

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

## **A SYSTEM-WIDE WHITEFLY IPM AFFILIATED PROJECT**



## **Third Quarterly Technical Report**

### **Phase 1**

April-June 1999

**International Institute of Tropical Agriculture**

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## Summary

Strong progress was recorded during the April-June 1999 quarter in all Project themes. Monitoring and diagnostic surveys 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. It was noted that the biocontrol agent of cassava green mite occurred throughout the sampled areas, and perhaps because of this, CGM damage was generally low. Monitoring surveys were completed in the southern part of Kagera region, Tanzania, but results will be presented in the report for the next quarter.

575 bags of CMD-resistant cv. SS4 was purchased, delivered and planted in Masaka and Rakai districts. This enabled the Project to exceed its multiplication target of 30 ha for Uganda. In Kenya, the Project contributed to the planting of > 35ha of multiplication blocks of cvs. SS4 and TMS 30572. More than 10,000 tissue culture plantlets were successfully imported into Tanzania from IITA, Nigeria including both known CMD-resistant cultivars and genotypes with novel sources of CMD resistance. These were to supplement existing rapid multiplication activities currently on-going at four locations in Lake zone, which have cumulatively provided planting material equivalent to almost 500,000 cuttings.

15 elite cassava clones were selected for 'fast-track' multiplication from the germplasm evaluation at Alupe, Kenya. The best of these had experimental yields greater than 200 t/ha. Nine 'new' CMD-resistant cassava cultivars obtained from the final stages of the NARO breeding programme were planted at each of two demonstration locations in Rakai and Masaka. In Tanzania, preliminary results from evaluation trials in the pandemic-affected zone of Kagera region have shown that very few of the currently available cultivars have sufficient levels of CMD resistant to make them suitable for large scale multiplication. Most notably, Msitu Zanzibar, which had proved popular with farmers and was being multiplied through a major IFAD-funded multiplication scheme, may not be appropriate for multiplication in areas affected or immediately threatened by the pandemic.

18 district crops officers and NGO field workers from Nyanza and Western provinces, western Kenya completed a 'training of trainers' course on cassava production, pest/disease management and postharvest utilisation. In Tanzania, training in similar topics was given to 158 village leaders in wards of Bukoba district most severely affected by the pandemic.

Permission was granted by the Ministry of Agriculture and Co-operatives of Tanzania for the establishment of an open quarantine facility at ARI Maruku, Bukoba, in order to facilitate the introduction from Uganda of large quantities of CMD-resistant germplasm.

A proposal was developed for a follow-up second one-year phase for the Project and submitted to OFDA.

**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 second quarter of the Project, described in greater detail in the second quarterly report were as follows:

1. Monitoring and diagnostics surveys were conducted in the northern part of Kagera region, Tanzania. An area of approximately 5,000 square km had a moderate to high incidence of severe CMD although Karagwe district was less severely affected. Virus diagnoses confirmed the occurrence of UgV in south Nyanza, (western Kenya) and northern Kagera.
2. Rapid multiplication plots in Mwanza yielded 90,000 mini-cuttings of which 10,000 were used to established rapid multiplication plots in Kagera.
3. At Alupe, Kenya, 400 cassava clones were retained from the original >500 introduced from Uganda based on their performance and multiple pest/disease resistance.
4. Two evaluation trials including 26 improved cultivars were established at 6 sites in Bukoba district, Kagera.
5. A CMD Awareness Workshop and a seed multiplication workshop were held in Kisumu, western Kenya, and Bukoba, north-western Tanzania respectively. Training was provided to agricultural staff in CMD biology, spread and management, and the regional significance of the CMD pandemic.
6. The inaugural meeting of the cassava steering committee for western Kenya was held providing an opportunity to review progress of programmes tackling the CMD pandemic.
7. Senior plant quarantine officials from Uganda, Kenya and Tanzania were hosted to a study tour in Uganda and western Kenya to evaluate the open quarantine approach and assess the potential for its use in Tanzania.

## 1. Monitoring and Diagnostics

A survey to assess incidence and severity of major cassava pests and diseases was conducted in Rakai and Masaka districts, Uganda, from 16-26 June 1999. The results are described in Annex 1. Similar surveys were conducted in the two districts in December 1997, as part of the Whitefly IPM Project, and provide a useful comparison. At this time, CMD incidence was 67% in Masaka and 47% in Rakai, and most infection was current season i.e. it had resulted from infection by the whitefly vector, *B. tabaci*. During the current survey (fig. 1), incidences recorded were 72% for Masaka and 62% for Rakai, representing modest but significant increases on results for 1997. A more important difference between the two datasets, however, was the change in the balance of infection types. In the current dataset, cutting-derived infection was much more prominent, particularly in Masaka district. The increase in incidence in the two districts over the last two years is not as great as it has been in the central districts of Mukono, Mpigi and Luwero. This suggests either that there has been a more substantial reduction in inoculum pressure in Masaka and Rakai than elsewhere in southern Uganda, or that farmers are exploiting varietal diversity and limited resistance amongst some local cultivars, or a combination of the two effects. The former seems unlikely, since populations of *B. tabaci* recorded during the current survey were moderately high. There is some evidence for the latter, however, since during the surveys farmers commented that one of the widely grown local cultivars, 'Kwatamumpale', was being favoured because of its limited resistance to CMD. This observation suggests that there may be merit in pursuing a programme of phytosanitation in tandem with CMD-resistant varieties multiplication programme. This feasibility of such an approach will be explored during the final quarter of the Project.

Cassava green mite (CGM) was reported throughout the surveyed areas, but damage was generally moderate. Importantly, the introduced biological control predator for CGM was found throughout the areas surveyed, and has evidently established well in both districts. It is anticipated that this has already provided significant benefits to cassava producers in Masaka and Rakai districts. Cassava mealybug (CM) was not observed in either district, and cassava bacterial blight was of only minor importance. Cassava leaf and stem samples were collected from 10 cassava plants in each of 6 fields per district. DNA was extracted from leaf samples for subsequent virus diagnostics tests, to be performed in the July-September quarter, and cassava cuttings were rooted in pots in the screen-house at Namulonge to provide reference material for virus diagnoses.

Monitoring and diagnostic surveys were conducted in collaboration with KAEMP in the southern parts of Kagera region in June. Results will be presented in the fourth quarterly report. There were no survey activities in western Kenya during the current quarter.

## **2. Multiplication**

### **Uganda**

In order to make up for the deficiencies in the first round of multiplication (November 1998), an additional 575 bags of CMD-resistant cv. SS4 were purchased from a producer near to Kampala. These were then transported by lorry to Rakai and Masaka districts in the first part of April. The Irish Foundation for Co-operative Development (IFCD) co-ordinated the distribution of the stems, and planting took place in April, during a period of favourable rainfall. IFCD's report for the current quarter is attached as Annex 2. Mr. G. Tusiime, of IITA, visited most of the partner institutions involved in the multiplication programme in June, and the report in which the findings of this visit are detailed is provided in Annex 3. In general, positive progress was reported from multiplication sites visited and the target for multiplication in Rakai and Masaka should be achieved.

### **Kenya**

At the beginning of the main rainy season in March, roughly 3.5 ha (=8.5 acres) CMD-resistant material was available for planting. By the end of June, through support provided by the Gatsby Charitable Foundation, the Rockefeller Foundation and OFDA, more than 35 ha had been planted in primary multiplication centres (Annex 4). The main sites included Alupe Research Sub-Station (> 20ha), Bungoma, Bukura, Siaya and Busia Farmer Training Centres (FTCs) (> 11 ha) and Kakamega Research Station (> 4 ha). Preparations will be made for the transition to secondary multiplication centres in the second season of rains beginning in September.

### **Tanzania**

Strong progress was realised in the implementation of multiplication activities in north-western Tanzania during the April-June period. Results are reported in detail in Annex 5. Rapid multiplication was sustained at Nyakasanga and Nyamikoma, Mwanza region, and at Maruku ARI and Kiilima, Kagera region. By the end of June material has been multiplied at these sites to provide almost half a million cuttings of improved cassava varieties. Critically, the quantity of material available in the pandemic affected zone of Bukoba District, Kagera region, is increasing at a satisfactory rate.

During May, more than 10,000 tissue culture plantlets of CMD-resistant varieties were transported from IITA, Ibadan, Nigeria, to Ukiriguru ARI. A combination of factors including stress during transportation and the difficulty of weaning and transplanting the materials meant that a substantial proportion of these plants were lost. A significant number of plants have been established, however, and these will serve as an important source of new germplasm. Two advantages associated with the importation of this material are that it provides a significant increase in the quantity of known CMD-resistant germplasm available for multiplication, and material introduced in this way is of unequivocal provenance. By contrast, there is some uncertainty over the identities of germplasm thought to be TMS 4(2)1425 and TMS 30572, currently being multiplied in the Lake zone.

### **3. Germplasm Diversification**

An important step was taken towards making a wider variety of CMD-resistant germplasm available to farmers in Masaka and Rakai, with the establishment of new cultivar demonstration plots. Trials were planted at International Care and Relief's demonstration site in Rakai and at the District Farm Institute in Masaka. Trials each included nine 'new' cultivars which are either released or in final stage evaluation trials of the National Cassava Programme (NCP). Germplasm in these trials will be formally evaluated, and in addition, will be used for farmer demonstrations.

55 new clones, from the EARRNET germplasm evaluation programme at Serere, were planted in the newly-expanded open quarantine facility at Alupe, Busia, western Kenya. Final evaluations were also done for the 601 clones that had been introduced in late 1997 from Serere (526 clones) and Namulonge (75 clones). Yields averaged 67 t/ha and exceeded that of the SS4 check in 79% of cases. Ten clones yielded more than 160 t/ha, although the small plot sizes were such that these data may be artificially high. 260 clones were selected for inclusion in the performance evaluation trial, planted in March, and the fifteen best performing were set aside for rapid multiplication. These were: MM96/7688, MM96/1871, MM96/7151, MM96/4052, MM96/4884, MM96/4684, MM96/7329, MM96/9308, MM96/4466, MM96/5280, MM96/3868, MM96/9362, TME 14, MH95/0183 and Unkown 2. These 'fast-track' materials will be planted out in multi-locational trials in March/April 2000. All clones advanced have a generally good background CMD resistance, having been selected from Serere where CMD pressure is moderately high. Pest and disease responses will be more thoroughly evaluated, however, in the performance evaluation trial.

In Tanzania, a wide diversity of germplasm continues to be multiplied as described in the previous section, and a selection of these are being evaluated in Bukoba District, where the impact of the CMD pandemic is currently greatest. Evaluations are being made of 25 cultivars at six sites in Bukoba. By the end of the final quarter of the Project (September 1999), sufficient data should have been collected to make an assessment of the relative resistance to CMD of the different cultivars being evaluated. Preliminary data derived from the fourth set of monthly data for one of the trial sites (Gera) planted in January, are presented in Fig. 2. Lower incidence and severity scores recorded in Tanzania, when comparing common cultivars [TMS 30337 and TMS 4(2)1425], suggests that infection pressure was greater at the Ugandan site than in Tanzania. From these data it is clear that only a few cultivars currently available in Tanzania have sufficient resistance to CMD to resist infection under the high levels of disease pressure associated with the pandemic. This highlights the importance of the introduction of germplasm with greater levels of resistance than those currently available. This problem will be addressed through the introduction of 'new' germplasm from Uganda through open quarantine and from IITA through tissue culture plantlets (the latter achieved this quarter).

### **4. Stakeholder Linkages**

IFCD continued to be active in co-ordinating activities of NGOs in Masaka and Rakai districts and in strengthening the work of the district agricultural authorities. The

establishment of demonstration sites should also facilitate the strengthening of links between district-based government and NGO extension workers and their farmer clients.

The Project continued to encourage the consideration by Tanzanian plant protection authorities of the establishment of open quarantine in north-western Tanzania. A presentation was made to Tanzanian cassava stakeholders from the Lake zone and senior plant protection staff on the current CMD situation in Kagera, and the potential benefits of setting up an open quarantine arrangement. Tanzania Root and Tuber Crops Programme staff reported that permission for the establishment of such a facility at ARI Maruku was granted on June 21. A copy of the letter of approval with accompanying guidelines is attached as Annex 6.

TRTCP has developed a proposal for the set-up and running of open quarantine at ARI Maruku. The proposal envisages close collaboration between TRTCP, KAEMP, IITA-ESARC, EARRNET and NARO (Uganda) in the set-up and maintenance of the site and in the introduction of elite CMD-resistant germplasm from Uganda. It is anticipated that one practical consequence of this collaboration will be the sharing of costs.

## **5. Training**

### **Uganda**

No training activities were specifically programmed for this quarter in Uganda, but *in situ* advice was provided to both Project partners and farmers on cassava plant health management during the monitoring visit of Mr. G. Tusiime.

### **Kenya**

A two week course entitled ‘Agronomy, Rapid Multiplication, and Distribution of Healthy Planting Materials’ was held in Kisumu, Kenya, from 3 to 14 May. This activity was supported by IITA’s training unit (facilitated by Mr. M. Ajayi, IITA, Ibadan), and covered both theoretical and practical aspects of cassava production, multiplication and plant health management. Beneficiaries were principally District Crops Officers, although several NGO staff also attended. Participants were drawn from all 17 districts of Nyanza and Western provinces, and a key aspect of the training was to equip participants with the ability to pass on their knowledge to other agricultural workers and farmers. Plans were also developed at the end for the secondary multiplication of CMD-resistant cassava within each of the districts represented. The course was supported by GCF, Rockefeller and OFDA.

### **Tanzania**

158 village leaders were trained in CMD and its management, rapid multiplication and postharvest processing methods in 9 farmer education centres in Bukoba District. This approach was designed to rapidly disseminate information on the current CMD crisis to ‘grass-roots’ level.

## **6. Workplan highlights for July-September 1999**

### **Uganda**

- Diagnose viruses from > 120 CMD-diseased leaf samples collected from Rakai and Masaka
- Sustain multiplication of CMD-resistant cv. SS4 and develop implementation plans with stakeholders for first ratooning (planned for October/November)
- Identify germplasm for supply to open quarantine site in Tanzania
- Complete first evaluation of the performance of new germplasm planted at two demonstration sites
- Conduct farmer training in cassava pest and disease management

### **Kenya**

- Contribute to multiplication of > 40 ha CMD-resistant cvs. SS4 and TMS 30572
- Develop overall implementation plan with partners for secondary multiplication
- Establish first multiplication sites in south Nyanza
- Continue multiplication of 15 'fast-track' multiple pest/disease resistant clones from germplasm development programme, Alupe
- Crops officers to initiate training of farmers at district level

### **Tanzania**

- Report results of diagnostics and monitoring survey, southern Kagera
- Expand rapid multiplication activities at Nyakasanga, Nyamikoma, Maruku and Kiilima
- Integrate tissue culture materials into rapid multiplication programme
- Select germplasm for advancement to large-scale multiplication on the basis of evaluation results
- Prepare for the September/October establishment of open quarantine at Maruku
- Train farmers in Bukoba district

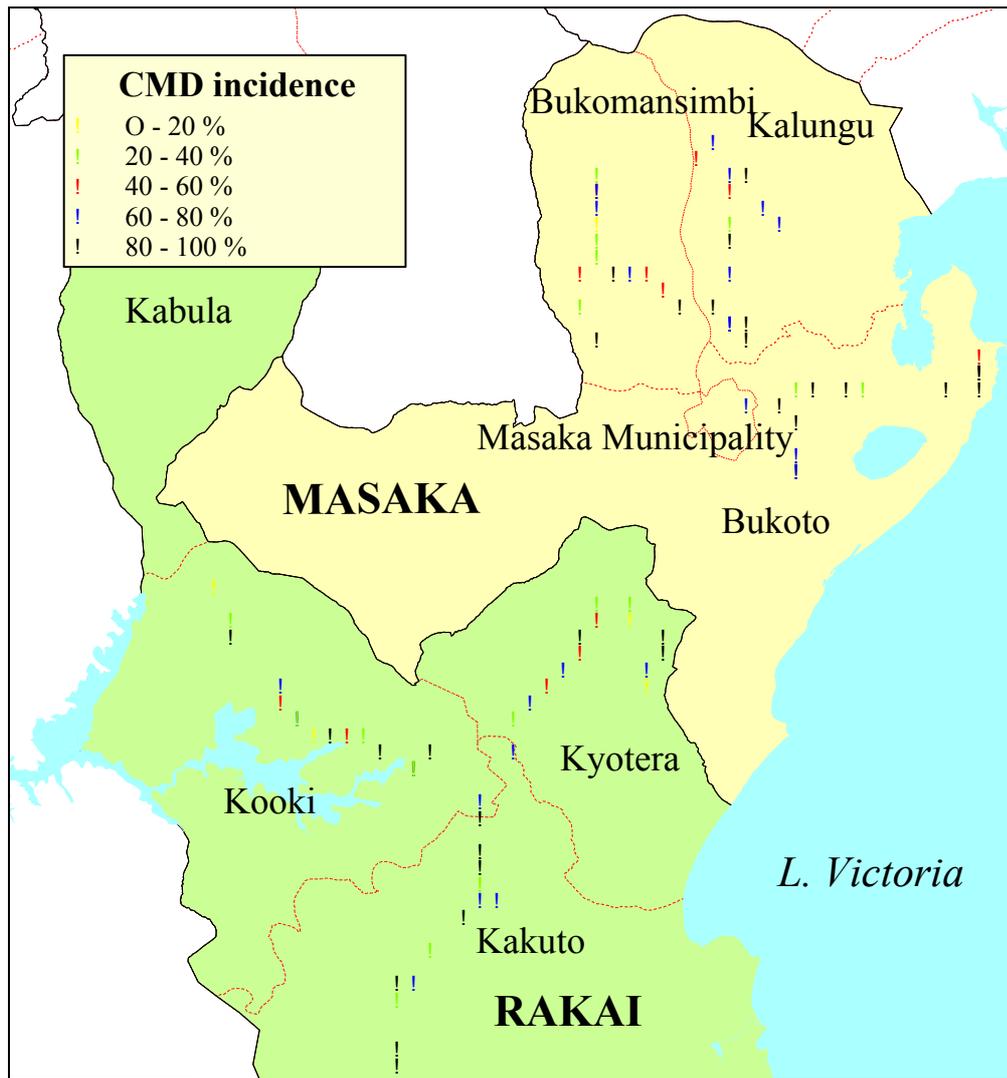


Fig. 1. Incidence of CMD in Rakai and Masaka Districts, June 1999

## CMD response of cassava cultivars Uganda and Tanzania

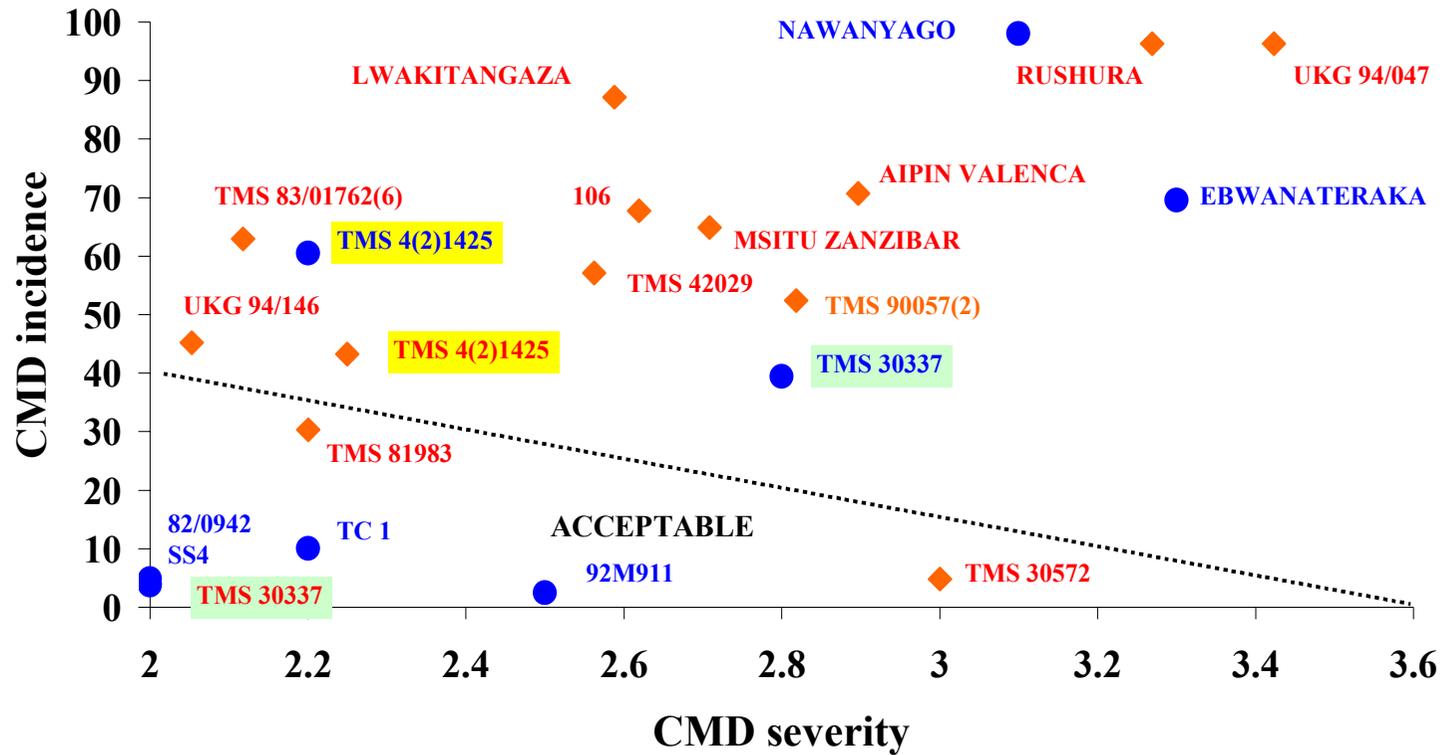


Fig. 2. Comparison of CMD response of local & improved cultivars in Uganda (Kamuli - blue) and Tanzania (Bukoba - red) 4 months after planting

## ANNEX 1

### **Masaka and Rakai (Uganda) cassava pest and disease field level survey**

**16-26 June, 1999**

**Geoffrey Tusiime**

#### **Background and methods**

A survey was carried out to assess the status of cassava pests and diseases in the two southern Ugandan districts of Masaka and Rakai. These are districts that have been severely affected by the epidemic of severe cassava mosaic disease and some intervention measures require the constant monitoring of the status of the major pest and disease constraints. The sampling approach used followed that of the other major USAID-funded cassava project in Uganda, the PL-480 Project, 'Dissemination and utilisation of mosaic resistant cassava in Uganda', which operates in neighbouring districts of central Uganda.

Three counties from each of the two districts were surveyed in mid-June 1999. In each county, 15 cassava fields were sampled at regular intervals along roads used. In each field, 30 plants were examined in order to assess the incidence and severity of the principal cassava pests and diseases. These included: cassava mosaic disease, cassava bacterial blight, cassava mealybug and cassava green mite. Also surveyed were natural enemies of the most important arthropod pests of cassava i.e., the parasitic wasp *Apoanagyrus lopezi* for the cassava mealybug (CM)(*Phenacoccus manihoti*) and the predatory mite *Typhlodromalus aripo* for the cassava green mite (CGM)(*Mononychellus tanajoa*).

#### **Results**

##### *CMD*

Incidence of CMD for counties surveyed ranged from 56.2-83.6% in Masaka district, while in Rakai the range was 57.8-70.9%. On the sampled plants, CMD severity was moderate to severe i.e., ranging from 3.3-3.5 in Masaka and 3.1-3.4 in Rakai district.

##### *Whitefly abundance*

The mean number of adult whiteflies (*Bemisia tabaci*) per plant (taken on the 5 top-most leaves) varied from district to district. The highest number was in Kooki county (4.1), and the least in Bukomansimbi (0.8).

##### *Source of CMD infection*

For plants with CMD, the main source of the disease was infected cuttings. Four out of the six counties (all Masaka counties inclusive) had most of the disease from cuttings, while in Rakai district, only Kakuuto county had a higher level of CMD infection from stem cuttings.

### *Cassava Bacterial Blight*

This disease was of only minor importance, and no severely affected plants were observed in either Rakai or Masaka.

### *Cassava green mite and T. aripo*

The incidence of cassava green mite was in most cases high. With the exception of Kalungu and Bukoto (46.9 and 30%, respectively) the rest of the counties had CGM incidences above 70%. Despite this, severity of CGM damage was low in all counties (2.5-2.9). The CGM abundance rating was moderate and ranged from 2.4-2.8. The CGM predatory mite *T. aripo*, which has been widely released in Uganda, but not in Masaka and Rakai districts, was found in association with the green mite in all counties. They were though more abundant in Rakai district, in which their numbers were more than 3 times as high as in Masaka district counties.

## Summary of cassava field survey results: Masaka and Rakai districts, 16-26 June

### A. Cassava mosaic disease (CMD)

County*	CMD		whitefly Numbers per plant	CMD infection mode (%)		
	Severity	Incidence		C	W	H
Bukomansimbi	3.5	56.2	0.83	38.7	17.6	43.8
Kalungu	3.5	74.7	1.7	60	14.7	25.3
Bukoto	3.3	83.6	2.1	76.2	7.33	16.4
Kakuuto	3.4	70.9	1.7	51.6	19.3	29.1
Kooki	3.1	56.9	4.1	27.3	29.6	43.1
Kyotera	3.2	57.8	1.3	32.0	25.8	42.2

\*Bukomansimbi, Kalungu, Bukoto are in Masaka district while Kakuuto, Kooki, Kyotera are in Rakai district

C – cutting-borne infection

W – current season, whitefly-borne infection

H – healthy (= symptom-free)

### B: Cassava green mite, Cassava mealybug and associated natural enemies

County*	CGM				CMB Incidence	<i>A.lopezi</i> incidence
	Severity	Incidence	CGM #s	<i>T. aripo</i> # incidence		
Bukomansimbi	2.9	74.2	2.7	27.3	0	0
Kalungu	2.6	46.9	2.5	76.6	0	0
Bukoto	2.7	30	2.6	25.1	0	0
Kakuuto	2.7	78.3	2.6	82.4	0	0
Kooki	2.8	78.4	2.8	53.8	0	0
Kyotera	2.5	71.1	2.4	61.8	0	0

\*Bukomansimbi, Kalungu, Bukoto are in Masaka district while Kakuuto, Kooki, Kyotera are in Rakai district

## ANNEX 2

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

#### 1. Locations /Contact Persons.

The locations and contact persons for the multiplication of mosaic resistant cassava remain as reported in the previous reports. It should, however, be noted that CONCERN benefited from the cuttings that were provided in April 1999. The locations are as follows:-

<b>Location</b>	<b>Acreage</b>	<b>Contact Person</b>
1. Kyakanyomozi village	Approximately 1 acre	John Kayabule
2. Lunyinya	Approximately 1 acre	John Sserwadda
3. Betelemu	Approximately 1 acre	John Lubowa
4. Concern Office	Approximately 1 acre	Office Superintendent
5. Kirumba	Approximately 1 acre	Max

#### 2. Cassava Status

The cassava plants from the cuttings received in November 1998 are doing very well. Those that had reasonable moisture and were planted on fertile soil are over six feet high and have branched. Those on poor soils are about four feet high. The ICR plot at Ssanje was temporarily flooded and some plants rotted. This prompted the NGO to plant the new cuttings (supplied in April) on a new plot on a slope. The majority of the multiplication plots have been weeded, though the grasses have tended to grow very fast during these rains. Roguing continues in all plots.

#### 3. Fresh cuttings.

IITA had hoped to supply 600 bags of CMD-resistant cv. SS4 cuttings for multiplication on 30 hectares of land. It did, however, provide 575 bags to be multiplied on 28.75 hectares. Apart from Concern, which opened up new fields, the rest of the groups used the cuttings for gap filling the old plots. These cuttings were also used for planting the gardens that were left over when the first cuttings were not sufficient. The groups did open new fields when the above exercise did not use up the cuttings received.

Some of the cuttings dried up since some there were delays for some farmers in receiving the planting material. Generally speaking, the cuttings arrived at the right time and the majority germinated. The plants from these cuttings are over 1/2 inch high. The distribution of the April cuttings is summarised below.

<b><u>Beneficiary</u></b>	<b><u>Sacks</u></b>	<b><u>Expected Hectareage</u></b>
1. Masaka District Admin.	105	5.25
2. Rakai District Admin.	54	2.70
3. World Vision	40	2.00
4. Kitovu Mobile	100	5.00
5. WEAR	28	1.40
6. MADDO	88	4.40
7. ICR	50	2.50
8. LWF/RACA	30	1.50
9. OCBO	20	1.00
10.Redd Barna	20	1.00
11.KWEAP	20	1.00
12.CONCERN	20	1.00
<b>Totals</b>	<b>575</b>	<b>28.75</b>

#### **4. Observations**

The members of staff (Concern) undertook to multiply the 2<sup>nd</sup> amount of cuttings for onward distribution to the villages under their supervision. This was after the villagers had mishandled the 1<sup>st</sup> allocation of cuttings. As the ratooning stage is approached, a workshop shall be required for the partner NGO'S to be instructed on how ratooning is done and other related issues for the way forward.

#### **5. Financial Report**

IITA disbursed the remaining fifty per cent of the funds for the multiplication programme. These funds were received by the two district co-ordinators (District Agricultural Officers) Masaka and Rakai. They in turn passed on the money to the beneficiaries as follows:-

<b>Beneficiary</b>	<b>Amount</b>
1. Rakai District Administration	1,040,000=
2. International Care and Relief (ICR)	520,000=
3. Orphan's Community Based Organisation (OCBO)	520,000=
4. Rakai Counsellor's Association (RACA)	520,000=
5. Women Enterprise Association of Rakai (WEAR)	520,000=
6. Kabula Women Empowerment in Agricultural Production (KWEAP)	260,000=
7. Concern Worldwide	520,000=
8. Masaka Diocesan Development Organisation (MADDO)	1,300,000=
9. Kitovu Mobile	1,170,000=
10. World Vision	1,040,000=
11.Redd Barna	520,000=
12. Masaka District Administration	1,560,000=
13. IFCD Handling Charges	126,500=
<b>Total Amount Disbursed</b>	<b>9,616,500=</b>

The groups used this money for opening up new land (land clearing, 1st and 2nd ploughing), planting and weeding the old crop. All NGO'S have submitted the financial accountability.

## ANNEX 3

### Report on a monitoring visit to Masaka and Rakai Districts (29 May – 1 June, 1999)

Geoffrey Tusiime

#### Introduction

Cassava mosaic resistant variety multiplication, which began in the districts of Masaka and Rakai during the last quarter of 1998, still continues. Monitoring of all aspects of this multiplication has been taking place. The broader objectives of the project include cassava cultivar diversification as a strategy towards long term household food security. This aspect, which was not handled in the last quarter of 1998 when the multiplication exercise first took off, has commenced with the establishment of demonstration plots in the two districts. The materials for demonstration plots are the recently released cassava mosaic disease resistant varieties. The progress of cassava multiplication and activities of cassava cultivar diversification so far are reported here.

#### 1. Demonstration Plots

Material for demonstration plots was delivered to 2 areas, one for each of the 2 districts. In Masaka material was delivered to the District Farm Institute, Kamenyamiggo, while in Rakai it was taken to the International Care and Relief (ICR) agricultural demonstration site, Sanje. Partners in both institutes agreed to have the demonstration plots planted immediately. Cultivars delivered included:

- ◇ SS4 (Nase 4)
- ◇ TMS 30572 (Migyera or Nase 3)
- ◇ MH-95/0192
- ◇ TMS 30555-17
- ◇ I 91/02324
- ◇ I 91/02327
- ◇ MH-95/161
- ◇ 95/SE-00094
- ◇ I 92/0057

#### 2. Cassava Multiplication

##### *1999A Season*

Cassava multiplication activities continued this year with the delivery of more SS4. The material that was delivered in the first half of April 1999 has all been planted.

The distribution of this material was made to all partners who participated in multiplication activities in 1998, and was as follows:

◇ Masaka District Authority:	105 bags
◇ World Vision	40 bags
◇ Rakai District Authority	54 bags
◇ Kitovu Mobile	100 bags
◇ WEAR	28 bags
◇ MADDO	88 bags
◇ ICR	50 bags
◇ LWF/RACA	30 bags
◇ OCBO	20 bags
◇ Redd Barna	20 bags
◇ KWEAP	20 bags
◇ Concern	20 bags

With the exception of LWF/RACA and KWEAP, one or more sites were visited for each of the above organisations. In the sites visited, cassava has germinated well (>80%). CONCERN this time distributed its material among 6 farmers. The farmer (Sarah Nagadya) who received the biggest quantity (6 bags) was visited. The crop had germinated and was growing well. The need to keep the crop CMD-free through the removal (roguing) of infected material was pointed out to her.

#### *1998 B season*

Some of the cassava fields planted in the 1998 B season were visited. Again with the exception of LWF/RACA, KWEAP and WEAR at least one site was visited for each of the partner organisations. Most of the partners used part of the cassava material that was delivered for the 1999A season to gap-fill their old cassava plots where space has been created either by failure to germinate or by constant rouging. Whilst areas along the Mbarara road were not visited, reports from partners with plots there indicated that the area has again experienced drought and that this has had a negative effect on the germination of cassava in these plots.

*Masaka District Authority:* With the exception of a small portion of the field in which weeds had recently been sprayed with a herbicide, much of the crop is vigorous and performing well. Cassava mosaic disease (CMD) incidence has remained very low.

*World Vision:* One site (Sunga Model Farmers) was visited. Unfortunately, with the onset of rains, most of the crop was flooded and has been abandoned. Although other sites were not visited, World Vision reported that the good progress realised during the previous quarter had been sustained.

*Rakai District Administration:* The crop has been well maintained and is doing well. With vigorous rouging of CMD infected plants, the field is virtually free of CMD.

*Kitovu Mobile:* Three sites were visited i.e., Kyanamukaka (Masaka District), Lwagulwe and Mpambire (Rakai District). The Lwagulwe site was doing well. The other two sites have a good crop though the stand is rather low.

*WEAR:* Though the fields were not visited, I held a discussion with someone in charge of one of the sites. She reported that all was fine with their crop.

*MADDO:* Two sites were visited. A ½ acre site at Kifamba (Rakai District) was visited for the first time. The crop is growing well. The second was the Kabale Sanje site. The nature of the sandy soil on this site has curtailed proper growth of the crop.

*ICR:* The crop is growing well after a threat by floods was overcome by creating drainage channels through the field.

*Redd Barna:* Only one site was visited (Lukerere Primary School). The crop has been well managed and is growing vigorously.

*OCBO:* Received 20 bags and distributed it to 2 groups i) Kitonezi (12 bags) ii) Nabigasa (8bags). All had been planted and germinated well.

## ANNEX 4

### Progress report – OFDA third quarter activities – Kenya ONFARM - Kenya

#### 1. Status of Primary Multiplication Sites.

##### **KARI-Kibos (6.5 acres) [Variety - SS4]**

This field has so far been cut to plant/establish approximately 100 acres of SS4 in Bukura FTC, Bungoma FTC, Busia FTC and KARI-Alupe. Other areas which have received seed from the site include Agricultural Society of Kenya-Kisumu branch (ASK-Kisumu branch) based at the Mamboleo showground and KARI-Njoro (seeds for establishing about 1/2 an acre). About 1/2 an acre is yet to be cut to supplement Migyera (TMS 30572) from Siaya FTC to establish 20 acres at KARI-Kakamega. The re-growth at Kibos is about 3 months old and will be ready for cutting during the short rains beginning in September. Incidences of CMD have been noted mainly on young re-growth of 1.5-3 months old. These have been rogued. About 14 cases have been noted since May and all have been rogued. It has also been noted that although this variety shows signs of disease during the early stages, after about 4 -6 months plants seemingly recover from the disease and produce healthy leaves.

##### **Bungoma FTC (8 acres) [Variety - SS4]**

This field was first established during the short rains of 1998. The crop however failed because of drought. It was re-planted in March 1999, with 50% germination being realised. Intensive gapping was carried out and this raised the crop stand at Bungoma to about 75%. It was noted that this low germination was evident in all the other fields planted using SS4. Research was conducted locally to establish the cause of this low germination and it was established that SS4 has low rooting and germination capacities compared with other varieties.

##### **Bukura FTC (8 acres) [Variety - SS4]**

This field was first established during the short rains of 1998. The crop also failed because of drought. It was replanted in April 1999 with 46% germination being realised, but gap filling has raised the crop stand to 72%.

##### **Busia FTC (8 acres) [Variety - SS4]**

This field was established in May 1999. After intensive gapping, the crop stand has been estimated at about 65%.

##### **KARI-Alupe (59 acres) [Variety - SS4 and Migyera]**

The clonal variety-testing site (9 acres) was established in March/April 1999. This was done by KARI and IITA-Uganda. The multiplication (50 acres) site was established in May/June 1999. About 13 acres has been established using Migyera and 37 acres using SS4. The germination percentage at this site has not yet been established since the whole field has not yet sprouted.

##### **KARI-Kakamega.**

About 20 acres are being opened up and planting is scheduled to start in the fourth week of July. The materials from this site will come from the 4 acres of Migyera at Siaya FTC and KARI-Kibos (1/2 acre of SS4).

**Table 1. Primary Rapid Multiplication Sites for Mosaic Resistant/Tolerant Cassava Varieties in Western Kenya (1997 - 1998 Establishment).**

Site	When Established	Acreage	Cutting Status
KARI-Alupe	First Rains, 1997	2.0	April, 1998
Busia FTC	First Rains, 1998	2.0	September, 1998
Busia Prisons	First Rains, 1998	2.0	*Condemned in 1999
Teso DAO	First Rains, 1998	2.0	Cut Since Short Rains 1998
KARI-Kibos	May, 1998	6.5	October 2, 1998 March 2 - June, 1999
Siaya FTC	Second Rains, 1998	4.0	Not yet cut
Bukura FTC	Second Rains, 1998	5.0	Destroyed by drought
Bungoma FTC	Second Rains, 1998	8.0	Destroyed by drought
		<b>31.5 acres</b>	

\* Due to hail damage and subsequent infection with cassava bacterial blight

**Table 2. Primary Rapid Multiplication Sites for Mosaic Resistant/Tolerant Cassava Varieties in Western Kenya (1999 Establishment).**

Site	When Established	Acreage	Cutting Status
Bungoma FTC	March, 1999	8.0	Not yet cut
Bukura FTC	First Rains, 1999	8.0	Not yet cut
Busia FTC	First Rains, 1999	8.0	Not yet cut
KARI-Alupe	First Rains, 1999	50.0	Not yet cut
KARI-Kakamega	Second Rains, 1999	20.0	To be planted
		<b>94.0 acres</b>	

Total of the current standing crop is 112.5 acres. Therefore from May 1998 to July 1999, the 2 acres of 2 improved cassava varieties at Alupe will have been multiplied to 112.5 acres. This gives a rapid multiplication ratio of 1 acre of seed field to 56 acres of newly planted crop.

## 2. Training

### **Workshop for District Crops Officers (DCOs) in Western Kenya on agronomy, distribution and rapid multiplication of cassava varieties resistant to CMD.**

A two-week training was held from May 3-14, 1999 for District Crops Officers from 17 districts in western Kenya. Other organisations present included CARE-Kenya and SACRED-Africa. This training was held as a follow-up to the one held in March 1999 for the DAOs/DALEOs. It was also held at Tom Mboya Labor College, Kisumu, Kenya. The training focused on agronomy, distribution and rapid multiplication of cassava varieties resistant to CMD. Topics included: the importance of cassava in Kenya; morphology and physiology of cassava; climatic and soil requirements of cassava; quality and selection of planting materials; agronomic practices for cassava; principles and methods of informal survey with farmers; preparation of extension materials and development of questionnaires for informal farmer surveys; cassava processing and products; cassava disease management and cassava pests. Field visits were also carried out during the training.

## ANNEX 5

### **Progress report – OFDA third quarter activities – Tanzania Tanzania Root and Tuber Crops Programme**

#### **1. Rapid multiplication of resistant varieties**

Field maintenance of the multiplication plots of cassava resistant varieties at Nyakasanga continued during this period. Varieties multiplied under the rapid technique included: TMS 4(2)1425, TMS 30337, TMS 81983, TMS 42029 and TMS 60142. Table 1 shows the status of the varieties under multiplication at various sites in the Lake Zone. At the Nyakasanga site plants have three to four stems. Only two stems will be left while the rest from each plant will be pruned and cuttings used for further multiplication in polythene bags at Ukiriguru.

#### **2. Introduction of cassava tissue culture plantlets**

In May 1999, 10,527 plantlets were received from IITA Nigeria. Table 2 shows the status of the introduced plantlets.

##### *Observations*

Most losses of plantlets were recorded during the first three days after transplanting into the screen-house in soil-filled black polythene bags. The soil used was not sterilised (facilities for this are not available) and the temperature in the screen house was high, which weakened the plantlets. Another reason for relatively high losses was the fact that watering was done after transplanting. One of the genotypes, TME 117, was lost during the transplanting process.

#### **3. Establishment of open quarantine**

Permission has been granted by the Ministry of Agriculture and Co-operatives to establish an open quarantine site, which will facilitate the introduction of CMD resistant germplasm from Uganda. The site of about 2 hectares will be established at ARI Maruku, Bukoba under the agreed phytosanitary regulations (Annex 6).

#### **4. Screening for resistance to CMD in Kagera**

Cassava varieties are being evaluated for their resistance to the severe CMD associated with the pandemic at a number of sites in Kagera region. 2 sets of varieties are being evaluated in Bukoba district at Gera, Bushasha and Maruku. One set includes 15 varieties and the second set a further 15 varieties. Varieties being evaluated include: Msitu Zanzibar, Aipin Valenca, Rushura, TMS 30572, TMS 4(2)1425, TMS 106, TMS 42029, TMS 30337, TMS 81983, TMS 83/01762(6), Var X, Konyo, Binti Kombo, UKG 94/069, UKG 92/003, UKG 94/276, UKG 94/232, UKG 94/047, UKG 94/192, UKG 94/220, UKG 94/156, UKG 94/146, UKG 94/023 and UKG 92/035. Analysis of preliminary data is in progress. An initial assessment of the data shows that TMS 30337, TMS 81983 and TMS 30572 have low severity and low disease incidence. Varieties UKG 94/146 and TMS 4(2)1425 are also performing relatively well. The local varieties Rushura and Lwakitangaza are severely attacked: most plants are diseased and the severity of disease is typically high.

**Table 1: Status of cassava planting material multiplication with promising characteristics to resist mosaic disease (June, 1999)**

Location	Variety	Plants established	Number of remaining plants	Estimated number of cuttings
1. Nyakasanga, Mwanza	TMS 30337	400	325	2925
	TMS 81983	1693	1572	14148
	TMS 4(2)1425	16586	15160	136440
	TMS 42029	8	6	54
	TMS 60142	737	642	5778
	TMS 30572	7127	6213	55917
	Others:			
	Msitu Zanzibar	8360	7140	64260
	Mulundi/5	9893	8790	79110
	TMS 106	867	817	7353
	TMS 30001	320	305	2745
TMS 90057(2)	1180	1010	9090	
Lwakitangaza	8433	7229	65061	
2. Maruku, Bukoba	TMS 60142	251	245	245
	TMS 30337	647	524	524
	TMS 30572	3628	2025	2025
	TMS 4(2)1425	6844	6075	6075
	Others:	827	793	793
	TMS 90057			
3. Masalakulangwa a farmer group- B, Nyamikoma, Mwanza	TMS 4(2)1425	2120	1861	3722
	TMS 30572	260	118	236
	Msitu Zanzibar	9400	5042	10084
	UKG 94/156	250	230	460
	UKG 94/146	250	232	464
4. Kiilima, Bukoba	TMS 4(2)1425	1995	1870	2740
<b>TOTAL</b>		<b>82,076</b>	<b>68,224</b>	<b>470,249</b>

**Table 2: Tissue culture plantlets**

Clone	No. transferred to humidity chambers	No. transplanted from May 23-26	No. healthy plantlets at May 30	No. plants surviving at June 26
TMS 4(2)1425	5450	3270	1980	1502
TMS 60142	2560	1664	770	667
TMS 30572	2070	621	580	475
New germplasm	447	273	199	178
<b>Total</b>	<b>10,527</b>	<b>5828</b>	<b>3629</b>	<b>2822</b>

## 5. Training of village leaders in Bukoba district

Training sessions were conducted in Farmer Extension Centres (FECs). Participants invited included:

- (1) Village Agricultural Extension Officers
- (2) Councillors
- (3) Division Executive Officers
- (4) Ward Executive Officers
- (5) Village Executive Officers
- (6) Farmer Extension Centre Managers

### Topics covered included:

- (1) Introduction to cassava mosaic disease
- (2) Control of cassava mosaic disease
- (3) Rapid multiplication techniques
- (4) Post-harvest and cassava processing techniques

Table 3 shows the training coverage, and the number of participants who attended the training is given in Table 4.

**Table 3: Wards covered during the CMD training program in Bukoba district. (period May, 1999)**

Location	Division	Wards
1. FEC Nsunga	Misenyi	Minziro, Nsunga, Kasambya
2. FEC Kashaba	Misenyi	Kilimilile, Kyaka
3. FEC Kabirizi	Rubale	Izimbya, Rubale, Ruhunga
4. FEC Kyema	Katerero	Katetero , Bujugo
5. FEC Nyakibimbili	Katerero	Nyakibimbili, Kasharu, Ibwera
6. FEC Kyakailabwa	Kyamtwara	Nyanga, Maruku, Kagondo, Kibeta, Katoma
7. FEC Mushozi	Bugabo	Kagya, Nyakato, Kishanje, Rubafu, Bulandangabo
8. FEC Kayanga	Kiziba	Bwanjai, Kitobo, Bugandika, Buyango, Ruzinga
9. FEC Kayigo	Kiziba	Kayingo, Kashenye

**Table 4: CMD training participants in Bukoba district**

Location	Participants attendance		
	Men	Women	Total
FEC Nsunga	5	3	8
FEC Kashaba	12	5	17
FEC Kabirizi	24	2	26
FEC Nyakimbili	13	1	14
FEC Kyema	11	13	24
FEC Kyakailabwa	16	7	23
FEC Mushozi	12	1	13
FEC Kayanga	14	4	18
KAEMP	2	-	2
FEC Kanyigo and Kashenye	13	0	13
<b>Total</b>	<b>122</b>	<b>36</b>	<b>158</b>

## **6. Future plans:**

- (1) Establishment of multiplication cassava field under open quarantine for cassava mosaic disease resistant varieties from Uganda at ARI Maruku. KAEMP has indicated a willingness to support the establishment activities.
- (2) Arrange for an exchange visit with farmers from Bukoba, Mwanza, Shinyanga and Biharamulo districts to Uganda.
- (3) Monitoring screening trials both in Bukoba and Ukiriguru.