screened at Maruku and Bushasha had CMD incidences of <50% at six months after planting. At the site of highest infection pressure (Gera), however, all but two of the varieties had incidences of >70%. Varieties showing moderate to good levels of resistance across the three sites included TMS 30337, TMS 30572(6), TMS 81983, UKG 94/146 and 83/01786(6).

Establishment of the open quarantine at ARI-Maruku, Bukoba was initiated with the identification of the planting material of cv. SS4 that will be used in the establishment of 5ha. The site to be used for collection of the material is the Masaka District Farm Institute, Kamenyamigo.

Cassava multiplication training workshops were held at Kalisizo, Rakai district and Kamenyamigo, Masaka district on September 15 and 16, 1999 with the objective of explaining to participants the concept of stem multiplication, training them in techniques of cassava multiplication, explaining the concept of ratooning and techniques of ratooning. An IPM workshop was also held at Bukoba, Tanzania from 18-20 August 1999. During the workshop, a paper on the status of CMD in Kagera and Mara regions was presented.

Project Purpose: To boost production of cassava in Uganda, Kenya and Tanzania and enhance both short and longer term food security, through the implementation of an emergency programme to multiply and disseminate mosaic resistant cassava.

Project Activities:

1. **Monitoring and Diagnostics:** Conduct focused surveys in south-western Uganda, western Kenya and north-western Tanzania to provide detailed distribution maps of cassava mosaic geminiviruses (CMGs) in the Project target areas, and baseline data for subsequent impact analysis.
2. **Multiplication:** Multiply and distribute in collaboration with Project partners, elite CMD resistant materials.
3. **Germplasm diversification:** Increase the range of cassava materials available to farmers in areas targeted by the project thereby reducing future risk of production collapse.
4. **Stakeholder linkages:** Identify and strengthen links between key stakeholders with roles in enhancing cassava production in target areas.
5. **Farmer training:** Develop producer skills in identification and management of cassava pests and diseases with special focus on CMD, in addition to basic production and multiplication skills.

Background

The project entitled 'Emergency Programme to Combat the Cassava Mosaic Disease Pandemic in East Africa' funded by the Office for Foreign Disaster Assistance (OFDA) of the United States Agency for International Development (USAID) was initiated in October 1998. The Project forms part of the System-wide IPM Programme's Whitefly IPM Project. Highlights from the third quarter of the Project, described in greater detail in the third quarterly report were as follows:

1. Monitoring and diagnostic surveys conducted in Rakai and Masaka districts, Uganda revealed incidences of CMD of 62% and 72%. These figures represented small increases on the levels recorded from late 1997 of 47% and 67% respectively.
2. Monitoring surveys were completed in the southern part of Kagera region, Tanzania, in collaboration with KAEMP. The survey was conducted in June 1999 but results are reported in the current quarterly report.
3. 575 bags of CMD-resistant cv. SS4 were purchased, delivered and planted in Masaka and Rakai districts. In Kenya, the project contributed to the planting of >35ha of multiplication blocks of cvs. SS4 and TMS 30572. More than 10,000 plantlets were successfully imported into Tanzania from IITA, Nigeria including both known CMD-resistant varieties and genotypes with novel sources of CMD resistance.
4. 15 elite cassava clones were selected for 'fast-track' multiplication from the germplasm evaluation at Alupe, Kenya. Nine 'new' CMD resistant varieties from the final stages of the NARO breeding programme were planted at each of the two demonstration locations in Rakai and Masaka.
5. 18 district crops officers and NGO field workers from Nyanza and Western provinces completed a 'training of trainers' course. In Tanzania, similar training was given to 158 village leaders of Bukoba district.
6. The Ministry of Agriculture and Co-operatives of Tanzania granted permission for the establishment of an open quarantine facility at ARI Maruku, Bukoba.

1. Monitoring and Diagnostics

Uganda

A survey was conducted to assess the incidence and severity of major cassava pests and diseases in Rakai and Masaka districts from 16-26 June 1999. Cassava leaf samples were collected from 10 cassava plants in each of 6 fields per district. DNA was extracted from the leaves for virus diagnostic tests, which involved use of a DNA fingerprinting technique which uses the polymerase chain reaction (PCR). Out of 120 samples tested, 48 gave positive test results for UgV/EACMV-UgV, 3 gave positive results for ACMV and 69 samples gave no results at all. There were no mixed infections. These results suggest a change in the balance of cassava mosaic geminiviruses (CMGs) occurring in this region, since comparisons with earlier similar surveys (December 1997) reveal that the occurrence of ACMV and mixed ACMV/EACMV-Ug infections has declined significantly. It is likely that this occurs as a result of farmers' failure to select the most severely diseased plants for replanting, which are typically infected with both ACMV and UgV/EACMV-Ug.

Tanzania

A survey was conducted in June 1999 focusing on Biharamulo and Muleba districts, in the southern part of Kagera region. The results are described in detail in Annex 3. CMD was less prevalent in Biharamulo, where 50% of the surveyed fields had a low incidence (<20%) and severity scores typically varied between class 2 and 3. CMD was more prevalent in Muleba district where about 47% of the surveyed cassava fields had incidences between 41% and 100%. Severe symptoms of CMD, characteristic of the UgV/EACMV-Ug associated pandemic, were observed in 12 fields covering 50% of the district.

A second CMD survey was carried out in Kagera and Mara regions of Tanzania in July 1999. Districts surveyed included Bukoba and Karagwe in Kagera region and Tarime and Musoma in Mara region. The incidence of CMD in north-western Tanzania was generally high in both Kagera and Mara regions, and averaged 63% (fig. 1). Bukoba district was the area with greatest incidence, with more than 85% of plants diseased. By contrast, in Tarime incidence was significantly lower at 49%, although even this represented a significant increase on previous surveys conducted in the same area. There was more variation in CMD severity (fig. 2), and areas which stood out as having higher than average severity scores included Bukoba district and the south-western part of Karagwe. These areas corresponded to the area apparently affected by the pandemic, and the expansion into Karagwe was a new development for this quarter. Based on diseased severity data alone, there was little suggestion that the pandemic had expanded down the eastern shore of Lake Victoria to include the northernmost part of Tanzania. Further virus diagnostics surveys will be required to confirm the identity of viruses occurring in the Kenya/Tanzania border area. Whitefly numbers also differed sharply from Mara to Kagera (fig. 3). *B. tabaci* abundance was much greater in Bukoba and southern Karagwe districts than it was in Musoma and Tarime. In addition, there appeared to be a degree of positive association between number of *B. tabaci* adults and CMD symptom severity. It was also notable that whiteflies were less abundant in the areas of Kagera region first affected by the CMD pandemic (i.e. those on the Uganda border), than more recently affected areas (i.e. southern Bukoba and south-western Karagwe).

Kenya

No surveys were done but there were no reports of any significant change in the CMD situation. It seems the Winam Gulf of Lake Victoria and the Kano Plains in the Kisumu area are still restricting the rate of southwards expansion of the pandemic in western Kenya.

2. Multiplication

Little additional planting of multiplication plots was carried out this quarter since the period is dry throughout much of the Project zone. Main operations of the July to September period were therefore weeding and general maintenance of the current multiplication blocks.

Uganda

Evaluation of the multiplication programme was carried out on some of the mature crop in Rakai and Masaka districts with the aim of assessing the number of fields ready for harvesting. 18 fields were visited, 9 fields from each district. 15 out of the 18 fields were ready for stem harvesting. The infection level was low (0-5%) in most of the fields. The stems were to be distributed as agreed at the beginning of the project. Although a number of problems were encountered during establishment of the multiplication fields, the results were promising. Funds for the second phase of the project will be provided to the project partners at the beginning of October 1999.

Kenya

Transition to the secondary multiplication centres that was scheduled for the second season of rains beginning in September was postponed because of the immaturity of primary multiplication plots. It was proposed instead to move to this stage in March 2000. At KARI Kakamega, 8ha of Migyera was established in August using material from Siaya FTC. The germination percentage was 70-80% and CMD incidence was <5%.

Tanzania

Rapid multiplication of resistant varieties at ARI Maruku and Ukiriguru, Mwanza continued during the current quarter. Results on the status of the varieties are presented in Annex 3. More than 1 million cuttings of CMD resistant varieties had been multiplied at ARI Ukiriguru by the end of the current quarter, and more than 35,000 at ARI Maruku. Plants of variety TMS 4(2) 1425 showing CMD symptoms were rogued. At Maruku, plants had a good canopy and were doing well.

3. Germplasm diversification

In Uganda, no further introductions of germplasm were made during the current quarter, although the demonstration plots were maintained. It is proposed to expand on the evaluation of 'new' cassava varieties from both the national cassava programme of NARO and the EARRNET germplasm programme within the proposed second phase of this Project.

In Tanzania, evaluations of more than 25 improved and local varieties continued at a range of sites in Bukoba district, Kagera. Preliminary analysis of the data collected from the first of the two trials to be planted, and including 15 cassava varieties, has been completed. Results are presented in Fig. 4.

At all three sites, a significant proportion of the varieties tested had high incidences of CMD by the date of the final evaluation, 6 months after planting. Infection was greatest at Gera, a location between Bukoba town and the Uganda border. Results are not presented for the whitefly populations recorded, but Gera was distinct from the other two sites in having very large populations of cassava whiteflies (*Bemisia tabaci*) through the course of the six months

of evaluation. Infection of the evaluation material with CMD was less at Bushasha, and even less still at Maruku, although even at this last site, initially selected to be a 'pre-epidemic' low spread location, there was almost 100% infection in some varieties. This was a clear indication that during the period of the trial, the epidemic 'front' reached Maruku. The worst performing varieties included Rushura, Lwakitangaza, UKG 94/047 and TMS 90057(2). Aipin Valenca and Msitu Zanzibar are the two varieties currently being widely multiplied in Mara region, and also proposed for large-scale multiplication in Kagera. Data from the evaluation trials, however, indicates that both become heavily diseased under CMD pandemic conditions. Moreover, symptoms of diseased plants are relatively severe, meaning that sustainable cultivation of diseased material will not be feasible as is the case with some tolerant varieties. It is therefore recommended that no further multiplication of these two varieties be undertaken in Kagera region in the immediate future.

Varieties providing consistently the best performance over the three sites included: TMS 30337, TMS 30572(6), TMS 81983, TMS 83/01786(6) and UKG 94/146. TMS 4(2)1425, being multiplied in quantity at ARI Ukiriguru and on a smaller scale at ARI Maruku, was readily infected in evaluation trials, but symptoms were generally moderate to mild. This is characteristic of the performance of this variety, and means that whilst plant may become diseased, the impact of the disease on final yield is minimal. Yield effects are also under investigation in other experimental trials currently underway in Bukoba.

Multiplication plots of Masaka DFI were identified for the provision of stems for the establishment of the open quarantine facility in Kagera region, Tanzania. These will be sufficient to plant a 5ha block which will also be supplemented with a wide range of 'new' clones from the EARRNET germplasm development programme at Serere, Uganda.

In Kenya, the current quarter was a period of maintenance of the wide diversity of germplasm in place at the open quarantine site at Alupe, Busia. 14 clones are being multiplied for fast-track evaluation. Each of these is now represented by more than 1,000 plants, and material should be ready for multi-locational evaluation in March, 2000. More than 150 of the 500 or so clones originally introduced from Uganda have been selected for the 'slower' station-based performance evaluation trial, and these too are currently being maintained and evaluated ready for the next level of selection in March 2000.

It is also proposed to introduce an additional set of clones from Uganda during the final quarter of the calendar year. These will be placed in open quarantine and evaluated in the same way as the previous set of materials. They will provide the Kenyan cassava programme with yet greater diversity with which to tackle the production and other constraints currently faced.

4. Stakeholder Linkages

The Irish Foundation for Co-operative Development (IFCD) co-ordinated the distribution of the stems in Rakai and Masaka districts and will continue to be actively involved in the next phase of activities. Training workshops conducted in Rakai and Masaka districts on 15 and 16 September were also used to bring stakeholders together for discussion of current progress of the project and plans for the next stage, including the ratooning of the first planted crop. All of the 13 partner organisations involved in the Project activities in Rakai and Masaka, with the exception of MADD0, were involved in these meetings.

An IPM workshop, held in Bukoba, Tanzania, in August, provided an opportunity for a wide range of stakeholders with an interest in cassava and other crops to meet and discuss the use of IPM approaches in the region. The OFDA CMD Project activities, aimed at combating CMD in the two regions of Tanzania, and future plans were discussed. The Tanzania Pesticide Research Institute agreed to assign one person who would be involved in monitoring the open quarantine field at Maruku.

In Kenya, KARI, ONFARM, the extension system and farmer training centres continued to work together in implementing the Project. Changes in the overall co-ordination of the work in Kenya were however requested by KARI, and these will be discussed and implemented in the final quarter of the year.

New links were developed with researchers at the University of Arizona with expertise in research into cassava whiteflies and whitefly-transmitted geminiviruses. These will be developed into a new component of the proposed second phase of the Project in the October-December period.

5. Training

Uganda

Cassava multiplication training workshops were held at Kalisizo, Rakai and at Kamenyamigo, Masaka district on 15 and 16 September 1999 with the aim of explaining to the participants the concept of cassava multiplication, training them on techniques of cassava stem multiplication and ratooning. During the training other aspects concerning the epidemiology and management of disease and cyanide levels were discussed. Participants included Project Officers and Extension staff from IFCD and district extension staff from Rakai and Masaka districts involved with the multiplication programme (Annex 4).

The participants presented brief reports on the progress of the cassava multiplication for both the mature (planted in November 1998) and the young (planted in April 1999) crops. The reports indicated that the mature crop had established better in many places and was more likely to yield more planting material in the next phase of multiplication than the young crop. Poor establishment of the young crop was as a result of the poor germination which was attributed to a number of factors including: delays in delivery of planting material down to multiplication fields, deterioration of cuttings, bruising of nodes and effects of prolonged drought in many parts of the two districts. It is also increasingly being recognised that cv SS4 is unusually sensitive to stresses during the harvesting, transporting and planting processes. Premature sprouting of axillary buds in mature crops also reduces the amount of viable cuttings that can be obtained from a parent crop. This provides further stimulus for the provision of an increased diversity of germplasm, which is one of the main objectives of this Project.

Tanzania

An IPM workshop was held in Bukoba town from 18-20 August 1999 during which a paper on CMD status in Kagera region was presented. Mr Peter Sseruwagi represented IITA-ESARC at the meeting, and presented a paper on management of CMD.

Kenya

No major training activities were organised during this quarter in western Kenya, although District Crops Officers (DCOs), trained during the previous quarter, provided informal training of extension officers within each of their districts.

Project Outputs, Targets, Indicators and Achievements

<i>Outputs</i>	<i>Targets</i>	<i>Indicators</i>	<i>Achievements</i>
Focused cassava mosaic surveys conducted in target areas	Distribution of cassava mosaic geminivirus species characterised in 1999 and 2000	Geo-referenced distribution maps available and results published	UgV identified for the first time in north-western Tanzania. Spread of severe CMD documented throughout Project zone. Virus incidence maps produced for Tanzania, Kenya and southern Uganda. Results published.
Baseline/impact assessment studies	Make assessments of key production data in target areas including: yield and disease incidence in cassava varieties at the outset and conclusion of Project	Initial baseline report Final impact report Independent documentation from government and non-government bodies	Baseline data obtained on CMD status in target regions. Changes in incidence documented over Project duration. Premature to assess impact of multiplication programme – CMD-resistant material remains under multiplication
Multiply, in collaboration with NARS and partners, CMD resistant cassava materials in target areas	Produce for distribution to farmers: In Uganda: > 150,000 stems In Kenya: > 150,000 stems In Tanzania: > 50,000 stems	Areas planted in multiplication centres. Numbers of stems delivered to farmers	In Uganda, 30ha (equivalent to about 300,000 stems) of SS4 established. About 40ha of SS4 and TMS 30572 established in Kenya (equiv. to 400,000 stems) with other partners. > 60,000 stems produced in Tanzania
Yields of cassava increased through cultivation of improved varieties	Improved cassava varieties provided through multiplication yielding > 10t/ha in farmers' fields	Independent data on yields of new varieties in farmers' fields	Experimental trials at Alupe, Kenya gave yields of >100t/ha for the best clones. On-farm trial data for varieties multiplied by Project show yields > 20t/ha. Data not yet available for Project multiplied cassava in farmers fields

Project Outputs, Targets & Indicators (cont.):

<i>Outputs</i>	<i>Targets</i>	<i>Indicators</i>	<i>Achievements</i>
Genetic base of mosaic resistant cassava diversified	CMD resistant materials supplied through multiplication scheme: In Uganda: at least 5 varieties In Kenya: at least 3 varieties In Tanzania: at least 3 varieties	Presence of new varieties in farmers' fields in target areas. Local stakeholder reports	Nine 'new' CMD resistant varieties from NARO breeding programme were planted at each of two demonstration locations in Rakai and Masaka. In Kenya, 15 elite clones were selected for 'fast-track' multiplication from the germplasm evaluation at Alupe. More than 100 are still being evaluated. In Tanzania, 10,000 tissue culture plantlets of new varieties from Nigeria were introduced. >25 new varieties are still being evaluated in Bukoba. Plant quarantine authorities gazetted Kagera region, Tanzania, and authorised the establishment of an open quarantine site at ARI-Maruku, Bukoba.
Stakeholder linkages developed	In addition to govt. extension and research systems, at least two other partners actively participating in Project activities in each target area	Reports of partner organisations in target areas	IFCD co-ordinated Project activities in Rakai and Masaka and works with 12 other partners in the two districts. ONFARM co-ordinated multiplication in Kenya. Other partners were KARI, Ministry of Agriculture and Farmer Training Centres. In Tanzania activities were co-ordinated by the Tanzania Root and Tuber Crops Programme. Other partners are MARA-FIP and KAEMP. Plant quarantine services in all three countries were integrated in Project germplasm exchange activities.
Farmer training in cassava plant health management and multiplication techniques	At least 100 farmers in each target area trained in plant health/multiplication techniques	Training reports. Trained farmers able to recognise key cassava pests/diseases, know how to sustain crop health and multiply planting material	37 participants from 11 organisations in Rakai and 41 participants from 6 organisations in Masaka were trained in the first quarter. Two scientists from IITA-ESARC and one from TRTCP also attended a training workshop in December 1998. Representatives from partner organisations trained. During the second quarter, 60 Agriculture and plant protection officers from Bukoba were trained. In March 1999, 31 participants attended a training workshop in Kenya. Multipliers in Uganda were also trained. 158 village leaders trained in Bukoba, Tanzania in the third quarter.

Fig. 1. Incidence of CMD in north-western Tanzania, June-July 1999

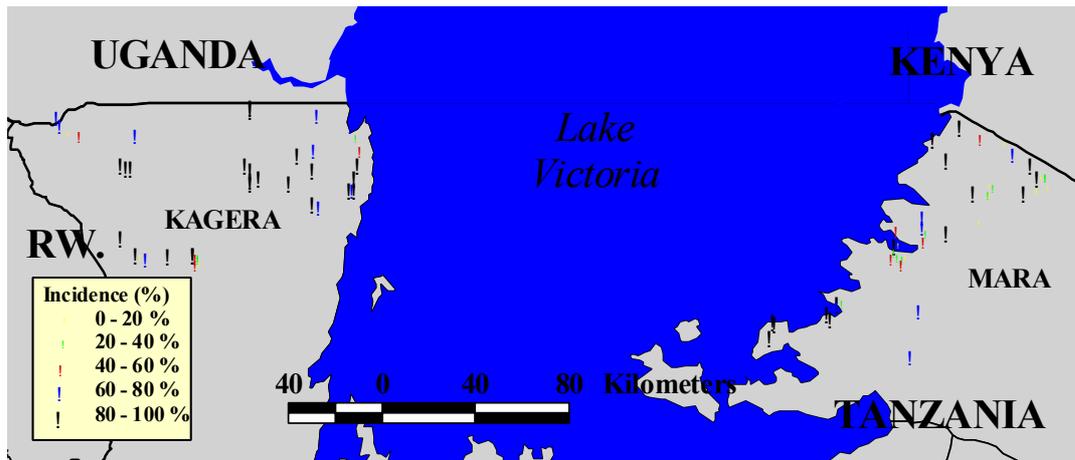


Fig. 2. CMD severity in north-western Tanzania, June-July 1999

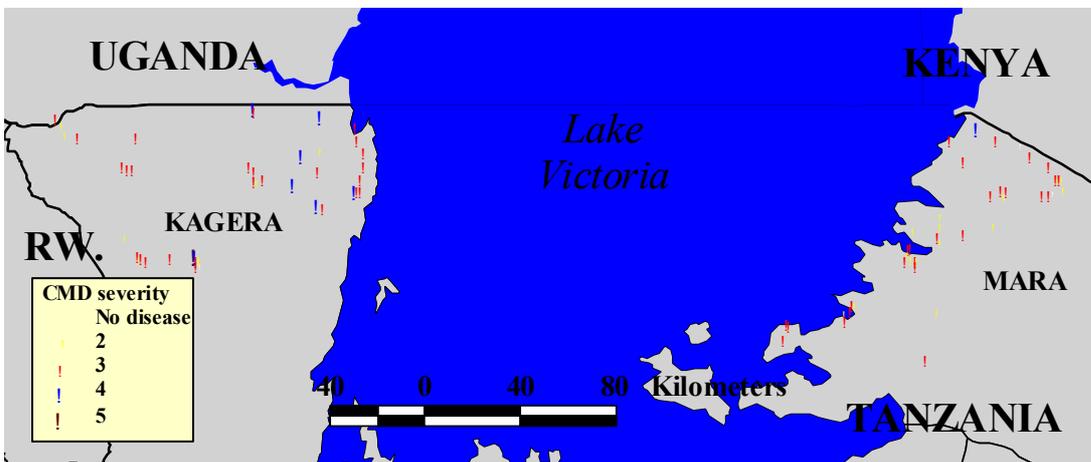
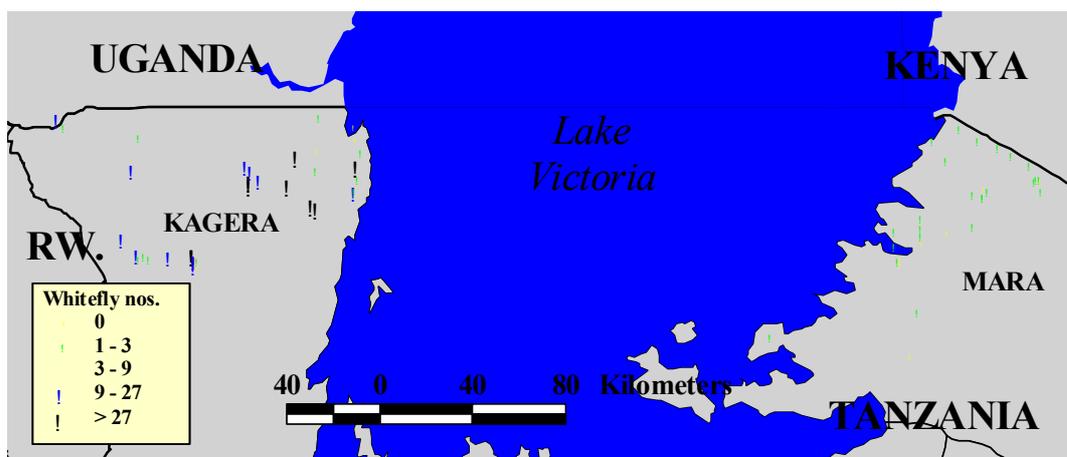
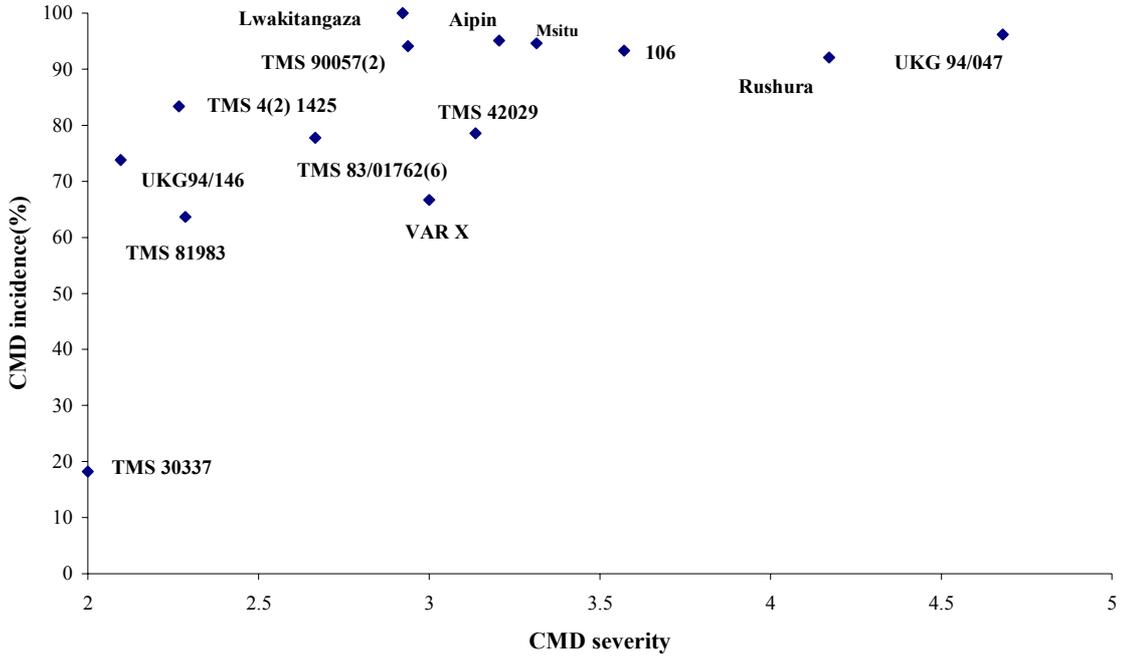


Fig. 3. Whitefly abundance in north-western Tanzania, June-July 1999



4.1 Gera



4.2 Maruku

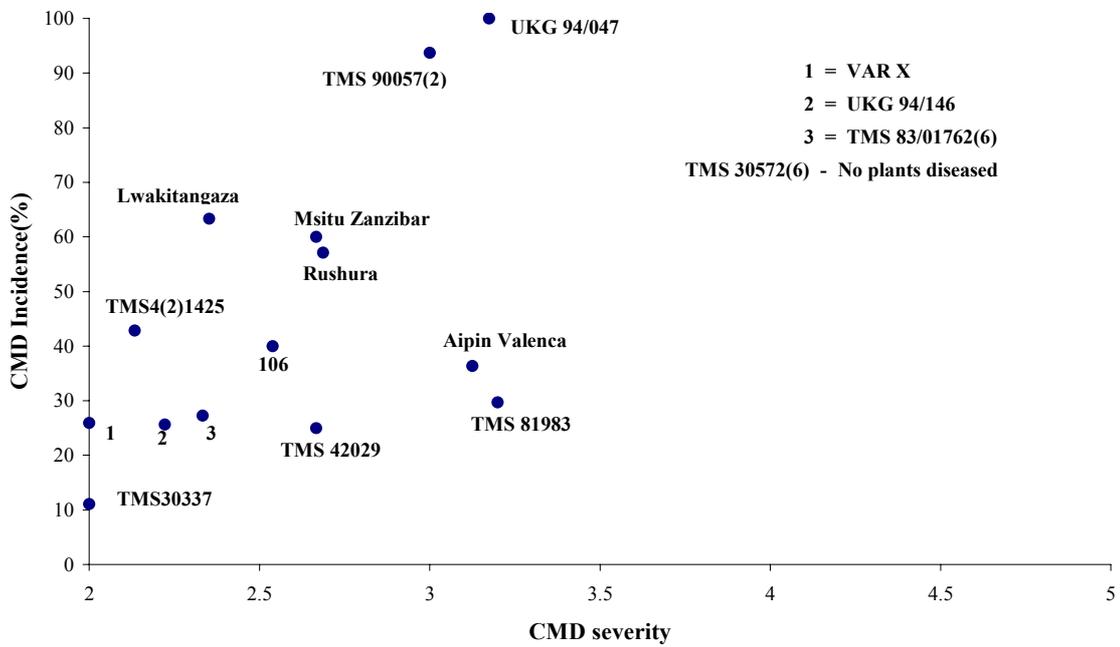


Fig.4.1/4.2 CMD response of cassava varieties at Maruku/Gera, Kagera, Tanzania

4.3 Bushasha

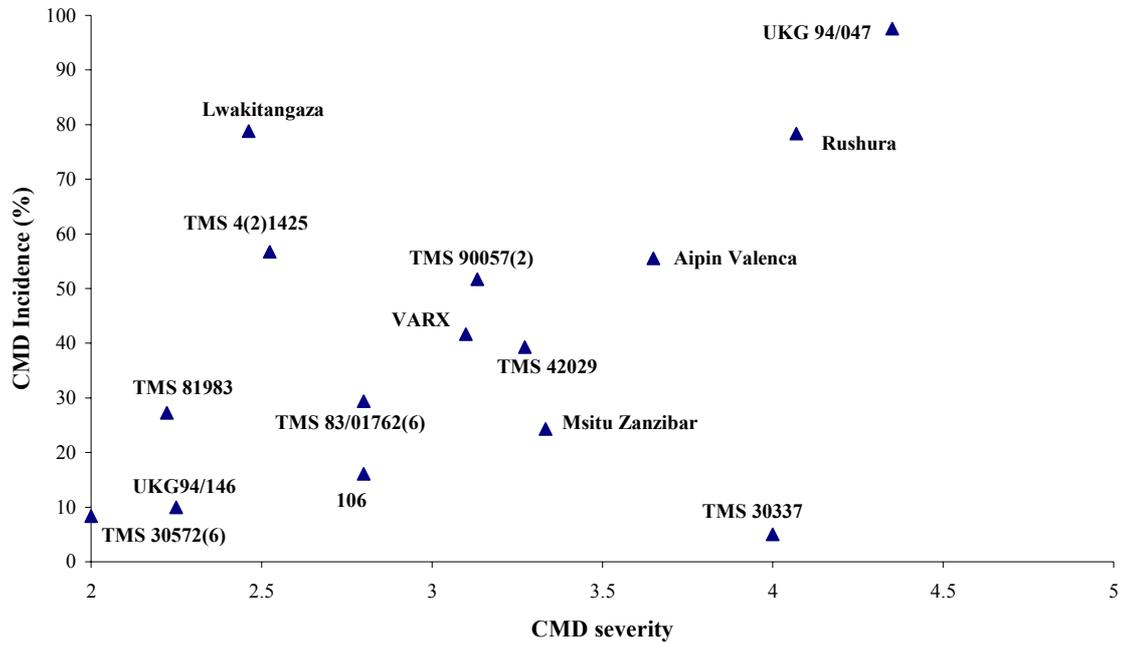


Fig.4.3 CMD response of cassava varieties at Bushasha, Kagera, Tanzania

ANNEX 1

Progress report – OFDA fourth quarter activities – Uganda Irish Foundation for Co-operative Development

1. Introduction

As earlier reported in the previous quarter's progress report, three hundred (300) bags of mosaic resistant cassava cuttings, cv. SS4, were received by IFCD and distributed to the partner NGOs for multiplication purposes. The locations and contact persons for the groups are as then reported.

2. Cassava Status

The average germination rate for cassava planted in April/May in both Masaka and Rakai is 70%. The optimum germination of 90 – 100% was not attained for the following reasons:

- Many tender / young cuttings were included in the bags. These dried up even before planting.
- A few good cuttings were bruised / damaged during the process and so they could not germinate.
- Rakai and Masaka districts had a further period of unseasonally dry weather shortly after the cuttings were planted.

The cassava plants that germinated are six inches to three feet high, depending on the soil moisture content. From the recent monitoring exercise, the mosaic incidence is very low, about 1%. The IITA official indicated that this is probably the result of the presence of a small number of infected cuttings in the introduced material. The farmers / multipliers have been accordingly advised to rogue all the infected plants. Since the 1999 'B' season rains have started, the rate of cassava growth should increase. The multiplication plots that had not been well cared for have had the due attention and by September / October ratooning may be possible.

3. Observations

Most NGOs encouraged their groups to multiply the cassava on land not less than 0.1 ha. This has facilitated monitoring and supervision. Such groups have tended the crops well and they are flourishing. It has been noticed, however, that some school demonstration / participation groups have not given due attention to the plants. Multiplication by LWF councillors in Kabula county (on individual farms) has not gone well as many of these plots have been neglected. Many were not weeded and had been damaged by domestic animals.

CONCERN distributed a few cuttings (12 –30) to individual households against the recommendation of the Project. The two problems associated with this include the difficulty of monitoring which results and the likelihood of mixing of new resistant with local susceptible varieties.

4. Recommendations

NGOs and groups that have shown capability of cassava multiplication should be assisted. IFCD strongly recommends that these groups receive further funding / cuttings. These are: Kitovu Mobile (Lwaggulwe), WEAR, OCBO, MADDO, World Vision, Kabula Women Enterprise Programme, Rakai and Masaka District Administration (D.F.I) and ICR.

5. Financial Report for Cassava

All groups that received the first half of the financial support from IITA have forwarded to the IFCD the necessary accountability. Some payments are supported by agreements from payees who do not have receipts to issue to their payers. The cost for land preparation is high as this includes bush clearing, first and second ploughing. This item cost well over 70% of the first financial assistance disbursed. The remaining 30% catered for transporting the cuttings from the IFCD offices to the respective multiplication centres and planting. NGOs that had established “block” multiplication centres had to foot the weeding bills. It was much easier with “group multiplying “ as group members provided labour (planting & weeding) when the funds were not sufficient. Most LWF /RACA councillors who were managing plots on voluntary basis failed to maintain the plots because of limited resources. Since Concern distributed few cuttings to the households, no funds were given to them. Most of these plants were well cared for. About 4% of these, however, did neglect the crops.

Financial Summary

	Receipt's Payments
Jim opening A/C Baroda	10,000/=
Total Received by IFCD from IITA	9,880,000/=
Total Issued to NGOs	8,970,000/=
Bank charges /dues	141,900/=
Balances at Banks	<u>778,100/=</u>

- Jim contributed 10,000/= for the opening the account
- The expenses incurred by some NGOs exceed the amounts allocated for the first quarter

Attached, please find the amalgamated /analysed financial report

Rosemary Mayiga

Programme Manager *IFCD FSP*

ANNEX 2

Progress report – OFDA fourth quarter activities – Kenya
ONFARM - Kenya

Rapid Cassava Multiplication Program For Western Kenya

Status of Multiplication Sites

JANUARY – SEPTEMBER

1999

Report by
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EXECUTIVE SUMMARY

The establishment of cassava varieties resistant to mosaic in Western Kenya started way back in the first rains of 1997 at KARI-Alupe Sub-station, with 0.4ha each of SS₄ and Migyera varieties. The materials at this site were cut in April 1998 and used for establishing the following sites.

Table 1. Sites established with materials from KARI-Alupe sub-Station

Cassava site	When established	Area planted	Cassava variety
Busia FTC	First rains, 1998	0.4	Migyera
		0.4	SS ₄
Busia Prison	First rains, 1998	0.4*	Migyera
		0.4*	SS ₄
Teso DAO	First rains, 1998	0.4	Migyera
KARI-Kibos Sugar Research Station	First rains, 1998	2.6	SS ₄
Siaya FTC	Second rains, 1998	1.6	Migyera
Bukura FTC	Second rains, 1998	2.0**	SS ₄
Bungoma FTC	Second rains, 1998	3.2**	SS ₄
Grand total		12.6 ha	
		9.0 under SS ₄	
		3.6 under Migyera	

*The Busia Prisons site was condemned in 1999.

**Bukura and Bungoma FTC sites were destroyed by drought.

This left 7.4ha of good crop.

In the first rains of 1999, the KARI-Kibos Primary Multiplication site was cut and used to establish the following sites.

Table 2. Sites established in 1999

Location	When established	Area (ha)	Variety	% Germination
Bungoma FTC	March, 1999	3.2	SS ₄	70%
Bukura FTC	April, 1999	3.2	SS ₄	65 – 70%
Busia FTC	April – May, 1999	3.2	SS ₄	65%
KARI-Alupe	April-June, 1999	14.6	SS ₄	80 – 85%
		5.2	Migyera*	

* The variety Migyera was from KARI-Alupe.

The total area covered under each cassava variety was 24.2 ha for SS₄ and 5.2 ha for Migyera.

The Siaya FTC's Migyera variety was cut in July – August 1999 to establish 8.4 ha at KARI-Kakamega Regional Center. Hence the total area of cassava established stands at 44.8 ha, with Migyera covering 17.6 ha and SS₄ covering 27.2ha.

These established sites have continuously been managed from land clearings, first ploughing, harrowing and second ploughing through to weeding. In some cases, re-harrowing has been done. In the short rains of 1999, we intend to manage the fields through weeding and general surveillance of incidences of mosaic disease. In the long rains of 2000 we plan to start involving districts in western Kenya in the Cassava Multiplication Program, as the Primary Multiplication sites would be ready by then for cutting.

DETAILS OF EACH SITE

1. Bungoma FTC (3.2 ha established)

1.1 Planting

The variety at this site is SS₄. The field was established at the onset of the long rains in March 1999 using about 72,000 ministem cuttings for planting.

1.2 Management Practices

1.2.1 Gapping

This activity was implemented from May 26 – 27, 1999. About 40,000 ministem cuttings were used. On June 19, 1999 field inspection was carried out and the overall germination percentage was determined, it was approximately 70%.

1.2.2 Weeding Operation

The field has been weeded three times. The first weeding was done between May 12 – 17, 1999 and the second weeding was done between May 26 – 27, 1999. The third weeding was done from July 22 – 26, 1999.

Major weeds were star grass (*Cynodon dactylon*), Couch grass (*Digitaria scalarum*) and assorted shrubs.

1.3 Pests and Diseases

Moles are a major pest at this site. They have been noticed to be interfering with the rooting system of the cassava plants thus resulting in the death of several plants.

A suitable pesticide has already been identified to put this under control in liaison with the management of Bungoma FTC. Some unidentified wild animal has also been noted eating cassava leaves. The FTC management has promised to do something about this in conjunction with the LAGROTECH staff.

1.4 Conclusion and Recommendations

- This field needs immediate weeding
- It has a slow growth rate compared e.g. with Busia FTC. Most of the current crop stand is slightly past knee height

2. Bukura FTC (3.2 ha established)

2.1 Planting

The SS₄ variety was used to establish this field. A section of the field was established in April 1999, and about 1.6 ha were re-planted in May – June 1999.

Approximately 96,000 two-node cuttings were used for both planting and gapping.

2.2 Management Practices

2.2.1 Weeding Operations

This field has been weeded twice. The first weeding was done on May 14, 1999 and the second weeding was done between July 22 – 28 1999.

The major weed is couch grass.

2.3 Pests and Diseases

No major pests except for terrestrial termites. Incidences of mosaic infected plants have been noted, but roguing is effected immediately upon detection of sick plants. About 6 plants were rogued by end of July 1999.

2.4 Conclusions and Recommendation

This field requires immediate weeding to reduce the choking effect of couch grass on the young sprouts. The cassava plants that were planted around April are slightly past the knee height, while the ones planted around May and June are about 15 cm high.

3. Busia FTC (4 ha established)

At this site, we have 3.6 ha under SS₄ variety and 0.4 ha under Migyera.

3.1. Planting

3.1.1 Old Field (0.8 ha)

This old field was established in March 1998 with 0.4 ha each of Migyera and SS₄ varieties. Part of the SS₄ field was cut in June 1999 to gap part of the 3.2 ha field within Busia FTC.

3.1.2 New Field (3.2 ha)

This site was established from May 21 – 24, 1999.

3.2 Management Practices

3.2.1 Gapping (3.2 ha)

This was done from July 6 – 8, 1999.

A follow up was made on 29 July, 1999 and the overall germination percentage was determined and pegged at 65%.

3.2.2 Weeding Operations

This field has been weeded three times as indicated below: -

First weeding was done between June 10 – 12, 1999, the second one was done between June 28 and July 1, 1999 and the third weeding was done between August 10 - 14, 1999.

A small section of the new field, was cleared and established a bit late, and this was weeded on July 28, 1999.

3.3 Conclusion and Recommendations

- Incidence of mosaic-infected plants has been noted to be high at the site compared with other primary multiplication sites. In July, about 12 plants were rogued. This was about 0.02% of the total plant population.
- The growth rate is relatively quite high at this site with most of the cassava plants almost reaching the waistline.
- This field needs weeding in about two weeks time or earlier than this due to heavy rains currently being experienced there.

4. KARI-Alupe (20 ha established)

Two cassava varieties SS₄ and Migyera were used to establish the fields at this site:

4.1 Planting

The SS₄ variety cuttings were mainly supplied from KARI-Kibos and used to establish about 14.8 ha at this site. The area covered by Migyera is about 5.2ha. Total area planted was approximately 20 ha.

Table 3. Cassava cuttings delivered to KARI-Alupe from KARI-Kibos site

Date	Amount Delivered	Cuttings
May 4	24,000	ministems
May 7	26,000	ministems
May 8	24,000	ministems
May 12	32,000	ministems
Total	106,000	

Table 4: Cassava bundles made and delivered to KARI-Alupe from KARI-Kibos site

Date	No. of bundles	*Cuttings delivered
May 21	50	22,500
May 23	92	41,400
June 3	84	37,800
June 5	165	74,250
June 9	138	62,100
June 12	200	90,000
June 16	221	99,450
June 19	223	100,350
June 23	228	102,600
Total	1,381	630,450

- Approximately 15 ministem cuttings are made from each 45 cm long stem. There were roughly 30 stems per bundle.

4.2 Management Practices

4.2.1 Gapping

Two hundred and ninety-eight bundles, consisting of 30 sticks per bundle, each stick about 45 cm long, were delivered to the site from KARI-Kibos on Monday, 5 July, 1999.

The total number of bundles supplied to KARI-Alupe from KARI-Kibos was one thousand six hundred and eighty. The overall germination percentage of the established field after gapping was estimated at 80 – 85%.

4.2.2 Weeding Operations

The fourth weeding commenced in early August, 1999 for the whole of the Alupe fields, and with the heavy rains currently being experienced around this region it is soon going to require fifth weeding.

4.3 Conclusion and Recommendations

- The growth rate at this field is encouraging with plant heights ranging between 15 cm – 50 cm depending on the specific dates of establishment.
- The fields are generally well managed.

5. Siaya FTC (1.6 ha established)

The whole of the field was planted with cassava variety Migyera and about 1.56 ha have been cut for bulking purposes at KARI-Kakamega. The cutting process lasted for one month commencing on July 27 to August 26, 1999.

5.1 Management Practice

5.1.1 Roguing

Cases of mosaic incidences have been noted at this site and infected ones rogued immediately. Between the months of July and August, 1999 approximately 15 infected plants have been uprooted and where weather conditions are favorable gapping was done for replacement purposes.

5.1.2 Weeding Operations

This field was weeded last in May 1999. Compared with other fields, the kind of weeds found at this site grow slowly and this can be attributed to the canopy that was already formed by migyera plants as they suppressed grass weeds in terms of growth. Since this field has been cut, weeds have jump-started and are growing vigorously.

5.2 Conclusion and Recommendations

This field needs urgent weeding, as there are heavy rains in Siaya FTC area at the moment hastening the process of weed growth. The first cut has been made hence shading effect on weeds eliminated.

6. KARI-Kakamega (8.4 ha established)

The whole of this field is under Migyera. The field operations undertaken were, land preparation which involved first ploughing, harrowing and second ploughing. In some cases re-harrowing was done. The whole process of land preparation lasted for about one and half months, from June 18 – July 27, 1999.

6.1 Planting

The bulking process started on July 30, 1999 and it ended on August 26, 1999.

Table 5: Cassava bundles made at the Siaya FTC site to KARI-Kakamega site

Date (1999)	No. of bundles cv. Migyera	Cuttings
July 30	272	122,400
August 5	248	111,600
August 12	311	139,950
August 20	289	130,050
August 26	216	97,200
Total	1,336	601,200

By August 31, 1999 the first section that was planted with this material had just started sprouting vigorously. This is encouraging and we hope that a high germination percentage will be attained, since the variety Migyera planted at the site has a high rooting and germination capacity than variety SS₄.

6.2 Management Practice

Due to the presence of lots of reliable rainfall at this site, the first weeding has been started at the section of the field where the first planting started. Other sections are being monitored closely incase they require the same attention. The sprouts are just half an inch from the ground level.

7. KARI-Kibos (2.6 ha)

The whole of this field was established with variety SS₄. It has re-growths, which are about 2 – 5 months old. This field has been cut to establish approximately 24.8 ha of the current standing crop. It has also supplied planting materials for gapping the Primary Multiplication sites.

7.1 Management Practice

7.1.1 Weeding

This field was weeded last in Mid-June, 1999 and at present it needs immediate and urgent weeding.

7.1.2 *Thinning*

This activity has been completed, leaving an average of four stems per re-growth so as to give good quality seeds during the cutting process. The whole operation took about one month.

7.2 **Pests and Diseases**

Incidences of mosaic-infested plants were noted between May and July 1999. A total of 22 cassava plants were rogued. In each case planting of a new cutting was done to replace the rogued ones especially where weather conditions were favorable.

SUMMARY OF EXPENSES

The summary below shows how funds from GATSBY Charitable Foundation, OFDA/USAID and Rockefeller Foundation Grant were used for field operations. The funds have also been used to hold two workshops this year. On March 10, 1999 a workshop was held at Tom Mboya Labor College in Kisumu for 17 District Agricultural Officers (DAOs) and District Agricultural and Livestock Extension Officers (DALEOs) from Western Kenya. This was a one-day Cassava Mosaic Disease (CMD) awareness workshop that was facilitated by Dr. James Legg (IITA-Uganda), Dr. Moses Onim (ONFARM-East Africa), Mr. Elijah Wanga (Provincial Crops Officer – Western Province), Ms. Phoebe Muchele (Provincial Crops Officer – Nyanza Province), Mr. J. Kamau (KARI-Katumani), Ms. Beatrice Luzobe (ONFARM-East Africa), Ms. Adeline Muheebwa (ONFARM-East Africa) and Prof. Micheal Thresh (Namulonge Research Institute). The workshop cost Ksh. 76,500.00. The second workshop was held between May 3-14, 1999. It was a workshop held for the 17 District Crops Officers (DCOs) from 17 districts in Western Kenya held at Tom Mboya Labor College, Kisumu. The workshop was held to train the DCOs on agronomy, distribution and rapid multiplication of cassava varieties resistant to CMD. The workshop was facilitated by Dr. Micheal Tunde Ajayi (IITA-Nigeria), Dr. Onim (ONFARM-East Africa), Dr. Jim Whyte (IITA-Uganda), Mr. Joseph Kamau (KARI-Katumani), Dr. Githunguri (KARI-Katumani), Dr. Siambi (KARI-Katumani), Mr. Nzioki (KARI-Katumani), Dr. Kariuki (KARI-Muguga) and Ms. Metrine Ndege (District Home Economics Crops Officer, Bungoma district). This workshop cost Ksh. 520,715.00. The funds were also used to finance KARI cassava research at Alupe and promising cassava entries from screening trials were advanced to clonal multiplication and further observation at a cost of Ksh. 88,546.00. The KARI cassava research is led by Mr. J. Kamau. The financing of cassava research activities was done in April 1999.

A system of getting funds for various field operations has been set up which has worked very well so far. The people in charge in the various stations where the multiplication process is going on send in budgets for the various requirements which are then cross checked with standard costs already incurred in all the stations and the funds are sent in immediately. Follow-ups are carried out frequently to ensure that activities that were budgeted for are carried out. So far the accounting process has gone on smoothly and any hitches encountered have been smoothed out.

Expenses Summary:

1. Rapid Cassava Multiplication.....	- Ksh. 1,669,595.00
2. Workshops.....	- Ksh. 597,215.00
3. Cassava Research	- <u>Ksh. 88,546.00</u>
TOTAL	<u>Ksh. 2,355,356.00</u>

ANNEX 3

Progress report-OFDA fourth quarter activities -Tanzania Tanzania Root and Tuber Crops Programme

October 1999

1. CMD monitoring and diagnostics

A survey was conducted in June 1999 focusing on Biharamulo and Muleba districts, in the southern part of Kagera region. CMD was less prevalent in Biharamulo. About 50% of the surveyed fields have low incidence (< 20%) and severity score of between class 2 and 3. Severe CMD symptoms were not observed in Biharamulo. CMD was however prevalent in Muleba district. About 47% of the surveyed cassava fields had incidences of between 41% and 100%. Symptoms of the CMD pandemic caused by UgV were observed in 12 fields covering almost 50% of the district. Whitefly populations were high in the CMD pandemic-affected fields.

Another CMD monitoring survey was carried out in Kagera and Mara regions of Tanzania in July 1999. The main objective was to obtain updated information on the extent of spread of the CMD pandemic in the Lake Victoria Zone. Two districts in Kagera and Mara regions (Bukoba and Karagwe in Kagera region and Musoma and Tarime in Mara region) were surveyed. CMD occurred almost in all the locations in the two regions with low to high incidence (0-100%). Severe CMD symptoms assumed to be caused by UgV were observed in all the 22 cassava fields examined in Bukoba district with incidence that varied between 23% and 100%. This is to say that large increases in the prevalence of CMD in Bukoba district have occurred between January and July 1999 to cover all the areas in the district. Mean severity score ranged from 2.3 to 4.0. In Karagwe district, only one cassava field out of the 21 sampled looked clean without CMD. Incidence in the CMD affected cassava fields ranged from 3% to 100%. For the first time we report the occurrence of the severe form of CMD in 9 cassava fields in Karagwe district of Kagera region with the epidemic front extending about 74 km inside the district from the Karagwe/Bukoba border on the north-east. In such fields incidence varied from 36% to 100% and severity score of between 2.4 and 4.5. In the fields affected by severe CMD most infection was whitefly-borne. Incidence was highest on the eastern part near to either the Bukoba/Karagwe border or the Uganda/Tanzania border to the north.

In Tarime district of Mara region, CMD was found in 24 fields of the total 26 surveyed during the study. Incidence ranged from 3% to 100%. Severe CMD was observed in 8 cassava fields with incidence that varied between 56% and 100%. Symptom severity score averaged between 3.0 and 3.5. These fields are mainly to the north along the Kenya/Tanzania border. In Musoma district CMD was found in 19 of the 20 examined cassava farmers' fields with infection proportion that ranged between 10% and 100%. Severe CMD symptoms were observed in two cassava fields (< 1 km from the shore of the Lake Victoria). Symptom severity score averaged 3.3.

Whitefly populations in the surveyed districts varied from one location to another. Mean whitefly numbers reached 202 per top five leaves per plant in one field in Karagwe and 125 whiteflies in Bukoba district in highly populated fields. In Tarime and Musoma districts, whitefly numbers were relatively low. Analysis revealed a significant ($P < 0.001$) positive correlation between the mean adult whitefly numbers and CMD incidence in Karagwe ($r = 0.7759$) and Bukoba ($r = 0.5297$) districts and no significant correlation in Musoma and Tarime districts. The results of the survey indicate that severe CMD pandemic continues to expand its range into cassava growing areas in Tanzania at a fast rate. The status of CMD in Mara and Kagera regions is given (Table 1)

2.0 Establishment of open quarantine

After groundwork on all the modalities to introduce an open quarantine facility at ARI - Maruku has been completed, permission was granted for the establishment. With careful observation of all the conditions attached to the permission, a 5 ha field was identified at ARI - Maruku station and is at least 200 m away from cassava fields. A team of staff from Tanzania Plant Protection Division (PPD) arrived in Bukoba in July 1999 for the field identification exercise. The Kagera Agricultural and Environmental Management Project (KAEMP) agreed to undertake land preparation activities. Ploughing is complete and application of herbicide on the sprouting couch grass will be done soon. The PPD staff will work together with IITA, the networks, the plant quarantine service in Uganda, and staff of Root Crops Programs in the two countries, to introduce large quantity of CMD resistant variety SS4 together with small quantities of a large (>200) number of clones of 'new' elite materials derived from the EARRNET germplasm development Programme based at Serere, Uganda. The target is to have at least 4.5 ha of SS4 and 0.5 ha EARRNET clones. Materials when in open quarantine at ARI-Maruku will be maintained under strict observation for a period of twelve months after which they are likely to be 'released' for more wide spread multiplication and/or evaluation.

3.0 Cassava Variety Screening Trials

The data for the first set of cassava varieties being evaluated for their resistance to the severe form of CMD in a number of sites in Bukoba district are currently being analysed. The results will be presented in the next report. Another set of 11 varieties is being evaluated again in Bukoba district (planted in April 1999) for CMD resistance. The list is found in the third quarter progress report. Preliminary data from the monthly record derived from this trial has revealed some resistance level in varieties UKG 94/069, and Konyo. All the remaining varieties have been severely affected by the severe form of CMD epidemic and cannot stand up.

4.0 Stakeholder linkages

The OFDA CMD Project continued to strengthen links with various partners in the Lake zone of Tanzania during this period. In an IPM workshop held in Bukoba town between August 18th and 20th 1999, Dr. R. Kapinga and Mr. J. Ndunguru jointly

presented a paper on CMD status in Kagera and Mara regions. All the OFDA CMD Project activities aimed at combating the CMD in the two regions and future perspectives were discussed. The summary will appear in the KAEMP Proceedings. Tanzania Pesticide Research Institute (TPRI), Arusha was approached to assign one person to be involved in monitoring of open quarantine field at ARI-Maruku and it was agreed. Five farmers groups were formed in Bukoba and will be involved in multiplication of sweet potato, cassava, and yam planting material.

5.0 Rapid multiplication of resistant varieties

Rapid multiplication of cassava resistant varieties at ARI Maruku and Ukiriguru, Mwanza continues during this period. Status of the varieties being multiplied is given in Table 2. At ARI Maruku, plants are doing well with a good canopy. About 25 plants of variety TMS 4(2) 1425 with CMD symptoms were rogued. The rest are ready for first ratooning.

6.0 Future Plans

- Monitoring and diagnostics, in the already affected and threatened zones (Western, Northern and Southern).
- Further multiplication of CMD resistant varieties introduced from IITA, Ibadan and Uganda. These include TMS 4(2) 1425, TMS 30337, TMS 60142 and SS4. Also promising varieties currently under evaluation
- To expand CMD screening sites to Mara region
- Establishment of open quarantine facility at ARI - Maruku, Bukoba and Mara
- Establishment of yield loss and CMD/CGM interaction trials in drier areas of Kagera and Mara
- Sensitization process on CMD identification and management strategies at farmers level to be strengthened through
 - Training
 - Awareness campaigns
 - Extension materials
- Technology transfer of diversified uses of cassava and sweet potato.

Table 1. Incidence of severe CMD and severity scores in Kagera and Mara regions by ward - July, 1999

Region	District	No. of wards	Incidence (%) ^a	Severity ^a	Whitefly count
Kagera					
	Bukoba	31 (31)*	86	3.1	28.6
	Karagwe	16 (7)	70	3.0	36
	Biharamulo	15 (0)	0	1	1.3
	Muleba	22(11)	56	3.0	53.2
Mara					
	Tarime	? (5)	81	3.1	2.13
	Musoma	31(2)	90	2.8	0.44

* Number in brackets is the number of wards affected by severe CMD

^a incidence represents proportion expressed as percentage of affected plants per field, severity based on 1-5 scale where 1=no symptoms and 5=severe mosaic (Ndunguru and Jeremiah, 1999)

Table 2: Status of Cassava Planting Material Multiplied with Promising Reaction to CMD ‘UgV’

Location	Number of cassava varieties	Established plant	Estimated cuttings as at October, 1999	Targeted beneficiaries
ARI- Ukiriguru (Nyakasanga site), Mwanza	6*	23,918	648,786	Bukoba district, Mara, Shinyanga
	6**	25,291	682,857	
ARI-Maruku Bukoba	4*	8,869	26,607	Kagera
Nyamikoma village (Masalakulangwa Comm. Group)	2*	1,979	11,874	Shinyanga
	3*	5,504	33,024	

* Proven to be resistant to ‘UgV’ by NARO, Uganda and IITA/ESARC

** Currently being evaluated in severely hit fields for resistance to ‘UgV’

ANNEX 4

Report on Cassava Multiplication Training Workshops and Evaluation Exercise of the Cassava Multiplication Programme in Rakai and Masaka districts

September 13th - 18th, 1999

Sseruwagi Peter

I. Introduction

The 'Emergency Programme to Combat the Cassava Mosaic Disease Pandemic in East Africa', is funded by the Office for Foreign Disaster Assistance (OFDA) of the United States Agency for International Development (USAID). Since the inception of its activities in Uganda, a number of activities have been carried out in the project area, Rakai and Masaka districts. The activities include; monitoring and diagnostic surveys of Cassava mosaic virus disease (CMD), establishment of stakeholder linkages and training and multiplication of CMD-resistant varieties. So far one monitoring and diagnostic survey has been conducted in the two districts by staff from the International Institute of Tropical Agriculture, Eastern and Southern Africa Regional Center (IITA-ESARC) based at Namulonge. Stakeholder linkages have also been established with partner institutions including; district agricultural administrations and a number of non-governmental organizations (NGOs). Two training sessions on CMD and its management and cassava multiplication have been conducted for the stakeholders. IITA-ESARC coordinates the project funds and the purchase and transportation of planting material, while the Irish Foundation for Co-operative Development (IFCD), one of the NGOs is charged with organizing and coordinating project activities by partner institutions. So far two rounds of multiplication have been carried out, with the first in November 1998 and the second in April 1999. In the first round, about 300 bags of CMD-resistant cv. SS4 were distributed in equal proportions to Rakai and Masaka districts for multiplication, targeting an area of 15 ha per district. However, not only was the actual area planted (10.4 ha) below the targeted 30 ha, the effective area under crop was much lower (6.9 ha) than anticipated, owing to a number of factors. In order to make up for the deficiencies in the first round of multiplication, an additional 600 bags of cv. SS4 were purchased and distributed for multiplication to the two districts in the second round. The Irish Foundation for Co-operative Development (IFCD) coordinated the distribution and planting of the stems. Mr. G. Tusiime of IITA-ESARC, has visited and reported on the multiplication programme in the two districts. The report presented here, therefore, only gives a general picture of the state of the multiplication fields, especially those planted during the first round (November, 1998). A report of the 'Cassava multiplication training workshops' conducted at Kalisizo, Rakai district and at Kamenyamigo District Farm Institute (DFI), Masaka district is also presented.

II. Cassava multiplication training workshops

Cassava multiplication training workshops were held at Kalisizo, Rakai district and at Kamenyamigo, Masaka district on September, 15th and 16th, 1999. Participants at the workshops included; Project Officers and extension staff from IFCD and district

extension staff from Rakai and Masaka districts involved with the multiplication programme (Table 1).

Objective of the workshops

The workshops aimed at;

- i) Explaining to participants the concept of cassava stem multiplication
- ii) Training participants in techniques of cassava stem multiplication
- iii) Explaining to participants the concept of ratooning
- iv) Training participants in techniques of ratooning and management of the ratoon crop

Progress reports

The workshops started with introductory remarks by IFCD. The participants were called upon to present brief reports on the progress of the cassava multiplication programme in their respective areas of jurisdiction. The report format to be used included brief reports on the number of bags of cassava stem cuttings obtained, hectareage initially established, present condition of the crop and problems encountered for both the mature (planted in November, 1998) and the young (planted in April, 1999) crops. Reports on the performance of the mature crop were more positive than for the young crop. The mature crop had established better in many places, which ensured a better stand, more likely to yield more planting material in the next phase of the multiplication programme than the young crop. However, some mature fields were reported to have very poor plant stands and may not be harvested soon, as is reported in section III of this report.

Table 1: Participants at the Cassava multiplication training workshops in Rakai and Masaka districts

Institution	Rakai	Masaka
IFCD/Extension	21	20
ICR	1	-
Rakai District Administration (RDA)	1	-
CONCERN	1	-
LWF/RACA	1	-
WEAR	1	-
OCBO	1	-
World Vision	-	1
Redd Barna	-	1
MADDO	-	1
Kitovu Mobile	-	0
Masaka District Administration (MDA)	-	2
KWEAP	-	1
TOTAL	27	26

Performance of the young crop was dominated by poor germination and establishment in many places, although a number of them were reported to be doing well. The poor performance of the young crop was attributed to a number of factors including among others; delayed delivery of planting material from Namulonge and IFCD collection centers in the two districts, deterioration of cuttings due to drying, rotting, bruising of nodes during packaging and transportation and the effects of the prolonged drought in many parts of the two districts. In addition to the factors raised above, a number of young fields were also reported to have low plant populations due to excessive roguing. The roguing resulted from the frequent occurrence of CMD infected SS4 plants in the fields, which mainly occurred at sprouting (cutting infection) together with the occurrence of mixed varieties in some fields. The first implication of the presence of CMD infected SS4 plants and mixed varieties in the young crop is that selection of planting material was not thoroughly carried out. Secondly, it is likely that some whitefly infection occurred. However, on close examination of the reports, there seemed to be some confusion between the symptoms of cassava green mite (CGM) infestation and CMD. This was evidenced from the lack of a single report on the presence of CGM in the fields and yet it was very apparent in many of the multiplication fields. It is therefore likely that the CGM infested plants were mistakenly rogued instead of the CMD infected plants. Additionally, although SS4 was the main variety anticipated for multiplication, a few field extension officers noted that some Migyera cuttings were also supplied in mixture with the SS4 cuttings. For fear of mixing the two varieties during harvesting (ratooning), some extension officers rogued out the Migyera plants, while others (Rakai district administration multiplication) left the plants to grow together with the SS4 plants. It was advised that the cv. Migyera be encouraged as a variety to be consumed after processing. The concerned NGOs were also advised to seek technical assistance in post harvest technologies from the 'Post harvest section' at IITA-ESARC, Namulonge.

Training

The participants were introduced to the concepts of cassava stem multiplication and ratooning. They were also trained in basic techniques of ratooning, the different methods of cassava multiplication and the management of the ratoon crop. Other concepts pertaining to the epidemiology and management of the disease, cyanide levels of the different cassava varieties and postharvest related issues were also discussed during the discussion period.

III. Evaluation of the cassava multiplication programme

Evaluation of the cassava multiplication programme was carried out on some of the mature crop (harvest age) in the two districts. The objective of the evaluation was to assess the number of SS4 cassava fields ready for stem harvesting (ratooning) and the proportion of crop infected with CMD and CGM.

A summary of findings from the evaluation exercise is presented in table 2. Overall 18 cassava multiplication fields were visited, with 9 fields from either district. The majority of the fields were well kept (weed free), very vigorous and largely free from CMD-infection. A rough estimate of the incidence of CMD put the infection level at 0 -5% in most of the fields (Table 2). The disease was, however, slightly

higher (>10<25%) in the field controlled by the 'Womens Enterprise Association of Rakai' (WEAR) in Rakai district. CGM infestation ranged from 5 - 10% in 11 fields. Four fields had plants with signs of recovery from CGM infestation and the remaining 2 fields hardly had any symptoms of CGM infestation. 15 out of the 18 fields were ready for harvesting. The remaining 3 fields were stunted and less vegetative and it was suggested that they be left in the field until the next season when they would be harvested (Table 2). The different proportions of stems harvested from the multiplication blocks to be used by each partner institution were outlined to the members. As was earlier agreed upon at the inception of the project, it was agreed that 40% of the stems would be given back to the project for re-distribution and establishment of new multiplication sites. The other 40% was to be sold by the multiplier (if possible) and the remaining 20% was to be used by the multiplier for either establishing new multiplication sites or for food production by the group members. It was however, noted that it would be much easier for the larger multipliers, for example Masaka District Administration (MDA) to apportion out material as agreed than for the small groups of farmers involved in the multiplication. Nevertheless, it was agreed that all partner institutions stick to the agreement and that modalities concerning the harvested material be worked out by IFCD. The members were informed about the availability of funds for the second phase of the project to be availed to the project partners at the beginning of October 1999. Members were called upon to prepare the fields in time to avoid delays in establishing the new crop.

In conclusion, it is needless to say that although a number of limitations were encountered during the establishment of the multiplication fields, the results are promising and show progress towards achieving the goals of the project. The second phase of the multiplication programme has had a lot to learn from the weaknesses of the first phase. As a result, therefore, a number of recommendations were made for consideration in the next phase and these include;

- i) Thorough selection should be done before harvesting to minimise CMD cutting infected plants and off types (non-SS4 plants) in the next crop.
- ii) Stem harvesting, packaging, distribution and planting should be done carefully and timely as soon as the rains start to minimize damaging the planting material and to ensure proper germination and crop establishment.
- iii) A detailed record of the; name of the recipient, gender, quantity acquired, area established and location of the material distributed should be kept. This would serve as a data bank from which to monitor the extent of area established of the new crop.
- iv) The mature crop at every site should be maintained as a ratoon crop for subsequent stem production after the first stem harvest.

Table 2. Cassava multiplication fields and their condition in Rakai and Masaka districts, OFDA project, August, 1999.

District	Partner Institution/s	ha	Crop and field status	Comments
Rakai	ICR	0.1	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Not very vigorous ▪ 1 to 2 stems per stool ▪ <5% CMD infection ▪ <5% CGM infection ▪ Weedy 	Ready for harvesting
Rakai	ICR	0.2	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ >5<10% CGM infection ▪ Weedy 	Ready for harvesting
Rakai	ICR	0.2	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ Signs of recovery from CGM infection ▪ Weed free 	Ready for harvesting
Rakai	Rakai district administration (RDA)	1.0	<ul style="list-style-type: none"> ▪ Mature ▪ >50<75% established plant stand present ▪ Not very vigorous (stunted) ▪ 1 to 2 stems per stool ▪ <5% CMD infection ▪ Signs of recovery from CGM infection ▪ Weed free 	Not ready for harvesting

Table 2 continued.

District	Partner Institution/s	ha	Crop and field status	Comments
Rakai	WEAR	0.6	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <10% CMD infection ▪ Signs of recovery from CGM infection ▪ Weed free 	Ready for harvesting
Rakai	OCBO	0.1	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Fairly vigorous ▪ 1 to 3 stems per stool ▪ <5% CMD infection ▪ No CGM infection ▪ Weed free 	Ready for harvesting
Rakai	OCBO	0.1	<ul style="list-style-type: none"> ▪ Mature ▪ Mixed with local varieties ▪ >75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ Signs of recovery from CGM infection ▪ Weed free 	Ready for harvesting
Rakai	OCBO NB: One other site is similarly like this one in every condition.	0.1	<ul style="list-style-type: none"> ▪ Mature ▪ <75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ No CGM infection ▪ Weed free 	Ready for harvesting

Table 2 continued.

District	Partner Institution/s	ha	Crop and field status	Comments
Masaka	Masaka district administration (MDA)	1.2	<ul style="list-style-type: none"> ▪ Mature ▪ >50<75% established plant stand present ▪ Not very vigorous (Stunted) ▪ 1 to 2 stems per stool ▪ <5% CMD infection ▪ <5% CGM infection ▪ Weed free 	Not ready for harvesting
Masaka	Masaka district administration (MDA)	1.4	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ <5% CGM infection ▪ Weed free 	Ready for harvesting
Masaka	Kitovu Mobile	0.4	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ <5% CGM infection ▪ Weed free 	Ready for harvesting
Masaka	World Vision NB: 3 other sites are similarly like this one in every condition.	0.1	<ul style="list-style-type: none"> ▪ Mature ▪ <75% established plant stand present ▪ Very vigorous ▪ 1 to 4 stems per stool ▪ <5% CMD infection ▪ <5% CGM infection ▪ Fairly weedy 	Ready for harvesting

Table 2 continued.

District	Partner Institution/s	ha	Crop and field status	Comments
Masaka	Kabula Women Empowerment (KWEAP)	0.1	<ul style="list-style-type: none"> ▪ Mature ▪ >25<50% established plant stand present ▪ Not vigorous (Stunted) ▪ 1 to 2 stems per stool ▪ <5% CMD infection ▪ <5% CGM infection ▪ Weedy 	Not ready for harvesting
Masaka	Kabula Women Empowerment (KWEAP)	0.4	<ul style="list-style-type: none"> ▪ Mature ▪ >75% established plant stand present ▪ Fairly vigorous ▪ 1 to 3 stems per stool ▪ <5% CMD infection ▪ No CGM infection ▪ Weed free 	Ready for harvesting