Photo taken by John Kateregga, Community Enterprises for Development Organization (CEDO), Rakai

Delivering and Disseminating Biofortified Crops in Uganda

Quarterly Report
January - March 2013

Prepared for:

HarvestPlus

Submitted by:

International Potato Center (CIP)

Delivering and Disseminating Biofortified Crops in Uganda

International Potato Center (CIP), National Crops Resources Research Institute (NaCRRI)/National Agricultural Research Organization (NARO), Makerere University (MAK) and BioCrops

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Prepared by

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Introduction

This is the second year of the project, "Delivering and Disseminating Biofortified Crops in Uganda," (BIOFORT Uganda). BIOFORT Uganda is a 5 year project with annual contracts to partners. The project is implemented by five partners, the International Potato Center (CIP), HarvestPlus, Makerere University, Department of Agricultural Production, College of Agricultural and Environmental Sciences (MAK), the National Crops Resources Research Institute (NaCRRI) of the National Agricultural Research Organization (NARO), and a private company, BioCrops Uganda Limited.

During the first year of the project, CIP supplied 100 clean in vitro plantlets of each of four orange sweetpotato (OSP) varieties, Ejumula, Kabode (NASPOT 10 O) and Vita (NASPOT 9 O) to Makerere University Plant Tissue Culture Laboratory at Kabanyolo (MAK) for multiplication. CIP also supplied virus indexed OSP mini-cuttings of Kakamega, Kabode, Ejumula and Vita to BioCrops Uganda Ltd for multiplication in the screen house. By November of last year, MAK had multiplied 6,879 plantlets while BioCrops had 18,500 vines ready for delivery. CIP in collaboration with NaCRRI conducted on-farm trials in the districts of Kabale, Isingiro, Rakai, Buyende and Oyam, with OSP clones, Kabode, NASPOT7/2006/1185, SPK0042006/1136, and NASPOT7/2006/292. CIP also set up post-harvest trials, i. e. curing and storage with one farmer in each of the districts of Rakai, Masaka and Mukono. As a result, NaCRRI is preparing to officially release OSP clones SPK0042006/1136 and NASPOT7/2006/292 which have performed well during the on-farm trials. The second year of the project is a continuation of year 1 activities. This is the first quarterly report of the second year of the project with different component objectives.

1.0 Project Objectives

The project's main objectives are to:

1. Establish a sustained supply and conserve virus-free plantlets of major OSP varieties at Makerere University and at NaCRRI.
2. Establish capacity of a private sector operator (BioCrops) to produce cuttings of primary foundation material.
3. Facilitate the adoption of at least three new OSP varieties to local conditions of northern and western Uganda.
4. Identify in every district, two commercially oriented, large-scale vine multipliers with excellent management skills.
5. Have at least 30% of target households in areas with prolonged dry seasons (>4 months) adopt the Triple S technology.
6. Test and refine recommended practices for curing sweetpotatoes by smallholder farmers to increase longevity in storage.

2.0 Major Accomplishments during the reporting period

2.1 Selecting farmers to host curing and storage trials

Gerald Kyalo undertook a field trip to the districts of Rakai, Masaka and Mukono to select farmers to participate in experiments on storage and curing on the 15th February 2013 (Rakai) and the 27th February 2013 (Mukono district). A total of 6 farmers were selected to participate in the curing and storage trials (2 per district) (See Table 1 for details). Gerald Kyalo made a follow up trip to Rakai (Thursday 28th March) and Mukono (Tuesday April 2nd) to start land preparations for the gardens where materials for the experiments will be planted. Each farmer will plant 1.5 acres of land with 6000 heaps (1500 heaps each of Kabode, Vita, NASPOT 1 and the local variety 'Araka', respectively). Planting is scheduled to take place in the second and third week of April 2013. The roots from the materials will be used to set up curing and storage experiments between August and December this year when the weather is expected to be most favorable for those experiments.

2.2 Pre-harvest monitoring/evaluation of on-farm trials

Gerald Kyalo (CIP) and Joweria Namakula (NaCRRI) undertook a field trip to assess sweetpotato virus disease (SPVD), Alternaria blight, vigor and to monitor OSP trials in Rakai, Isingiro and Kabale districts. All the trials were progressing well, but the prolonged dry season affected them. We lost four trial plots (3 Isingiro, and 1 Kabale) due to either farmers' abandonment or grazing by animals.

Table 1. Farmers selected to participate in curingand storage experiments

Name of farmer	Sub county	District
Ssebirumbi Alex	Bukakata	Masaka
Buyondo Fluge	Bukakata	Masaka
Ssentongo Matia	Lwankoni	Rakai
Tebandeke John	Kirumba	Rakai
Odur Francis	Nabale	Mukono
Kakooza Joseph	Nabale	Mukono

2.3 Harvesting OSP trials in Buyende, Oyam and Rakai

Joweria Namakula (NaCRRI) joined Gerald Kyalo (CIP) to harvest OSP trials in Buyende (14-18 January 2013), Oyam (21-25 January 2013) and Rakai (21-23 February 2013). A total of 23 trials were harvested. SPK004/2006/1136 had the highest average yield (12. 6 and 10.8 tons/ ha in Oyam and Buyende, respectively) followed by the test clone NASPOT 10 O (11.7 and 7.63 tons/ha in Oyam and Buyende, respectively). The second promising clone NASPOT 7/2006/292 yielded on average 9 and 3.9 tons/ha in Oyam and Buyende, respectively. All clones had SPVD scores below 3 (see Table 2 for details). The team also performed four palatability tests with the farmers. Generally farmers preferred SPK004/2006/1136 because it is vigorous and it is tolerant to drought. During the palatability tests, farmers preferred SPK004/2006/1136 and NASPOT 7/2006/292. SPK004/2006/1136 was preferred for its starchiness, good flavor and general appearance. NASPOT7/2006/292 was preferred for being very sweet in addition to all the attributes of SPK004/2006/1136.

Table 2. Average performance of 3 OSP clones evaluated in on-farm verification trials in Buyende and Oyam districts (Rakai, Isingiro, and Kabale are not yet harvested)

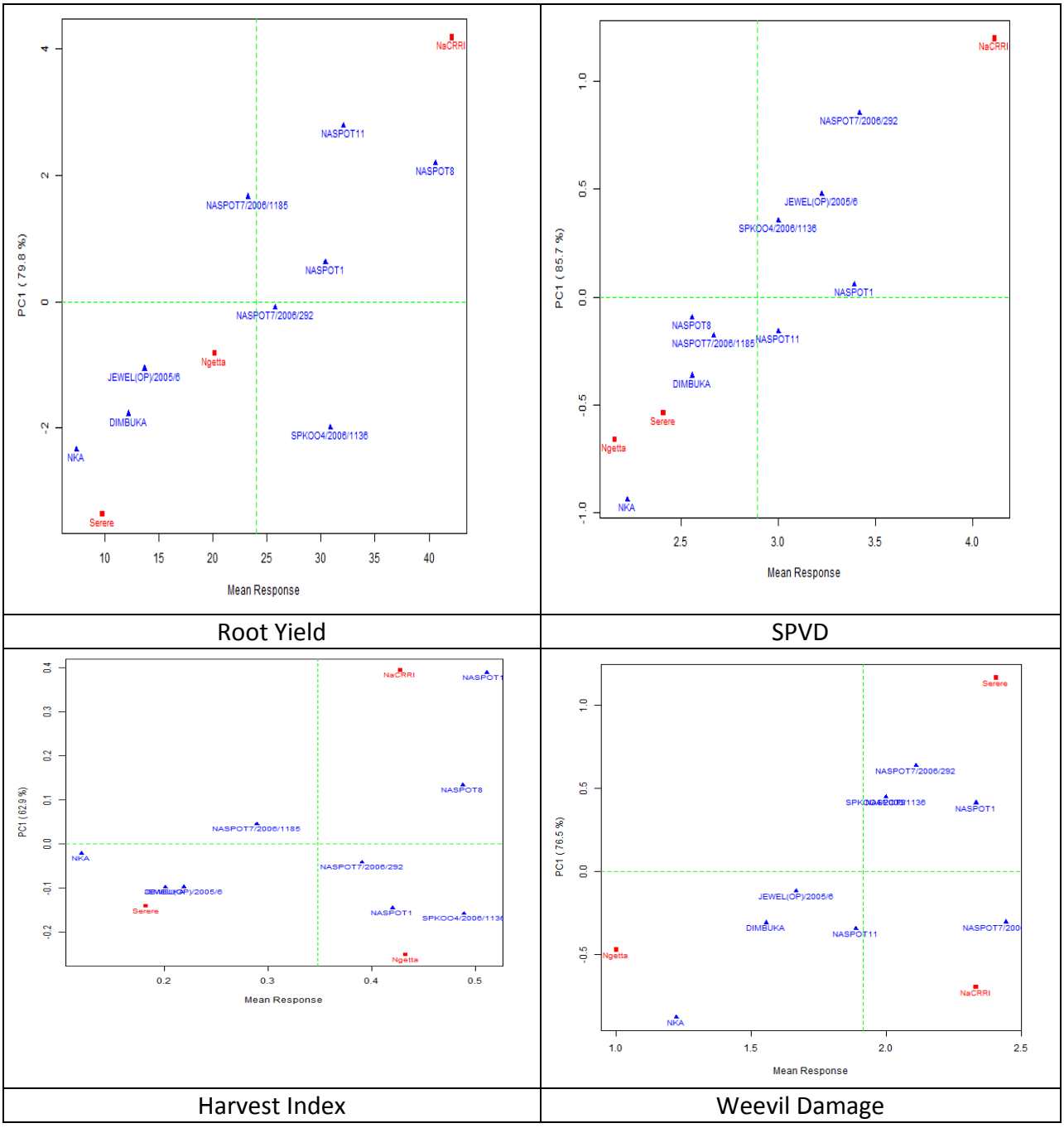
Buyende							
	Mean Root yield (tons/ha)	Mean SPVD Symptom score	Mean harvest Index	Flesh color	Mean Weevil damage score	Mean Alternaria Symptoms score	Mean % Marketable Roots
NASPOT 10	7.6	1.6	0.5	7	3	1	62.2
NASPOT 7/2006/1185	3.4	1.9	0.1	8	2	1	34.7
SPK 004/2006/1136	10.8	2.1	0.4	7	2	1	56.2
NASPOT 7/2006/292	3.9	2.6	0.2	8	2	1	45.2
Mean	**6.4**	**2**	**0.3**	**7**	**2.3**	**1**	**49.6**
Oyam							
NASPOT 10	11.7	2	0.7	8	4.4	1	61.6
NASPOT 7/2006/1185	5.8	2.1	0.4	8	3.7	1	57.4
SPK 004/2006/1136	12.6	2.6	0.7	8	3.3	1.6	59.4
NASPOT 7/2006/292	9	2.4	0.5	8	3.9	1.4	65.3
Mean	**9.8**	**2.3**	**0.6**	**8**	**4**	**1.3**	**60.9**

Fresh color: 7- Pale orange, 8- Deep orange

2.4 Harvesting of on-station trials

On station trials of OSP clones for the second season 2012 were harvested from only three locations, Namulonge, Ngetta, and Serere. The trial at Kabale did not establish well; data is therefore not presented. Data for the other three sites is presented in Table 3. NASPOT 8, an OSP check variety, yielded highest (40 t/ha). The farmers' preferred clones NAS7/2006/292 (25.8 t/ha), and SPKOO4/2006/1136 (30.9 t/ha) were comparable to the best check clone, NASPOT 1 (30.4 t/ha) (Table 3). Combined analyses (Table 4) showed that genotype (G), environment (E) and G x E were highly significant for SPVD, total root yield, commercial yield and weevil damage. G x E was not significant for harvest index though G and E were significant. Additive main effects and multiplicative interaction (AMMI) analysis biplot (Figure 1) showed that the candidate clones had yields above the average of all clones tested (23 t/ha) (Fig. 1). NAS7/2006/292 was the most stable clone for root yield and the best environment for root yield was Ngetta. NASPOT 1 was most stable for SPVD reaction though NASPOT 8 had the lowest average SPVD score; NaCRRI location had the highest SPVD scores. During the season, Ngetta environment was moist and this accounts for its lowest weevil damage. New Kawogo had the lowest weevil damage, though the scores for all clones did not exceed 3.0 (on a scale of 1-9). Palatability tests including both OSP and non-OSP were conducted on-station. There weren't great differences between the check (popular varieties like NASPOT 1) and the candidate varieties for release (NAS7/2006/292 and SPKOO4/2006/1136).

Figure 1. Biplots of mean root yield, SPVD, harvest index, and weevil damage and the first interaction principal components axis (PCA1) scores of OSP and 1 non-OSP clones grown in on-station trials in at 3 locations in Uganda



Root Yield | SPVD

Harvest Index | Weevil Damage

Table 3. Mean performance of 3 OSP, 1 yellow and 4 check clones evaluated at three on-station locations in Uganda, 2012 season 2

Genotype	Root yield (t/ha)	Mean harvest index	SPVD	Commercial yield	Flesh color	Weevil damage
JEWEL(OP)/2005/6 (yellow)	13.7	0.22	3.2	12.8	2	1.7
NASPOT7/2006/1185	23.3	0.29	2.7	22.2	8	2.4
NASPOT7/2006/292	25.8	0.39	3.4	24.5	8	2.1
SPKOO4/2006/1136	30.9	0.49	3	29.5	7	2
DIMBUKA (Non-OFSP Check)	12.2	0.2	2.6	10.5	2	1.6
NASPOT1(Non-OFSP Check)	30.4	0.42	3.4	29.4	2	2.3
NASPOT11(Non-OFSP Check)	32.1	0.51	3	31.4	2	1.9
NKA (Non-OFSP Check)	7.4	0.12	2.2	7.4	2	1.2
NASPOT8 (OFSP check)	40.6	0.49	2.6	39.7	6	2
Mean	**23.9**	**0.35**	**2.9**	**22.8**	**NA**	**1.9**
LSD	**5.9**	**0.08**	**0.5**	**5.9**	**NA**	**0.3**
CV	**30.1**	**27.95**	**19**	**31.3**	**NA**	**16.9**
Means by environment						
NaCRRI	42.1	0.43	4.1	41.4	**NA**	2.3
Ngetta	20.2	0.43	2.2	18.3	**NA**	1
Serere	9.8	0.18	2.4	9.4	**NA**	2.4
Mean	**24**	**3.79**	**2.9**	**22.8**	**NA**	**1.9**

SPVD=Sweetpotato virus disease severity, SPVD, weevil, and Alternaria damage scored on a scale of 1-9, where 1=no symptoms and 9=very severe damage symptoms. Fresh colour: 2- cream, 6- yellow with orange, 7- Pale orange, 8- Deep orange

NA = Not applicable

Table 4. Combined analyses of 4 sweetpotato genotypes grown in on-station trials at 3 locations in Uganda for sweetpotato virus disease (SPVD) resistance, harvest index, total fresh root yield, commercial yield and weevil damage.

SPVD						
	Df	Sum Sq	Mean Sq	F value	Pr(>F)	LSD5
Genotype (G)	8	12.344	1.543	5.126	0.000	0.450
Environment (E)	2	61.235	30.617	33.527	0.001	0.551
R:E	6	5.479	0.913	3.034	0.013	
G x E	16	16.493	1.031	3.424	0.000	0.780
Residuals	48	14.449	0.301			
Harvest index						
G	8	1.477	0.185	19.764	> 0.0001	0.079
E	2	1.083	0.542	81.316	> 0.0001	0.047
R:E	6	0.040	0.007	0.713	0.641	.
G x E	16	0.269	0.017	1.801	0.059	0.137
Residuals	48	0.448	0.009	.	.	.

Root yield						
G	8	8481.101	1060.138	20.544	> 0.0001	5.896
E	2	14747.191	7373.595	118.835	> 0.0001	4.543
R:E	6	372.296	62.0491	1.2025	0.32137	
G x E	16	3219.213	201.201	3.899	0.00013	10.213
Residuals	48	2476.954	51.603			
Commercial Yield						
G	8	8394.053	1049.257	20.5479	> 0.0001	5.866
E	2	14811.097	7405.549	111.608	> 0.0001	4.6986
R:E	6	398.120	66.353	1.2998	0.2756	
G x E	16	3263.357	203.960	3.9948	> 0.0001	10.160
Residuals	48	2451.153	51.066			
Weevil damage						
G	8	11.506	1.4383	13.706	> 0.0001	0.266
E	2	33.153	16.576	328.354	> 0.0001	0.130
R:E	6	0.303	0.050	0.481	0.8191	
G x E	16	16.396	1.025	9.765	> 0.0001	0.461
Residuals	48	5.037	0.105			

2.5 Transfer of the 'Triple S' technology at scale and building a cadre of trained extension personnel to monitor its adoption

Sam Namanda conducted trainings on 'Triple S' vine conservation and multiplication approach (February 7 – 15, 2013) for 4 pilot districts (Lira, Kole, Gulu and Oyam) in Northern Uganda. Eighty five community resource persons, 9 extension workers and 53 farmers were trained in application of the Triple S method to produce sweetpotato planting material. A total of 37 females and 100 male participants were trained (see Table 5 for details). Thirty farmers were selected to host demonstration sites for the Triple S technology. After the training, the farmers stored seed roots under sand and started preparing beds where the roots will be planted for sprouting. A total of 123 Triple S leaflets were provided to selected participants for reference. Sam Namanda conducted follow-up and technical backstopping visits (23-29th March 2013) on Triple S activities in Lira, Gulu, Oyam and Kole, northern Uganda. The demonstrations were doing well and farmers had started planting on beds.

Table 5. Summary of the categories of participants trained in Gulu, Oyam, Lira and Kole districts, and projected demonstration sites for season 2013A

District	Female participants			Male participants			Total participants	Total Demo sites
	*CRPs	*FEWs/CDAs	Farmers	CRPs	Fews	Farmers		
Gulu	11	1	12	15	1	2	42	11
Oyam	4	0	0	25	2	0	31	9
Lira	5	1	5	14	2	10	37	5
Kole	3	0	5	8	2	19	37	5
Total	23	2	22	62	7	31	147	30

*CRPs = Community Resource Persons

*FEWs/CDAs = Field Extension Workers/Community Development Assistants

2.6 Harvesting demonstration of clean planting material Vs farmers' planting material in Kamuli and Mukono

HarvestPlus in partnership with CIP, BioCrops and Makerere University are promoting the use of cleaned up planting material from tissue culture plantlets, free from disease. Clean planting materials are conserved and multiplied under screenhouses by BioCrops. The aim is to flash out the degenerated material at farmer level with the clean vines. The pre-requisite for promoting use of cleaned vines is farmers to conceptualize the use of clean planting material through on-farm demonstrations. Thus, the purpose of the trials was to demonstrate the performance of clean against farmer own source of planting material.

The trials were planted with cleaned vines from BioCrops Uganda Ltd (cleaned material, generation 1) and farmers' own material (not cleaned) in Mukono and Kamuli districts. The varieties planted were Ejumula (SPVD susceptible variety) and Kabode (SPVD resistant variety). Kamuli and Mukono districts were part of the sites where the project "Reaching End-Users (REU)" operated and where dissemination of Ejumula and Kabode varieties were initially introduced in 2007. The trials were established by planting 20 heaps (0.5 m diameter, 0.5 m high) of each of the varieties from BioCrops and farmers. The heaps were spaced 1 m from each other and 3 cuttings (30 cm long) were planted per heap. The trials were planted during season 2012B and harvested 100 days after planting. The numbers of plants with visual symptoms of SPVD (scale of 1 – 9) were recorded at one and two months after planting. Plants showing early disease symptoms were rouged out to minimize disease transmission to other plants. Whole harvesting of a sample of 5 heaps per treatment was done 100 days after planting and data on marketable, unmarketable and the respective weights were recorded. Data were computed and summarized using Excel spread sheets.

Only data from Kamuli was considered for computation because the trial in Mukono was neglected and suppressed by *Digitaria scalarum* weed. Vines from the clean crops (Ejumula and Kabode) were also harvested and taken for conservation and multiplication in the swamp in preparation for re-planting next season as generation 2 materials.

Both clean and farmer sources of planted vines resulted into varying levels of disease incidence. Generally, the clean vines had lower SPVD disease incidence than the farmer source of planted vines. The SPVD disease infection was lower on clean Ejumula and Kabode from BioCrops (SPVD score = 1) compared to the farmers' sourced material (Table 7). Using clean planting material increased the percentage of marketable roots by about 28 percent for Kabode. Clean planting material did not greatly increase the number of marketable roots of Ejumula variety possibly due to poor bulking of the roots during the dry spells that followed shortly after planting. The farmers harvested the vines of the clean crops for multiplication before harvest data was taken. This could be the reason vine weight for clean Ejumula is lower than the farmers' sourced Ejumula. Overall, planting using clean vines more than doubled the yield of storage roots produced for both Ejumula and Kabode varieties (see Table 7 for details). Preliminary evaluation of the two sources of planting material has confirmed that clean material performs better than farmer material recycled season after season. The sweetpotato virus disease susceptible variety had increased root yield after cleaning the planting material. Evidently,

farmers were quick to acknowledge the performance of cleaned material because they discriminately sourced cuttings from the clean plots before maturity for presentation during the farmers' field show. The experiment will be repeated during the 1st season of 2013 in Kamuli and Mukono.

Table 6. Percent symptoms of sweetpotato virus disease (SPVD) on Ejumula and Kabode orange sweetpotato varieties planted with Biocrops and farmer sources of planting material during season 2012B

Source material	Ejumula variety			Kabode variety		
	Total # of plants harvested	SPVD score	% SPVD infection	Total # of plants harvested	SPVD score	% SPVD infection
Biocrops	15	1	7	15	1	7
Farmer	15	3	20	15	2	13

SPVD scored on a scale of 1-9: 1 = (no symptoms, 9 very severe

Table 7. Yield performance of Biocrops and farmers sourced planting material of orange-fleshed sweetpotato varieties during season 2012B

Variety	% marketable roots	Yield (tons)/ha	Vine weight (tons)/ha	Total Biomass (tons)/ha
Ejumula Biocrops	27	17.8	5.6	23.4
Ejumula Farmer	51	7.8	16.4	24.2
Kabode Biocrops	68	10.6	16.0	26.6
Kabode Farmer	53	6.2	12.0	18.2

2.7 Tissue culture plantlet multiplication – MAK

In vitro plantlets of four OSP varieties were received at Makerere University Plant Tissue Culture Laboratory at Kabanylo on 24th/02/2012 from CIP-Nairobi. A total of 100 in vitro plantlets of each variety, namely Ejumula, Kakamega, Kabode and Vita were received from CIP-Nairobi. The cultures were further multiplied in vitro. The in vitro plantelts were sub-cultured onto multiplication medium, and later hardened and weaned in the screenhouse at Kabanyolo. MAK attained at least 1,000 in vitro plantlets of each of the 4 OSP varieties as required under the project. MAK has so far delivered over 4,000 in vitro sweetpotato plantlets to BIOCROPS (U) Ltd for primary multiplication and has sweetpotato at various stages of multiplication. MAK is also maintaining three varieties (Ejumula, Kabode, and Vita in the screenhouse at Kabanyolo. Kakamega is currently not maintained in the screenhouse after it tested positive to *Sweet potato chlorotic stunt virus* (SPCSV). Under this partnership MAK trained two technicians from BIOCROPS in sweetpotato tissue culture techniques. This year, another 2 technicians from BIOCROPS will be trained.

Table 8.Sweetpotato varieties that are being maintained in vitro at at MAK, as at March 30 2013

Variety	Total culture bottles
Ejumula	198
Kabode (SPK 004/6/6)	232
Kakamega (SPK004)	112
Vita(SPK 004/6)	350
Total	**892**

2.8 Vine multiplication at BioCrops

In 2012, CIP initiated collaborative activities with BioCrops to establish a sustainable supply of virus-free vines of four selected orange flesh sweetpotato varieties. Under this partnership, BioCrops was contracted to multiply and supply 40,000 cuttings of virus free primary foundation material of four orange flesh sweetpotatoes (OSP) varieties, Ejumula, Kabode, Kakamega and Vita. BioCrops received technical and financial support to expand its screen house facility and establish tissue culture and screenhouse multiplication of clean vines. Virus indexed start up vines were provided from Kenya Plant Health Inspection Services (KEPHIS) and Makerere University (MAK) for multiplication through nodal cuttings. However, Kakamega had virus symptoms and was discontinued. If this cultivar is to be continued with, new plantlets will have to be re-introduced from MAK.

Due to delayed set off of the project in 2012, all the vines were not delivered in that year. However, the balance has been delivered at the beginning of 2013. The deliveries of vines, status of multiplication and part of the plans for 2013 are summarised in Tables 9 and 10 below:

Table 9. Summary of status of clean vine stock multiplication at BioCrops by March 2013

Planned Activities	Targets	Actual achievements	Remarks
Complete the deliveries of the 2012 contracted numbers	40,000 vines to be delivered	Total of 36,990 vines were delivered in 2012 1. Ejumula = 12,000 2. Kabode = 7,250 3. Kakamega = 9,270 4. Vita = 8,470	The balance of 3,110 vines (1000 each of Ejumula, Kabode and Vita) were delivered
Integrate BioCrops activities in the sweetpotato seed system	Reach out to primary vine multipliers, commercial vine producers and extension staff.	Seven vine multipliers visited BioCrops on 10th December 2012 and were taken through the tissue culture procedure of generating virus free shoots and how the clean status is maintained in the insect proof nets/screen houses and on farm. They were also trained in weaning and nursery management.	The vine multipliers who visited BioCrops are future potential commercial vine multipliers

Maintain a constant supply of clean vines	Supply 40,000 vines in 2013	Vines delivered to CIP in Feb and March 2013: 1. Ejumula = 2,000 2. Kabode = 2,000 3. Vita = 2,000 Number of potted shoots: 1. Ejumula = 4,405 2. Kabode = 4,555 3. Vita = 5,865	Stock of clean Ejumula, Kabode and Vita are available
Establishing *in vitro* cultures of indexed material	Have at least 100 cultures of Ejumula, Kabode, Vita, Kakamega and at least two other farmer preferred varieties	Shelves for the growth room to be used for sweetpotatoes have been installed and are to be fitted with lights.	Negotiations are underway with the UMEME for BioCrops to get stable electricity Clean Kakamega to be re-introduced from MAK. Room has been created in the small screenhouse for new stocks of indexed material

Table 10. Multiplication and delivery of the four sweetpotato varieties by BioCrops

Variety	Vines delivered to CIP 29/8/2012	Vines delivered to Harvest Plus 18/12/2012	Total vines delivered in 2012	Potted shoots
Ejumula	400	11,600	12,000	4,405
Kabode	450	6,800	7,250	4,555
Kakamega	270	9,000	9,270	0
Vita	270	8,200	8,470	5,865
Total	**1,390**	**35,600**	**36,990**	**14,825**

Photos

A

B

C

D

E

F

G

H

I

J

A: Gerald Kyalo examines orange sweetpotato (OSP) clone, SPK 004/ 2006/1136 with a farmer at one of the trials in Rakai district
B: Farmers assess OSP clones at (name of place/village?) during a palatability test at Rakai district
C: Roots of OSP clone SPK 004/2006/1136
D: Roots of OSP clone NASPOT 7/2006/ 292
E: Participants in Triple S training session in Oyam district
F: Participants sort sweetpotato roots during Triple S training in Gulu district
G: Farmers preparing roots for storage Triple S training in Gulu district
H: Vine multiplication at BioCrops
I, J: In vitro multiplication and maintenance of the four orange fleshed sweetpotato varieties in one of the culture rooms in the Makerere Plant Tissue Culture Laboratory

3.0 Summary of personnel commitments

Dr. Robert Mwanga and Mr. Gerald Kyalo have continued to serve as Principal Investigator and Field Crops Agronomist for the project, respectively. Our partners, NaCRRI, Makerere University and BioCrops also continued with their activities as stipulated in their contracts. At NaCRRI, one Scientist (10% time), 1 technician (50%) and 1 driver (30%) are involved in the project. At Makerere, Dr. Ssetumba Mukasa has two technicians who are committed to the project.

4.0 Major equipment acquired

None.

5.0 Description of significant travel

During the reporting period, CIP staff undertook travels to accomplish project objectives. Table 12 below summarizes the travels.

6.0 Delays, Problems, Suggestions

The planned project activities are on course. Renewal of the contract delayed, leading to late release of funds for the project to partners.

Table 11. Summary of significant travels

Date	Name	Institution	Locations	Travel objective	Output
14-25.012013	Gerald Kyalo Jowelia Namakula	CIP NaCRRI	Buyende, Oyam	Harvesting 2nd season OSP trials	17 OSP trials harvested, 3 palatability assesments done.
21-23. 02.2013	Gerald Kyalo Joweria Namakula	CIP NaCRRI	Rakai, Masaka	Selecting farmers to host curing, storage, harvesting 4 OSP trials	Two farmers identified per district, 4 OSP trials harvested, 1 palatability assessment done
611-1115. 08 02 20122013	Gerald Kyalo Jowelia Namakula	CIP NaCRRI	Oyam, Gulu Kabale, Isingiro	Assesemnt of SPVD, Alternaria blight, vigour and monitoring OSP trials Planting trials	Diseases and vigour assessed, status of OSP trials established 10 trials planted, 8 farmers' fields planted with Kakamega and Kabode for storage experiments
18-20.02. 2013	Gerald Kyalo	CIP	NaCRRI	Participating in CloneSelector refresher training conducted by Luka Wanjohi and Robert Mwanga.	On-farm trial data was analyzed in CloneSelector
6.03. 2013	Robert Mwanga	CIP	FARM RADIO International (FRI), Kampala	To identify specific priorities related to OSP for consideration with FRI Uganda office, discuss the TOR for the OFSP National Advisory Group	Priorities related to OSP consideration with FRI identified, Robert Mwanga elected chairperson NAG.

				(NAG) and elect a chairperson of the group.	
7-15.2.13	Sam Namanda	CIP	Lira, Gulu, Kole, Oyam	Trainings on 'triple S' vine conservation and multiplication approach	A total of 37 females and 100 male participants trained, 30 demonstrations set up with farmers
23-29. 3.13	Sam Namanda	CIP	Lira, Oyam, Kole, Gulu	Follow up and monitoring Triple S activities	Status of Triple S demonstrations established, preparations for planting on beds started
28.3-2.4.13	Gerald Kyalo	CIP	Masaka, Rakai, Mukono	Preparing for planting of materials for post-harvest experiments.	Preparations done, land preparations in progress.

Appendix 1: Progress on Objectives and Outcomes for CIP

Milestone	Targeted outputs	Baseline	Progress
Objective 1:	**Ensure disease-free supply of primary foundation seed**		
Provide training, and ensure that the private sector partner can produce quality primary material using plantlets from MAK, initially obtained from KEPHIS, Muguga, Kenya.	40,000 cuttings of primary material produced	No pathogen-tested in vitro OSP varieties available at MAK in year 1	Between Feb and March 2013, BioCrops supplied to CIP: 1. Ejumula = 2,000 2. Kabode = 2,000 3. Vita = 2,000 Number of potted shoots: 4. Ejumula = 4,405 5. Kabode = 4,555 Vita = 5,865 Stock of clean Ejumula, Kabode and Vita are available
Asses the cost of tissue culture multiplication in Uganda.	Capacity of Biocrops to multiply clean foundation planting material established, two vine multipliers identified per district and trained on vine multiplication techniques	No experience of multiplying pathogen-tested OSP vines	Seven vine multipliers visited BioCrops on 10th December 2012 and were taken through the tissue culture procedure of generating virus free shoots and how the clean status in maintained in the insect proof nets/screen houses and on farm. They were also trained in weaning and nursery management. Tracking of costs at BioCrops is on-going
Objective 2:	**Transfer the Triple S technology at scale and build a cadre of trained extension personnel to monitor its adoption**		
Select key dry areas for testing this technology at scale.	Triple S technology validated and scaled up with farmers in key dry areas, 30% of target households in areas with prolonged dry seasons adopt the technology	Triple S technology not yet tested in HarvestPlus project areas	A total of 30 demonstrations were set up in Feb on Triple S in Gulu, Oyam, Kole and Lira districts
Train extension personnel to effectively implement the technology.	At least one lead farmer from each county hosting OSP trials trained in OSP production	No extension personnel trained in OSP production	137 farmers, Field Extension workers/ Community Development Assistants trained in Gulu, Oyam, Kole and Lira districts

Monitor adoption of technology and make any needed changes in approach based on addressing any emergent constraints to adoption.	At least 30% of communities in project areas adopt Triple S.	OSP is not grown in the project areas	Activity planned for later years
Evaluate characteristics of adopters and non-adopters.	Percent adoption and characteristics of adopters	Technology absent in project area	Activity planned for later years
Objective 3:	**Accelerate evaluation of on-farm of promising OSP clones**		
Conduct on-farm trials with extensive farmer participation in key target areas.	New OSP clones evaluated with farmers and at least two clones selected for further evaluation	New OSP clones from NaCRRI have not been tested in HarvestPlus project areas	Harvesting of 2nd season 2012 trials has been done in Buyende and Oyam districts. Harvesting 2nd season trials in Kabale Isingiro and Rakai will be done at end of April. Preparations are underway to plant 1st season 2013 trials in the respective districts.
Provide at least two new clones for cleanup for the seed system by year 4	Promising clones cleaned up before they are provided to vine multipliers and farmers	New clones from NaCRRI not yet cleaned	Promising clones SPK 004/2006/1136 and NASPOT 7/2006/292 have already been sent to KEPHIS, Kenya, for cleaning
Objective 4:	**Improve curing techniques and investigate other ways to improve post-harvest quality and extend post-harvest shelf life of traded OSP**		
Design and conduct trials and curing demonstrations	Conditions for curing established	There is no curing of OSP in E. Africa	Farmers (7) to host curing experiments have been identified in Mukono (2), Rakai (2), Soroti (1) and Masaka (2). Planting is underway for materials to be used in the curing experiments.
Evaluation of improved curing methods vs. current practice	Improved curing and storage techniques tested with farmers	Limited shelf life of sweetpotatoes	Experimental gardens have been planned for planting in late April; the curing experiments will be set up in August 2013 and will run for 3 months

Work with implementation team to improve training on handling of roots during harvest and postharvest.			Trainings on post-harvest handling will be scheduled at harvesting time
Objective 5:	**Backstop Implementation Team and Broader Dissemination Objectives**		
Respond to emergent problems concerning sweetpotato multiplication and production as requested by the implementation team.	Emerging problems solved	Issues among partners vary	CIP staff backstop HarvestPlus team on training of farmers, extension personnel and vine multipliers
Ensure that experience is documented and any relevant materials and finding are loaded on the Sweetpotato Knowledge Portal.	Documented experiences	No experiences on new OSP varieties and Triple S in HarvestPlus project areas	Quarterly and final 2012 technical reports have been written

Appendix 2: Progress on Objectives and outcomes for NaCRRI

Milestone	Targeted out puts	Baseline	Progress
Objective:	**Accelerate evaluation on-farm of promising OFSP clones**		
Conduct on-farm trials with extensive farmer participation in key target areas.	New OFSP clones evaluated with farmers and at least two clones passed on to the farmers	New OFSP clones from NaCRRI have been tested on-station.	Two famer choice clones, SPK 004 2006/1136 and NAS7/2006/292 selected from previous on-farm trials during 2011/2012 have been established for distinctness, uniformity and stability (DUS) tests. The clones are also maintained in the swamp and screen house and have been sent to Muguga, Kenya for virus clean-up. Also, 4 new promising clones (Ejumula OP/ 2012/9, Ejumula OP/2012/10, Ejumula OP/ 2012/11, Resisto OP/2012/2, are being multiplied and will go for on-farm testing during the first rains in 2013.
Objective:	**Backstop Implementation Team and Broader Dissemination Objectives**		
Respond to emergent problems concerning sweetpotato multiplication and production as	Provide solutions to urgent problems	No research institution ready to backstop partners consistently	NaCRRI team backstops partners as need arises

requested by the implementation team.			
Ensure that experience is documented and any relevant materials and finding are loaded on the Sweetpotato Knowledge Portal.	Documented information is readily available	Information on OSP in target districts lacking	Quarterly and final 2012 technical reports have been written

Appendix 3: Progress on Objectives and Outcomes for MAK and BioCrops

Milestone	Targeted out puts	Baseline	Progress
Objective :	**Ensure disease-free supply of primary foundation seed**		
Provide training, and ensure that the private sector partner can produce quality primary material using plantlets from MAK, initially obtained from KEPHIS, Muguga, Kenya	40,000 cuttings of primary material produced by BioCrops	BioCrops has clean OSP from MAK	Between Feb and March 2013, BioCrops supplied to CIP: 2. Ejumula = 2,000 4. Kabode = 2,000 5. Vita = 2,000 Number of potted shoots: 6. Ejumula = 4,405 7. Kabode = 4,555 Vita = 5,865 MAK is maintaining 50 bottles of in vitro plantlets of each variety. Each bottle contains 2-3 plantlets giving about 100 in vitro plantlets of each variety. Plants have already been established in the screenhouse for further multiplication. MAK will continue delivery to BIOCROPS.
Asses the cost of tissue culture multiplication in Uganda	Capacity of Biocrops to multiply clean foundation planting material established	No experience with OSP multiplication	Tracking of costs at BioCrops is on-going