Farmers participating in palatability tests for OSP clones in Oyam district, Uganda.
Photo by Kyalo Gerald- CIP Uganda

Delivering and Disseminating Biofortified Crops in Uganda

Final Report
January–December 2012

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

Final Report
January–December 2012

Prepared by
R.O.M. Mwanga, G. Kyalo, and J. Low (CIP), G. Ssemakula (NaCRRI/NARO), M. Ssetumba (MAK), and D. Talengera (BioCrops)

Table of Contents

Summary 17
1.0 Background 17
2.0 Major Accomplishments during the reporting period 19
2.1 Recruitment of Field Crops Agronomist 19
2.2 NaCRRI/NARO, MAK, BioCrops, and CIP Subcontracts 19
2.3 Monitoring and selection of vine multipliers in different regions of the country 19
2.4 Planning for on-farm trials 19
2.5 Selecting farmers to host OSP trials 19
2.6 Training farmers on agronomy of OSP 20
2.7 Planting on-farm and on-station OSP trials 20
2.8 Selecting farmers to host curing, storage and triple S experiments 20
Table 1: Farmers selected to participate in curing, storage and triple S experiments 21
2.9 Pre-harvest monitoring/evaluation of on-farm trials 21
2.10 Training Field Extension workers at Kabale 21
2.11 Planting 2nd season on-farm OSP trials 22
2.12 Training farmers on agronomy of OSP 22
2.13 Visit of Dr Wolfgang H. Pfeiffer, Deputy Director, Operations, HarvestPlus 22
2.14 Harvesting on-farm OSP trials 22
2.15 Seed systems meeting at Makerere University 22
2.16 Multiplication and maintenance of planting materials at NaCRRI 23
2.17 Harvesting of on-station trials 23
Table 2. Mean performance of 7 OSP clones and 4 check clones evaluated at four on-station locations in Uganda, 2012 (planted in May/June, harvested in Oct/November 2012) 23
3.0 Summary of technical progress 24
3.1 On-farm evaluation of promising OSP clones 24
3.2 Improving curing techniques and investigating other ways to improve post-harvest quality to extend post-harvest shelf life of traded OSP 24
Table 3. Yield and results for palatability tests of four test orange sweetpotato clones in five districts of Uganda 25
3.3 Vine multiplication activities at BioCrops 29
3.4 Vine multiplication activities at Makerere University 30

List of tables

Table 1: Farmers selected to participate in curing, storage and triple S experiments 21
Table 2. Mean performance of 7 OSP clones and 4 check clones evaluated at four on-station locations in Uganda, 2012 (planted in May/June, harvested in Oct/November 2012)..... 23
Table 3. Yield and results for palatability tests of four test orange sweetpotato clones in five districts of Uganda 25
Table 4. Percentage weight loss of sweetpaotato roots of three varieties cured for five days in saw dust, polythene and in the open 28
Table 5. Response of NASPOT 10 O and NASPOT 9 O stored for 14 days after curing 29
Table 6. Multiplication and delivery of the four sweet potato varieties 30
Table 7. Sweetpotato varieties for which clean planting material has been produced at MAK in collaboration with BIOCROPS, as at November 30 2012. 31
Table 8. Summary of Significant Travel 33
Table 9. Summary of Milestone/Activities and Progress 25

List of Appendices

Appendix 1: Farmer/ farmer groups participating in OSP trials i

SUMMARY

This is the end of the first year technical report for the project, "Delivering and Disseminating Biofortified Crops in Uganda," which began in January 2012. During this reporting period, CIP supplied 100 clean in vitro plantlets of each of the four orange sweetpotato (OSP) varieties, Ejumula, Kabode (SPK004/6/6) and Vita (SPK004/6) to Makerere University Plant Tissue Culture Laboratory at Kabanylo (MAK) for multiplication. CIP also supplied a combined total of 100 virus indexed OSP mini-cuttings of Kakamega, Kabode, Ejumula and Vita to BioCrops Uganda Ltd for multiplication in the screen house. By November 2012 MAK had multiplied 6,879 plantlets, while BioCrops had 18,500 vines ready for delivery.

CIP, in collaboration with the National Crops Resources Research Institute (NaCRRI) of the National Agricultural Research Organization (NARO), identified farmers to host on-farm trials in the districts of Kabale, Isingiro, Rakai, Buyende and Oyam, and planted a total of 100 on-farm trials in the respective districts. On-farm trials were set up with four OSP clones; NASPOT 10 O (Kabode), NASPOT 7/2006/1185, SPK004 2006/1136, NASPOT 7/2006/292. CIP also setup post-harvest trials, i.e. curing and storage with one farmer in each of the districts of Rakai, Masaka and Mukono. Curing trials were set up using four treatments; curing in sawdust, curing in the humidity chamber using polythene, in-ground curing for 7 and 14 days and farmers practice. The storage trials were set up in Masaka and Rakai with three treatments; pit storage with layers of sand, ordinary pit, storage of roots above ground in layers of sand and the common storage practice used by the farmers.

All 1st season on-farm trials were harvested and 7 palatability tests performed with farmers. SPK 004/2006/1136 had the highest yield across districts (16.2 tons/ha) followed by NASPOT 7/2006/292 (10.8 tons/ha). During the palatability tests, farmers preferred NASPOT 7/2006/292 and SPK 004/ 2006/ 1136 for their sweetness, starchiness, good flavor and general appearance. NASPOT 7/2006/292 and SPK004/2006/1136 are showing good prospects and will be considered for release if they perform equally well during the second season on-farm trials. Results from the curing experiment indicated that in-ground curing and curing in sawdust for seven days showed good prospects and will be repeated to evaluate them further.

1.0 BACKGROUND

This is the end of year 1 technical report of the project, "Delivering and Disseminating Biofortified Crops in Uganda," which started in January 2012. The project is implemented by five partners, the International Potato Center (CIP), HarvestPlus, the Department of Agricultural Production, College of Agricultural and Environmental Sciences of Makerere University (MAK), the National Crops Resources Research Institute (NaCRRI) of the National Agricultural Research Organization (NARO), and a private company, BioCrops Uganda Limited.

The HarvestPlus Reaching End Users (REU) orange sweetpotato (OSP), 2007 - 2009 project introduced beta-carotene-rich OSP (bioforitified sweetpotato) and related messages concerning agronomy, nutrition, and marketing in order to induce broad OSP adoption, increase vitamin A

intake, and reduce vitamin A deficiency (VAD) among children and women in Uganda. Biofortified sweetpotato is an extremely rich source of pro-vitamin A that has been proven to improve vitamin A status of children. Children with VAD are at increased risk of severe morbidity from common childhood infections such as diarrheal diseases and measles; in cases of extreme deficiency, they can go blind or even die. The intervention worked through local farmer groups (FGs) to disseminate information about OSP and improved nutrition and to distribute OSP vines for planting. In addition to the intervention, the project also included a rigorous evaluation component to test and document the most cost-effective method to disseminate OSP and encourage its consumption.

Despite the successful dissemination of the OSP varieties in the REU project areas in Uganda, a high proportion of the planting material succumbed to the devastating sweetpotato virus disease. Following discussions between MAK, CIP and HarvestPlus, it was realized that lack of a good supply of virus-free planting material could not allow sustainable cultivation of the susceptible OSP varieties. MAK was commissioned to start activities on the rapid multiplication of virus tested sweetpotato planting material using tissue culture to provide hardened clean stocks of OSP varieties to BioCrops.

BioCrops and CIP initiated collaborative work on developing and delivering biofortified crops in Uganda, specifically aimed at establishing a sustainable supply of virus-free cuttings of four OSP clones, NASPOT 10 O (Kabode), NASPOT 9 O (Vita), SPK 004 (Kakamega) and Ejumula. BioCrops received 195 clean vine cuttings from CIP-Nairobi in two batches to establish mother stocks for propagation of the four OSP varieties.

NaCRRI in collaboration with CIP have started conducting on-farm trials with extensive farmer participation in key target areas to identify superior, preferred, adapted OSP clones.

The project's main objectives are to:

1. Establish sustained supply of virus-free plantlets of major OSP varieties at Makerere University and at NaCRRI.
2. Establish capacity of the 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 Recruitment of Field Crops Agronomist

The project successfully recruited the Field Crops Agronomist, Mr. Gerald Kyalo, in February 2012. He is involved in all the research aspects of the project, including setting up of on-farm trials to test the adaptability of new OSP clones in northern and southwest Uganda. He is also responsible for setting up post-harvest experiments, including those on triple S technology.

2.2 NaCRRI/NARO, MAK, BioCrops, and CIP Subcontracts

Letters of understanding (LOUs) between CIP and the three partners were completed by March. However, funds were disbursed to their accounts in April 2012; MAK was the latest to receive funds for the project, in early June 2012.

2.3 Monitoring and selection of vine multipliers in different regions of the country

Gerald Kyalo of CIP joined Charles Musoke of HarvestPlus on a trip in February 2012 to assess the status and availability of vines in the districts of Gulu, Lira, Soroti, Rakai, Masaka, Isingiro, Mukono, and Buyende. The trip provided insight into the readiness of existing vine multipliers to supply planting material during the first season of 2012. During the trip, it was discovered that there was a shortage of planting material in the northern districts of Lira, Gulu, Kole, and Oyam, while there were plenty of vines in the districts of Mukono, Buyende, Luweero, and Isingiro. It was therefore agreed that the northern region would get supplies of vines from Soroti, while Kibale and Kamwenge would be supplied by multipliers from Luweero district. Farmers from Kabale would get supplies from Isingiro district.

2.4 Planning for on-farm trials

Robert Mwanga and Gerald Kyalo of CIP met Gorrettie Ssemakula, Head of the Sweetpotato Program of NaCCRI, to draw up plans for OSP activities under the project in February 2012. The team discussed arrangements to be made in preparation for the planting of OSP trials in the districts of Kabale, Isingiro, Buyende, Rakai, and Oyam. The team also inspected multiplication sites where OSP vines were being multiplied in preparation for the first season 2012 planting. Criteria for selection of farmers to host OSP were worked out.

2.5 Selecting farmers to host OSP trials

A trip was conducted in March in conjunction with the Sweetpotato Program of NaCRRI to select farmers to participate in the OSP trials in the districts of Isingiro, Kabale, Buyende, Rakai, and Oyam. Farmers were selected based on the following criteria:

1. Willingness to host the trial and have visitors come to her/his farm on the evaluation day
2. Availability of sufficient labor and land to undertake the trial for the agreed management approach

3. Accessibility of location (not too far from a major road)
4. Experienced sweetpotato grower in good health
5. As much as possible, soil for plot used in the trial should be homogeneous
6. Whether the farmer had problems in the past with animal destruction and theft

Based on the above criteria, 10 farmers were selected per district to host OSP trials (see Appendix 1).

2.6 Training farmers on agronomy of OSP

Mr. Kyalo joined the HarvestPlus team to conduct trainings on agronomy of OSP in the districts of Lira, Kabale, Kamwenge, Kibaale, Rakai, Mukono, and Buyende in April 2012. The training activity was led by HarvestPlus. The beneficiaries of the trainings were extension personnel under the project.

2.7 Planting on-farm and on-station OSP trials

To accelerate the on-farm evaluation of promising OSP clones, on-farm trials were planted in the districts of Buyende, Isingiro, Kabale, Rakai, and Oyam in April and May 2012. The OSP trials were hosted by 10 farmers per district with each farmer acting as a replicate. The trials were established with OSP clones, NASPOT 10 O (Kabode), NASPOT7/2006/1185, SPK004/2006/1136, NASPOT7/2006/292, and local checks selected by the farmers (see Appendix 1 for details of parishes, sub-counties, districts, individual farmers, farmer groups, composition of groups, and collaborating partners). The clones were planted in plot sizes of 30 m^2 arranged in five rows 6 m long on ridges 40 cm high or on mounds depending on the farmers' agronomic practice. To satisfy farmers' curiosity, 100 cuttings of SPK 004 (Kakamega) were planted in an additional plot.

A total of 11 clones (7 test clones, 4 check clones) were planted on-station in May 2012 in a RCB design, 5 row (ridge) plots (15 plants per row, 0.3 m between plants) with 75-plant per plot, in four locations at Namulonge, Kachwekano, Serere and Ngetta.

2.8 Selecting farmers to host curing, storage and triple S experiments

A team of two, Gerald Kyalo and Sam Namanda, undertook a field trip to the districts of Rakai, Gulu and Oyam to select farmers to participate in experiments on storage, curing and triple S in the last week of June 2012. Four farmers were selected per district (see Table 1 for details). The selected farmers received planting materials of NASPOT 10 O and SPK004. The roots from the materials will be used to set up curing, storage and triple S experiments in January 2013 when the weather is most favorable for those experiments. As the planted materials would only be ready later in the year, the team was compelled to travel to sites where the project "Reaching End Users (REU) was implemented to select farmers who have gardens of OSP materials on which we could impose curing experiments. The team travelled to Masaka, Mukono and Kamuli, 15-23 August 2012. Two farmers were selected in Masaka and one farmer in Mukono to host the experiments. The team imposed curing experiments on the selected farmers' fields in October 2012.

Table 1: Farmers selected to participate in curing, storage and triple S experiments

Names of farmers	Sub county	District
Bena Senatamu	Kabonera	Rakai
Namudu Carol	Lwankoni	Rakai
Felister Bwanika	Lwankoni	Rakai
Tebandeke John	Kirumba	Rakai
Mary Opio	Aboke	Oyam
Rose Akol	Aboke	Oyam
Milton Obong	Aboke	Oyam
Jacob Alipa	Aboke	Oyam
Ocira Michael	Koro	Gulu
Lakot Franker	Koro	Gulu
Okello Denis	Koro	Gulu
Adong Santa	Koro	Gulu
John Semakula*	Lwankoni	Masaka
Sekabonga*	Kamenyamigo	Masaka
Musumba*	Nakisunga	Mukono

* Farmers identified on second visit

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

Gerald Kyalo (CIP) and Joweria Namakula (NaCRRI) undertook a field trip to asses SPVD, Alternaria blight and vigour and monitor OSP trials in Rakai, Isingiro, Kabale, Buyende and Oyam districts (Photo A). All the trials progressed well especially in Oyam and Buyende where adequate rains were received. Rakai and Kabale, however, experienced a prolonged dry season which affected performance of the trials. Trials established at altitudes above 1300 masl were also affected compared to those planted at lower altitudes. Generally all the clones looked good but SPK 004 2006/1136 looked more vigorous and was more drought tolerant at all sites. It was also the more preferred by farmers at Buyende, Oyam, Rakai and Isingiro. Rakai district had the highest average SPVD scores while Oyam district had the lowest. Generally, during the growing season the clones had SPVD severity score of about 3.0 or less; this is good especially for OSP that are generally susceptible to the disease. There was a slight increase in SPVD severity score by the time the trials were harvested (see details under on-farm evaluation of promising OFSP clones).

Five trial plots (1 Buyende, 2 Rakai, 1 Isingiro, and 1 Kabale) were lost due to either farmers' abandonment or grazing by animals. The lost trials in Buyende, Isingiro and Rakai were lost due to weed infestation while the site at Kabale was eaten up by grazing animals. The farmers whose sites were not weeded informed us that it was too dry for them to weed as they feared they would lose the whole crop.

2.10 Training Field Extension workers at Kabale

Gerald Kyalo (CIP) joined Charles Musoke (HarvestPlus) to train extension workers at Kabale on pests and diseases of sweetpotatoes and beans during 26 - 28 July 2012. Four extension workers and 2 interns implementing project activities in Kabale and Kisoro districts were trained. This was a HarvestPlus led activity.

2.11 Planting 2nd season on-farm OSP trials

Gerald Kyalo (CIP) and Joweria Namakula (NaCRRI) planted second season trials of OSP in the project districts. Trials in Oyam were planted 6-11 August 2012 while those in Buyende were planted 4-6th September 2012. The rest of the trials were planted in October 2012. A total of 50 trials were planted during the second season.

2.12 Training farmers on agronomy of OSP

Mr. Kyalo joined the HarvestPlus team to conduct trainings on agronomy of OSP in the districts of Lira, Kabale, Kamwenge, Kibaale, Rakai, Mukono, and Buyende in April. The beneficiaries of the trainings were extension personnel under the project. The activity was led by HarvestPlus.

2.13 Visit of Dr Wolfgang H. Pfeiffer, Deputy Director, Operations, HarvestPlus

The Deputy Director, Operations, HarvestPlus, Dr. Wolfgang H. Pfeiffer, visited the project from 9 to 12 June 2012. He visited our trials in Buyende, where we discussed farmers' experiences with sweetpotato growing. He also visited our office at CIP and our partners, BioCrops, Makerere University (tissue culture laboratory, Kabanyolo) and NaCRRI.

2.14 Harvesting on-farm OSP trials

On-farm trials set up in April and May were harvested in September 2012 (Buyende and Oyam), October 2012 (Rakai) and November 2012 (Kabale and Isingiro). A total of 45 trials were harvested. The team also performed seven palatability tests with the farmers (2 in Buyende, 2 in Oyam, 2 in Rakai and 1 in Isingiro). Palatability tests could not be performed in Kabale district because of outbreaks of Marburg virus disease in the region. Marburg virus disease is contagious and as such public meetings were banned in the area.

2.15 Seed systems meeting at Makerere University

A meeting was held at Makerere University on 14th August 2012 to discuss the status of clean materials at BioCrops and the tissue culture lab at Makerere University. The meeting was attended by Robert Mwanga, Sam Namanda, Gerald Kyalo (CIP), Charles Musoke (Harvest Plus), Mukasa Ssetumba (MAK) and David Talengera (BioCrops). At that time, Makerere University, initially sourced 260 clean in vitro plantlets from CIP-Nairobi, had multiplied and reached a combined total 4,000 plantlets of Ejumula, Kabode, Kakamega already hardened and ready for delivery to BioCrops. It was indicated that samples of materials under conservation and multiplication by MAK and BioCrops had been collected and sent to Nairobi for virus indexing. BioCrops indicated that they had experienced problems with procuring nets for the second screenhouse, but that the process was nearly complete. Sam Namanda indicated that he was in the process of setting up demonstrations of clean planting material Vs diseased materials (farmer's traditional planting material) in Kamuli, Mukono and Masaka districts. He was planning to use the clean materials of Ejumula, Kakamega, Vita and Kabode from BioCrops. The demonstrations would serve to educate farmers on the significance of using clean planting materials. It was agreed that Sam computes the total number of cuttings for the

demonstrations and submits it to BioCrops. The team concurred that there was a challenge of ensuring that the private operator, BioCrops, continues with the production of clean planting OSP materials to feed into farmer multipliers, if not supported with funding in year 2 of the project.

2.16 Multiplication and maintenance of planting materials at NaCRRI

Multiplication and conservation of the four clones, NASPOT 10 O (Kabode), NASPOT7/2006/1185, SPK004/2006/1136, NASPOT7/2006/292 continued in the swamp at NaCRRI. Clone SPK004/2006/1136 apparently more preferred by farmers is also being multiplied upland on a larger scale to meet the envisaged increase in demand for its planting material.

2.17 Harvesting of on-station trials

On station trials of OSP clones were harvested in October/November 2012 from four locations, Namulonge, Ngetta, Kabale and Serere; yield data is shown in Table 2. SPKOO4/2006/1136 (28 t/ha), Sowola (OP)/2005/2 (14 t/ha), and NAS7/2006/292 (14 t/ha) were the best performing new test clones. The yield of SPKOO4/2006/1136 was higher than the best check clone, NASPOT 1 (22 t/ha). The clone mean reaction to SPVD was below score 3.5, which is good although not better than local checks.

Table 2. Mean performance of 7 OSP clones and 4 check clones evaluated at four on-station locations in Uganda, 2012 (planted in May/June, harvested in Oct/November 2012)

Clone	Total Root Yield (t/ha)	Commercial root yield (t/ha)	Weevil damage	SPVD	Alternaria blight	Harvest index	Biomass yield (t/ha)	Flesh color
JEWEL(OP)/2005/6	10.6	9.5	3.7	3.1	2.5	0.3	40.1	2
NAS5(OP)/2005/13	3.4	2.5	3.3	4.3	3.3	0.3	13.8	2
NAS5(OP)/2005/8	5.7	4.4	3.1	3.6	2.4	0.2	30.3	8
NAS7/2006/1185	6.8	5.6	3.3	2.8	2.0	0.3	30.2	8
NAS7/2006/292	14.3	12.1	3.5	2.8	2.2	0.4	36.9	8
NASPOT 1 (Check)	21.8	20.5	3.5	4.0	3.3	0.5	44.2	2
SOWOLA(OP)/2005/2	14.4	13.0	3.3	4.3	2.5	0.6	28.5	6
SPKOO4/2006/1136	28.8	26.8	3.2	3.4	2.8	0.6	50.1	8
NASPOT 8 (check)	20.8	19.3	3.2	2.8	2.3	0.6	38.4	6
New Kawogo (Check)	5.1	4.6	2.7	2.4	2.6	0.2	36.1	2
DIMBUKA (Check)	9.8	7.7	3.5	3.8	2.5	0.3	34.4	2
Mean	12.9	11.5	3.3	3.4	2.6	0.4	34.8	.
Cv	42.9	46.0	28.0	22.0	27.0	26.4	30.5	.
LSD	4.5	4.3	0.8	0.6	0.6	0.1	8.6	.

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, 8- Deep orange

3.0 SUMMARY OF TECHNICAL PROGRESS

3.1 On-farm evaluation of promising OSP clones

Harvesting of OSP trials started in Buyende, 6-9th September 2012 and ended in Kabale and Isingiro, 19-28 November 2012. SPK004/2006/1136 had the highest average yield (16.2 tons/ ha) followed by NASPOT7/2006/292 with an average yield of 10.8 tons/ha (Photos B-E). SPK004/2006/1136 performed better than the check clone NASPOT 10 O (average yield 11.1 tons/ha) (see Table 3 and 4 for details). Similarly, SPK004/2006/1136 had the highest marketable yield (14.0 tons/ ha followed by the check clone NASPOT 10 O (average marketable yield 9.5 tons/ha). SPK004/2006/1136 had the highest biomass yield (33.8 tons/ha). It was followed closely by NASPOT 7/2006/1185 (33.6 tons/ha) and NASPOT 7/2006/292 (28.0 tons/ha), respectively.

Generally farmers preferred SPK004/2006/1136 during pre-harvest assessments because it is vigorous and it is tolerant to drought. NASPOT7/2006/292 was preferred by farmers during the palatability tests (Photos F-K) in two districts Buyende (64.3%) and Rakai (34.7 %) while SPK004/2006/1136 was preferred in Isingiro 33% and Oyam 75.3%. SPK004/2006/1136 was preferred for its starchiness, good flavor and general appearance. NASPOT7/2006/292 was liked for its sweetness in addition to all the attributes of SPK004/2006/1136 (see Table 2 for details).

3.2 Improving curing techniques and investigating other ways to improve post-harvest quality to extend post-harvest shelf life of traded OSP

Post-harvest experiments were set up in Mukono, Rakai and Masaka using NASPOT 10 O, NASPOT 9 O and local check varieties selected by the farmers. Experiments were set up on both curing and storage. The main objective of the post-harvest experiments was to evaluate improved curing and storage methods for different varieties of orange sweetpotato (OSP). Treatments for curing included,

1. Curing sweetpotato in saw dust. The roots were cured in a locally made basket. The bottom of the basket was covered with saw dust before 20 kg of roots of each variety were added. The roots were then covered and sealed off with saw dust.
2. Curing by covering sweetpotato roots with a polythene sheet raised 15-20 cm above the roots. The idea was to try and achieve a temperature of about 30^0C and a relative humidity of 90-95%. The sheet was opened at night to increase airflow over the roots.
3. Detopping 14 days before harvest.
4. Detopping 7 days before harvest and
5. Farmers' practice (leaving the roots in the open) after harvest.

The treatments for storage included,

1. Pit storage with layers of sand: Pits measuring 1.5 m X 1 m X 0.3 m were prepared. A total of 20 kg of roots were then added within layers of sand. The pit was then sealed off afterwards with soil.

2. Ordinary Pit: The pit with the same size as above was used but with no sand. A total of 20 kg of roots was added as in treatment 2 above and sealed off with soil.
3. Storage of roots above ground in layers of sand. In this case 20 kg of sweetpotato roots were stored in layers of sand in a locally made basket.
4. Farmers' practice: the farmers' practice entailed storing 20 kg of roots in open space in a house.

Table 3. Yield and results for palatability tests of four test orange sweetpotato clones in five districts of Uganda

District	Clone	Total root yield (tons/ha)	Marketable root yield (tons/ha)	Biomass (tons/ha)	SPVD	Alternaria blight	Flesh color	Preference (%)
Isingiro	NASPOT 10	10.8	9.0	23.3	2.8	1.3	7	23.8 n=21
	NASPOT 7/2006/1185	8.0	6.4	38.8	3.5	1.3	8	0
	SPK004/2006/1136	18.5	16.2	36.2	2.9	1.6	8	33.3
	NASPOT 7/2006/292	11.1	9.6	26.0	2.8	1.6	8	9.5
Buyende	NASPOT 10	11.3	10.4	25.4	2.3	1.0	8	65.9 n=42
	NASPOT 7/2006/1185	4.6	3.4	35.0	3.0	1.0	8	4.7
	SPK004/2006/1136	17.5	15.8	36.2	2.6	1.0	8	47.6
	NASPOT 7/2006/292	8.2	7.5	25.4	2.1	1.1	8	64.3
Rakai	NASPOT 10	7.4	5.3	19.0	3.1	1.0	8	34.7 n=49
	NASPOT 7/2006/1185	7.3	4.9	27.5	3.5	1.1	8	6.1
	SPK004/2006/1136	12.9	10.8	27.4	3.6	1.1	8	16.3
	NASPOT 7/2006/292	9.2	7.2	25.6	3.0	1.0	8	34.7
Oyam	NASPOT 10	18.4	17.1	32.7	1.3	1.0	8	67.4 n= 89
	NASPOT 7/2006/1185	6.7	5.2	34.6	1.4	1.0	8	7.7
	SPK004/2006/1136	18.9	16.8	35.3	1.9	1.3	8	75.3
	NASPOT 7/2006/292	14.2	12.2	33.2	1.6	1.0	8	67.2
Kabale	NASPOT 10	7.7	5.8	21.1	1.5	1.3	7	NA
	NASPOT 7/2006/1185	2.7	1.4	31.9	2.1	1.3	8	NA
	SPK004/2006/1136	13.4	10.4	33.7	2.0	1.6	7	NA
	NASPOT 7/2006/292	11.5	9.0	29.8	2.1	1.6	8	NA
$LSD_{0.05}$		2.7	2.6	6.5	1.0	0.5	NA	NA
CV		55.7	64.0	49.0	41.2	42.3	NA	NA

LSD- Least significant difference at 5 %, Fresh color: 7-Light orange, 8- Deep orange, NA - Not availbale
SPVD and Alternaria blight scored on a scale of 1-9: 1=no symptoms, 9=very severe symptoms

Performance of OSP clones across districts (farms)

	Total root yield (tons/ha)	Marketable root yield (tons/ha)	Biomass (tons/ha)	SPVD	Alternaria blight	Flesh color	Preference (%)
NASPOT 10	11.1	9.5	24.3	2.2	1.1	7	25.3
NASPOT 7/2006/1185	5.9	4.3	33.6	2.7	1.1	8	2.8

SPK004/2006/1136	16.2	14.0	33.8	2.6	1.2	8	24.6
NASPOT 7/2006/292	10.8	9.0	28.0	2.3	1.2	8	23.7

Photos

A

B

C

D

E

F

J

K

A: Joweria Namakula (NaCRRI) (center) with farmers at one of the trials in Oyam
B, C: Preferred clone SPK 004/2006/1136
D, E: 2nd preferred clone NASPOT 7/2006/292
F, H: farmers during a palatability test in Oyam
K: some of the clones after preparation, ready for the palatability test (Left to right): NASPOT 10 O (Kabode), NASPOT 7/2006/1185, SPK004 2006/1136, NASPOT 7/2006/292

The roots were assessed for rots, sprouting, shriveling, and attack by weevils using a 5 point scale (1= absence of defect, 2=¼ of the root has the defect, 3= ½ of the root has the defect, 4= ¾ of the root has the defect and 5= severe) by visual assessment. In addition weight loss was also calculated.

After six weeks of storage, the roots stored in pits had sprouted and were therefore discarded. Roots stored in layers of sand in baskets were still doing well with no sprouting, and no rotting or shriveling. The roots were maintained, and will be assessed again at 10 weeks of storage.

Roots cured in saw dust for five days showed the lowest percentage weight loss compared to roots left in the open and those cured in polythene bags (photo A1). NASPOT 9 O showed the lowest weight loss of 3.3 % followed by NASPOT 10 O at 3.4% (See Table 4 for details). Roots left in the open showed the highest weight loss (NASPOT 10 O, 10.2%, local check 7.6%). Roots cured in polythene sprouted by the 5th day. The experiment was repeated by curing NASPOT 10 O and NASPOT 9 O in polythene for 2, 3, 4 and 5 days. NASPOT 9 O started sprouting on the second day (number of sprouts = 35) and by the 5th day up to 62 sprouts could be counted. NASPOT 10 O also sprouted and by the 3rd day, up to 38 sprouts could be counted. No sprouts were counted on the roots left in the open.

In ground curing for 14 days resulted in sprouting (sprouting = 2) while roots cured for 7 days did not sprout. As a result, sprouting continued in storage for the roots cured for 14 days compared to those cured for 7 days. Apart from sprouting, all roots stored well for 14 days (photo B1) and were tasty when eaten by farmers except the un cured roots which were shriveled (Shriveling =2) and could not be peeled easily (Table 5). In grounding curing for 7 days and curing roots in saw dust are showing good prospects for extended shelf life of roots especially for the market but more research is needed with a bigger sample size and at wider scale before the technology can be taken to the farmers.

Table 4. Percentage weight loss of sweetpaotato roots of three varieties cured for five days in saw dust, polythene and in the open

Treatment	**Sweetpotato variety weight loss (%)**		
	Local	NASPOT 10 O	NASPOT 9 O
Open (control)	7.6	10.2	4.7
Polythene	5.7	5.0	3.7
Saw dust	4.7	3.4	3.3

$LSD_{0.05}$ = 5.3 (LSD- Least significant difference at 5%), CV= 57.5

A1

B1

A1: Sweetpotato roots being cured in sawdust, polythene bags and in the open (open basket) at the home of one of the farmers in Mukono district

B1: Sweetpotato roots in storage for 14 days after curing

Table 5. Response of NASPOT 10 O and NASPOT 9 O stored for 14 days after curing

Variety	Treatment	Sprouting	Shriveling	Rotting	Weevil
	Detopping Vs no detopping				
NASPOT 9 O	No detopping	1.6	1.3	1.1	1.0
NASPOT 10 O	No detopping	1.3	1.3	1.1	1.4
Local check	No detopping	1.5	1.2	1.2	1.1
NASPOT 9 O	Detopping (7 days)	1.8	1.2	1.0	1.4
NASPOT 10 O	Detopping (7 days)	1.8	2.0	1.1	1.5
Local check	Detopping (7 days)	1.8	1.3	1.1	1.1
NASPOT 9 O	Detopping (14 days)	1.9	1.4	1.0	1.5
NASPOT 10 O	Detopping (14 days)	1.8	1.3	1.0	1.3
Local check	Detopping (14 days)	1.9	1.5	1.1	1.1
$LSD_{0.05}$		0.4	0.5	0.3	0.5
CV		25.8	41.5	27.8	47.9
	Open Vs Humidity Chamber and sawdust				
NASPOT 9 O	Open	1.7	2.8	1.5	1.4
NASPOT 10 O	Open	1.7	3.9	1.8	2.7
Local check	Open	1.6	2.7	1.4	1.3
NASPOT 9 O	Humidity chamber	1.9	1.8	1.2	1.2
NASPOT 10 O	Humidity chamber	1.8	2.7	1.0	1.3
Local check	Humidity chamber	1.8	2.7	1.5	1.4
NASPOT 9 O	Straw dust	1.7	1.7	1.0	1.2
NASPOT 10 O	Straw dust	1.8	2.4	1.2	1.3
Local check	Straw dust	2.1	2.0	1.1	1.1
$LSD_{0.05}$		0.3	0.8	0.4	0.5
CV		24.5	50.3	48.3	61.1

Codes: 1= absence of defect, 5= severe

3.3 Vine multiplication activities at BioCrops

The work started effectively with the acquisition of a limited number of virus indexed OSP mini-cuttings on 28/3/2012 and 23/5/12 from KEPHIS, Kenya and multiplying them in available insect proof screen house that was available by then (photos 1-5)). Later space became limiting and with the delays in completing the new screen house, multiplication stalled. Subsequent identification of *Sweet potato chlorotic stunt virus* (SPCSV) symptoms halted BioCrop's plans of initiating the material in vitro. When leaf samples were collected and sent to KEPHIS for indexing variety Kakamega was found to be infected with SPCSV, therefore, further multiplication of this variety was stopped. Kakamega was found to have the fastest multiplication rate (three times that of Kabode and Vita) with long intenodes. Ejumula

elongated twice faster that than Kabode and Vita. However, having found Kakamega to be viral infected, vines from it were condemned. The number of shoots that had so far been generated and the vines that could be derived are indicated in Table 4. Kakamega was released to CIP for planting because by then the virus indexing results had not been received from KEPHIS. BioCrops released some vines to CIP for the establishment of on farm experiments to demonstrate the yield advantage of disease free material. This early release was to catch up with the general planting season where the indexed clean vines could be planted alongside the farmer's material for yield comparison. The number of shoots available and the number of vines so far delivered is shown in Table 5.

Table 6. Multiplication and delivery of the four sweet potato varieties

Variety	Weaned shoots introduced from MAK	Mini cuttings received from KEPHIS	Total shoots potted	Cuttings released to CIP	Cuttings to be destroyed	Vines ready for delivery
Kakamega	0	77	3,790	270	10,300	Nil
Ejumula	620	44	2,745	400	0	7,560
Vita	550	50	4,365	270	0	6,450
Kabode	780	24	2,410	450	0	4,490
Total	**1,550**		**17,100**	**1,390**	**10,300**	**18,500**

3.4 Vine multiplication activities at Makerere University

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, Kabode (NASPOT 10 O coded as before release SPK004/6/6) and Vita (NAPOT 9 O coded as SPK004/6 before official release) were received. However, the *in vitro* plantlets contained a high proportion damaged plantlets that could have resulted from poor handling during transit. Due to the set back above, a request was made for similar sweetpotato varieties from CIP- Nairobi. These were received on 28th/05/2012. The varieties were Kabode, Vita, Kakamega (SPK004) and Ejumula (Table 7). Since the cultures were in tubes, detection of contaminated cultures was done with much ease. In this regard, healthy cultures were sub-cultured onto multiplication medium.

By end of November 2012, MAK had sweetpotato at various stages of multiplication (photos 7 – 10). Due to losses at hardening and weaning stage, MAK planned and produced over 6,000 in vitro plantlets for weaning the target number of 4,000 plantlets. MAK multiplied at least 1,000 in vitro plantlets of each of the four OSP varieties as required under this project (see Table 7). MAK had by December 2012 delivered 1,950 in vitro sweetpotato plantlets to BIOCROPS (U) Ltd.

Table 7. Sweetpotato varieties for which clean planting material has been produced at MAK in collaboration with BIOCROPS, as at November 30 2012.

Variety	Total culture bottles as at October 30, 2012	Number of plantlets: November 15, 2012	Tissue Culture Plantlets delivered to Bio Crops as at November 31, 2012.
Ejumula	198	1,800	620
Kabode (NASPOT 10 O)	232	2,080	780
Kakamega (SPK004)	112	1,499	On hold
Vita(NASPOT 9 O)	350	1,500	550
Total	**892**	**6,879**	**1,950**

N.B. Delivery of variety Kakamega (SPK004) has been put on hold following the suspicion and later testing positive to SPCSV.

4.0 Summary of personnel commitments

Dr. Robert Mwanga and Mr. Gerald Kyalo serve as principal investigator and Field Crops Agronomist for the project, respectively. Our partners, NaCRRI, MAK, and BioCrops have carried on with their activities as stipulated in their contracts. At NaCRRI, one scientist (10% time), one technician (50%), and one driver (30%) have been involved in the project. At Makerere, Dr. Ssetumba Mukasa has two technicians who are committed to the project.

5.0 Major equipment acquired

The project procured two items, a Dell Laptop computer (Dell Latitude E5420) for Mr. Kyalo, and two digital Hygo- thermometers for measuring relative humidity and temperature during curing experiments.

6.0 Description of significant travel

During the reporting period, CIP staff undertook many travels to accomplish project objectives (Table 8).

Photos

1

2

3

4

5

6

7

8

9

10

1: The new 200 sq m (Floor capacity) screen house.

2: Multiplication work in the 200 sq m screen house

3: Growth of Kakamega (Left) compared to Kabode (Right)

4: Growth of Ejumula (Left) compared to Vita (Right)

5: Multiplication work in the small screen house (Note variety Kakamega in front left and mid right), 6: BioCrops tissue culture laboratory at Kabaga

7: In vitro rapid multiplication of sweetpotato in one of the culture rooms in the Makerere Plant Tissue Culture Laboratory.

8: In vitro sweetpotato hardening and shoot multiplication and root induction in re-cycled baby food jars.

9: Weaning and hardening was carried out in bottles to raise mini vines for micro-cuttings and establishment in the screenhouse.

10: Nusery Multiplication of the four orange sweetpotato varieties: 1 = Kakamega, 2 = Vita, 3 = Kabode, 4 = Ejumula (extreme right); arranged in decreasing order of the rate of multiplication in the screenhouse at Kabanyolo.

Table 8. Summary of significant Travel

Date	Name	Institution	Locations	Travel Objective	Output
15.02–1.03 2012	Gerald Kyalo Charles Musoke	CIP HarvestPlus	Gulu, Lira, Kole, Oyam, Masaka, Isingiro, Buyende, Soroti	Monitoring and assessment of vine multiplication	Status and presence of vines assessed. Suitable suppliers for first season planting identified
6–28.03 2012	Gerald Kyalo Jowelia Namakula	CIP NaCRRI	Buyende, Rakai, Isingiro, Kabale, Oyam	Selecting farmers to host trials	Ten farmers identified per district
2–19. 04.2012	Gerald Kyalo Charles Musoke Lillian Adeke	CIP HarvestPlus	Lira, Kabale, Kibale, Kamwenge	Training extension personnel on agronomy of OSP	Extension personnel trained on agronomy of OSP, arrangements for distributing planting material made
23.04–16.	Gerald Kyalo	CIP	Buyende, Rakai,	Planting trials	Fifty (10 per district)

Date	Name	Institution	Locations	Travel Objective	Output
05 2012	Jowelia Namakula	NaCRRI	Isingiro, Kabale, Oyam		trials planted
09.06. 12	Gerald Kyalo HarvestPlus Team Wolfgang H. Pfeiffer	CIP HarvestPlus	Buyende	Field visit	Trial sites, commercial sweetpotato farmers visited
11.06. 12	Robert Mwanga Wolfgang H. Pfeiffer HarvestPlus team	CIP HarvestPlus	BioCrops, Makerere University		Project progress discussed, status of sweetpotato clones under multiplication discussed
26.07-28.07 2012	Gerald Kyalo Charles Musoke	CIP Harvest Plus	Kabale	Training Field Extension Workers (FEWs) on pests and diseases of sweetpotato	Four FEWs successfully trained
9-25.07 2012	Gerald Kyalo Jowelia Namakula	CIP NaCRRI	Buyende, Rakai, Isingiro, Kabale, Oyam	Assesemnt of SPVD, Alternaria blight, vigour and monitoring OSP trials	Diseases and vigor assessed, status of OSP trials established
20-30. 06.2012	Gerald Kyalo Sam Namanda	CIP	Rakai, Oyam, Gulu	Selecting farmers to host curing, storage and triple S experiments	Four farmers identified per district
6-11. 08 2012	Gerald Kyalo Jowelia Namakula	CIP NaCRRI	Oyam, Gulu	Planting trials	10 on-farm trials planted, more 8 fields planted with Kakamega and Kabode for storage trials
15-16.08. 2012	Gerald Kyalo Sam Namanda	CIP	Masaka, Kamuli, Mukono	Selecting farmers with OSP gardens to impose curing experiments	3 farmers selected, 2 in Masaka, 1 in Mukono
14.08. 2012	Robert Mwanga Sam Namanda Gerald Kyalo	CIP	Makerere University	To discuss progress and way forward with BioCrops and Makerere University	Plans were made for: a) planting demo plots for clean vs farmer vine cuttings b) monitored health status of plants at BioCrops
3-11.09.2012	Gerald Kyalo Shiphar	CIP	Buyende	Planting 2nd season OSP	10 on-farm trials planted, 9 on-farm trials

Date	Name	Institution	Locations	Travel Objective	Output
	Mulumba Joweria Namakula	NaCRRI		trials and harvesting 1st season OSP trials	harvested, 2 palatability tests done
17-22.09.2012	Gerald Kyalo Shiphar Mulumba Joweria Namakula	CIP NaCRRI	Oyam	Harvesting 1st season OSP trials	10 on-farm trials harvested, 2 palatability tests done
25-29.09.2012	Gerald Kyalo HarvestPlus team	CIP HarvestPlus	Soroti	Review meeting for vine multipliers	Review meeting for vine multipliers successfully done
1-6.10.2012	Gerald Kyalo Joweria Namakula	CIP NaCRRI	Isingiro, Kabale	Planting 2nd season OSP trials	20 on-farm trials planted
8-20.10.2012	Gerald Kyalo Joweria Namakula	CIP NaCRRI	Rakai, Masaka	Planting 2nd season OSP trials, harvesting 2nd season OSP trial, setting up curing experiment	10 on-farm trials planted, 8 on-farm trials harvested, curing experiment set up with 2 farmers; one in Masaka and one in Rakai
8-10.11.2012	Gerald Kyalo	CIP	Rakai, Masaka	Monitoring post-harvest experiments	Monitoring done, data collected
19-25.11.2012	Gerald Kyalo Joweria Namakula	CIP NaCRRI	Isingiro, Kabale	Harvesting 1st season OSP trials	18 on-farm trials harvested
04/12/2012	Robert Mwanga, Gerald Kyalo	CIP	BioCrops	Discuss status of vine multiplication by BioCrops and MAK and plan for the next course of action	Status of vine multiplication discussed; BioCrops was advised on status of OSP material at MAK.
10-12/12/2012	Gerald Kyalo, Charles Musoke	CIP HarvestPlus	Tissue culture Lab (MAK), BioCrops	Introducing vine multipliers to aspects of tissue culture	Vine multipliers in project areas successfully introduced to basics of cleaning sweetpotato planting materials.

7.0 Delays, problems, suggestions

The planned project activities have been on course during the reporting period. However, the first rains were late, thereby delaying the planting of on-farm trials in the respective districts.

Planting on-farm trials for second season was also delayed in Isingiro, Kabale and Rakai. The persistent drought in Rakai and Kabale affected the on-farm trials resulting in poor yields in those districts. Funds to our partners were disbursed late so activities started later than planned.

Table 9. Summary of milestone/activities and progress

Activity/Milestone	Targeted Outputs	Target Date	Baseline	Status	Comments
CIP: Task 1 Ensure disease-free supply of primary foundation seed					
Obtain disease-free plantlets from KEPHIS in Kenya for MAK to multiply 4,000 plantlets	4 OSP clean tissue culture starter stock available at MAK	Dec. 2012	Required pathogen-tested in-vitro OSP varieties not available at MAK	Completed	Varieties varied significantly in the multiplication rate with the lowest observed with Kakamega. Each bottle contains 3-4 plantlets giving about 3,000 in vitro plantlets. By November, MAK had multiplied 5,000 in vitro plantlets.
Assess the cost of the tissue culture multiplication in Uganda	Information on cost of production of sweetpotato tissue culture clones	Dec. 2012	Information on sweetpotato tissue culture production is not available in Uganda	Information collection is in progress	For later reporting
Have advanced yield trial OSP clones "cleaned-up" at KEPHIS where thermotherapy chambers are available	Clean OSP available for seed system	Dec. 2014	Promising OSP clones not clean	On schedule	Three new OSP clones have been sent to Muguga for cleaning: NASPOT 7/2006/1185, SPK 004 2006/1136, and NASPOT 7/2006/292
Task 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 Triple S 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	Dec. 2012	Triple S technology not yet tested in HarvestPlus project areas	postponed to 2013	Dry areas selected include Oyam, Gulu, Lira, Kole (Northen Uganda) and Rakai (South western Uganda). First meeting with farmers held last week of June. Trials will be setup with 3 farmer groups selected in the 4 districts in January 2013 when the weather is favorable
Train extension personnel to effectively implement Triple S technology	At least one lead farmer from each county hosting OSP trials trained in OSP	Dec. 2012	Number of extension personnel trained in OSP production	Postponed to January 2013	Farmers to host Triple S trials were selected in last week of June 2012

Activity/Milestone	Targeted Outputs	Target Date	Baseline	Status	Comments
	production				
Monitor adoption of Triple S 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	Dec. 2014	OSP is not grown in the project areas	Planned for later years	Adoption will be monitored in year 2014
Evaluate characteristics of adopters and non-adopters of Triple S technology	Percent adoption and characteristics of adopters	Dec. 2015	Technology absent in project area	Planned for later years	
Task 3 Accelerate evaluation on-farm of promising OSP clones					
Conduct on-farm trials for OSP clones with extensive farmer participation in key target areas	New OSP clones evaluated with farmers and at least two clones selected for further evaluation	Dec. 2012	New OSP clones from NaCRRI have not been tested in HarvestPlus project areas	1st season planted, monitored and harvested. 2nd season planted	Trials have been planted in Kabale, Isingiro, Rakai, Buyende, and Oyam from 23 April to 16 May (1st season) and August to September 2012(2nd season). 100 trials planted (20 per district) with OSP clones NASPOT 10 O, NASPOT 7/2006/ 1185, SPK 004 2006/1136, and NASPOT 7/2006/292. 1st season trials have been harvested. SPK 004 2006/1136, and NASPOT 7/2006/292 are the most promising.
Task 4 Improve curing techniques and investigate other ways to improve postharvest quality and extend postharvest shelf life of traded OSP					
Design and conduct trials and curing demonstrations	Conditions for curing established	Dec. 2012	There is no curing of OSP in Uganda	completed	Curing experiments were set up on the 19-20/ 10/2012 (Masaka and Rakai) and 31/10/ 2012 (Mukono) with 3 farmers; 1 farmer in each of the districts of Mukono, Rakai and Masaka.
Evaluation of improved curing methods vs. current practice	Improved curing and storage techniques tested	Dec. 2012	No curing method for sweetpotato used by	completed	Roots were cured using 4 treatments; in-ground curing

Activity/Milestone	Targeted Outputs	Target Date	Baseline	Status	Comments
	with farmers		farmers in Uganda		for 7& 14 days, curing in saw dust, polythene and farmers' practice. In-ground curing for 7 days and curing in saw dust showed good prospects. Other forms of curing caused the roots to sprout so they will be left from the investigations.
Work with implementation team to improve training on handling of roots during harvest and postharvest	Training on handling and postharvest of at least one key contact person from each target district conducted	Dec. 2012	Training on handling of roots during harvest and postharvest not done in project areas	Planned for later years	CIP is working with HarvestPlus team to improve postharvest handling
Task 5 Backstop implementation team and broader dissemination objectives					
Respond to emergent problems about sweetpotato multiplication and production as requested by the implementation team	Backstop sweetpotato research and development work by partners	Continuous	CIP not involved in farmer partner activities in project area	Continuous	CIP has backstopped all the partners since start of project
Ensure that experience is documented and any relevant materials and finding are loaded on the Sweetpotato Knowledge Portal (SPKP)	Relevant documents from the project uploaded on SPKP	Continuous	No documents on the biofortification project on SPKP	Continuous	Compilation of reports for uploading on SPKP is in progress.
NaCRRI					
Conduct on-farm trials for OSP with extensive farmer participation in key target areas	New OSP clones evaluated with farmers and at least two clones passed on to the farmers	Dec. 2012	New OSP clones from NaCRRI have not been tested on-farm.	On schedule	1st and 2nd season OSP trials were planted in Kabale, Isingiro, Rakai, Buyende, and Oyam from 23 April to 16 May. 100 trials planted (20 per district) with OSP clones NASPOT 10 O, NASPOT 7/2006/1185, SPK 004 2006/1136, NASPOT 7/2006/292. 1st season trials

Activity/Milestone	Targeted Outputs	Target Date	Baseline	Status	Comments
					were harvested; SPK 004 2006/1136 had the highest yield (16.2 tons/ha) followed by NASPOT 7/2006/292 (10.8 tons/ ha). NASPOT 7/2006/1185 had the lowest yield (5.9 tons/ha)
Evaluating OSP clones on station	OSP clones from breeding tested on station	Dec. 2012	Breeding program at NaCRRI has new OSP clones not yet tested on station	On schedule	On station trials of OSP clones were harvested from four locations, Namulonge, Ngetta, Kabale and Serere (results shown in Table 2)
Multiplication and maintenance of planting materials for trials	At least 2 OSP clones multiplied on station	Dec. 2012	There is shortage of planting materials for on-farm trials	On schedule	Four clones (NASPOT 10 O (Kabode), NASPOT 7/2006/1185, SPK 004 2006/1136 and NASPOT 7/2006/292) were planted for seed conservation and multiplication in plots 15 X 5 m
Respond to emergent problems about sweetpotato multiplication and production as requested by the implementation team	Backstop sweetpotato research work by partners	Conti n-uous	NaCRRI not involved in OSP research and development work in project areas	Continuous	NaCRRI has started on-farm trials and associated activities in project areas
Ensure that experience is documented and any relevant materials and finding are loaded on the SPKP	Relevant documents from the project loaded on SPKP	Conti n-uous	No documents on the biofortification project on SPKP	Continuous	Compilation of progress made by partners has started
			MAK & BioCrops		
MAK. Obtain disease-free OSP plantlets of 4 varieties from KEPHIS in Kenya and multiply 4,000 plantlets at MAK	40,000 cuttings of primary material produced	Dec. 2012	Required pathogen-tested in-vitro OSP varieties not available at MAK	Completed	Varieties varied significantly in the multiplication rate with the lowest observed with Kakamega. Each bottle contains 3-4 plantlets giving about 3,000

Activity/Milestone	Targeted Outputs	Target Date	Baseline	Status	Comments
					in vitro plantlets.
BioCrops. Improve infrastructure (construct a screen house), provide training, and ensure that the private sector partner can produce quality primary material utilizing plantlets from MAK	Capacity of BioCrops to multiply clean foundation planting material established, two vine multipliers identified per district and trained on vine multiplication techniques	Dec. 2012	No experience of multiplying pathogen-tested OSP vines	On schedule	A 75-m^2 floor space insect-proof screen house is now fully operational. Construction of a new 200-m^2 screen house was completed on 31/8/2012. Current screen house capacity is 17,000 potted cuttings. MAK trained two BioCrops technicians (Geoffrey Atibuni and Farida Mugisha) in tissue culture of sweetpotato
Milestone 1: Obtain disease-free plants or vine cuttings from CIP-Nairobi or MAK	10, 000 vine cuttings of each of 4 OSP varieties (from clean vines) available by December 2012	Dec. 2012	Pathogen-tested source of OSP varieties not available at BioCrops	4 OSP pathogen-tested clean stock received	Clean OSP varieties received as mini-cuttings. Mini cuttings received from KEPHIS during the project: 1. Ejumula, 44 2. Kakamega, 77 3. Vita, 50 4. Kabode, 24
Receive initial 4 OSP varieties		March–May		completed	Weaned plants received from MAK: 1. Ejumula, 620 2. Kakamega, 0 3. VitaA, 550 4. Kabode, 780. Kakamega was not supplied due to viral infection.
Milestone 2: Train and ensure that BioCrops can produce quality primary utilizing plants from CIP-Nairobi or MAK					
Multiplying initial varieties of OSP vines (1st cutting) in seed	Differences between OSP varieties in multiplication	June –July	No previous work on multiplication of OSP	Accomplished	Current number of potted cuttings in the screen house:

Activity/Milestone	Targeted Outputs	Target Date	Baseline	Status	Comments
boxes	established		in screen at BioCrops		1. Ejumula, 2,745 2. Kakamega, 3,790 3. Vita, 4,365 Kabode, 2,410. Number of vines ready for delivered in December 2012: 1. EJumula, 7,560 2. Kakamenga, 10,300 3. Vita, 6,450 4. Kabode, 4,450. Delivery of 18,500 vines of Ejumula, Vita and Kabode has been proposed. Kakamega will not be delivered although this will be considered in the final numbers to be delivered.
Establishing sweet potato in vitro cultures	Have at least 100 in vitro cultures of each of the 4 OSP varieties to established by June 2012	June 2012	Pathogen-tested source of OSP varieties not available at BioCrops	Completed	1. BioCrops moved to a spacious lab at Kabaga on 9th October 2012 (Photo 6). 2. 500 culture vessels with their covers were purchased for sweet potato TC. Some consumable were purchased and the technicians had a hands-on work in their own lab. TC material will be received from MAK when wiring the growth room is completed.

Appendix 1: Farmer/ farmer groups participating in OSP trials

No.	Name	Status	Composition	District	Sub-county	Parish	Collaborating Partner
1.	St. Everest	Farmer group (FG)	13 (5 females, 8 males)	Isingiro	Mwizi	Ngoma Mwizi	Millennium Villages project
2.	Kigalama widows	FG	120 (119 females, 1 male)		Kabuyanda	Iryango	
3.	Kabugutukore	FG	11 (6 females, 5 males)		Kabuyanda	Kabugu	
4.	Abamule Fish group	FG	25 (15 females, 10 males)		Kikagati	Ntundu	
5.	Nyampikye Primary school	FG			Kabuyanda	Kabuyanda	
6.	Kabatagare	FG	48 (44 females, 4 males)		Nyakitunda	Nyakarambi	
7.	Bugongi women	FG	16 (all female)		Nyakitunda	Bugongi	
8.	Kanywammaizi Environment	FG	8 (5 females, 3 males)		Kabuyanda	Kanywamaizi	
9.	Karutonga Savings	FG	12 (2 females, 10 males)		Nyamuyanja	Nyamuyanja	
10.	Kabirizi Tweyambe group	FG	Gb 16 (11 females, 5 males)		Kaberebere	Kaberebere	
11.	Muyanbi William	Individual		Kabale	Kamuganguzi	Katenga	Africa 2000 Network
12.	Beatrice Ngabirano	Individual			Bubare	Nyemiyaga	
13.	Byarugaba Charles	Individual			Kamuganguzi	Katenga	
14.	Rukanshungirwa Fred	Individual			Kamuganguzi	Katenga	
15.	Tumwekwase Elizabeth	Individual			Hamulwa	Shebeya	

No.	Name	Status	Composition	District	Sub-county	Parish	Collaborating Partner
16.	Twinomugisha Dinar	Individual			Hamulwa	Shebeya	
17.	Karugaba Fidelis	Individual			Hamulwa	Karukala	
18.	Kuhasire Annet	Individual			Hamulwa	Mpungu	
19.	Rubereti Edith	Individual			Bubaale	Bubaale	
20.	Karimunda Paul	Individual			Hamulwa	Hataba	
21.	Tagabira atyaime	FG	23 (21 females, 1 male)	Buyende	Bugaya	Namusikizi	VEDCO
22.	Tagabira atyaime	FG	23 (21 females, 1 male)		Bugaya	Namusikizi	
23.	Basoka kwavula	FG	25 (22 females, 3 males)		Buyende	Ikanda	
24.	Kyebajja tobona	FG	30 women		Bugaya	Butaswa	
25.	Byakatonda	FG	25 (21 females, 4 males)		Buyende	Ikanda	
26.	Kyowelela Harriet	Individual			Buyende	Ikanda	
27.	Ajja tobona	FG	25 (21 females, 4 males)		Bugaya	Butaswa	
28.	Namusobya Fazillar	Individual			Bugaya	Namusikizi	
29.	Kantono Irene	Individual			Bugaya	Namusikizi	
30.	Basoka kwavula	FG	25 (22 females, 3 males)		Buyende	Ikanda	
31.	Mary Opio	Individual		Oyam	Aboke	Opeta	World Vision
32.	Opio Francis	Individual			Aboke	Opeta	
33.	Anna Ojok	Individual			Aboke	Apach	
34.	Aripa Jacob	Individual			Aboke	Apach	
35.	Rose Akoi	Individual			Aboke	Apach	
36.	Obong Milton	Individual			Aboke	Apach	
37.	Awino Sophia	Individual			Aboke	OPeta	
38.	Ajuka Patrick	Individual			Aboke	Opeta	
39.	Oyeli Peter	Individual			Aboke	Opeta	
40.	Okidi Charles	Individual			Aboke	Apul	

No.	Name	Status	Composition	District	Sub-county	Parish	Collaborating Partner
41.	Mutesasira Daniel	Individual		Rakai	Kabonera	Kakunyu	CEDO
42.	Twosi women	FG			Nabigasa		
43.	Baale Aids	FG			Wankone	Baale	
44.	Basoka Kwavula women	FG			Kalisizo Rural		
45.	Basoka kwavula	FG			Lwankoni	Kibutamu	
46.	Duka Obwavu	FG			Lwankoni	Lwankoni B	
47.	Kewelimidde	FG					
48.	Tebandeke John	Individual			Kirumba	Buyisa	
49.	Bena Sentamu	Individual			Kabonera	Kitanga	

Note: 1. Test clones include NASPOT 10 O (Kabode), NASPOT7/2006/1185, SPK004/2006/1136, and NASPOT7/2006/292

VEDCO- Volunteer Efforts for Development Concerns

CEDO- Community Enterprise Development Organization