Better sweet potatoes boost farmers from subsistence to the market economy

RIU

Validated RNRRS Output.

Sweet potato growers in Uganda have gone from not having enough produce to eat, to wondering how best to market all the sweet potatoes they harvest. Previously, vines for planting sweet potato crops were in extremely short supply. Plus, sweet potato virus severely damaged tubers. Now, farmer groups produce and market plenty of quality planting material—varieties resistant to virus disease. The new sweet potatoes, high in beta-carotene, also help reduce serious vitamin A deficiencies which affect 30% of children and 50% of women. Quality sweet potatoes for export fetch high prices. A new growers association is already working to export the new varieties. The potential is huge and the improved varieties have spread to D.R. Congo, Kenya, Tanzania, Sudan and even Chad.

Project Ref: **CPP53:**
Topic: **1. Improving Farmers Livelihoods: Better Crops, Systems & Pest Management**
Lead Organisation: **BUCADEF, Uganda**
Source: **Crop Protection Programme**

Document Contents:

Description

CPP53

Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Chad, Congo DR, Kenya, Sudan, Tanzania, Uganda,

Target Audiences for this content:

Crop farmers,

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Rapid multiplication and distribution of improved sweetpotato Varieties

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

- The Crop Protection Programme (CPP) was the major source of funds.
- The Regional Network for the Improvement of Potato and Sweetpotato in Eastern and Central Africa (PRAPACE) contributed funds.
- The National Agricultural Research Organization (NARO) of Uganda gave in-kind support

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

- **PROJECT No. R8040/ZA0483: RAPID MULTIPLICATION AND DISSEMINATION OF SWEETPOTATO VARIETIES WITH HIGH YIELD AND ß-CAORTENE CONTENT (DFID CPP-FUNDED):**

The above-named project was implemented by the Buganda Cultural and Development Foundation (BUCADEF) under the management of the regional network-PRAPACE. BUCADEF is an NGO that belongs to the Buganda Kingdom in central Uganda, inhabited by over six million people. Recommendations given the blessing of this cultural institution are usually readily adopted as the Baganda people cherish their culture and institutions. The following were the contact people in each of the institutions

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*4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? **(max. 400 words)**. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.*

The project was implemented between June 2001 and May 2003 with the purpose of developing a cost-effective and sustainable system for **continuous multiplication** and **timely distribution** of **quality sweetpotato planting material** (**vines**) in eight districts of **central Uganda,** targeting thousands of households. It aimed to alleviate food insecurity, poverty and malnutrition among small-scale farmers, which could be realized through increased production of sweetpotato varieties tolerant to Sweetpotato virus disease, high yielding and rich in **ß-carotene**, a precursor to **vitamin A.** Such varieties are referred to as **orange-fleshed sweetpotato (OFSP)**. Production and consumption of OFSP varieties in sufficient quantities significantly contributes to alleviating **vitamin A deficiency (VAD)** in target areas, where VAD incidence levels are 30% among children and 50% among women. In the absence of formal seed systems in Uganda for producing and distributing quality vines, large scale production is only possible through informal systems, which was the principal approach in this project. The following are among the major outputs

- Commercially-oriented **informal farmer-based systems** were established and are operating in all eight target districts. Forty-eight percent of farmers commended the system for reducing chronic shortage of vines while 62% reported that it relieved them from travelling long distances to collect vines.
- Vines that could plant over 2,000 hectares were produced and distributed to over 35,000 farmers.
- It is estimated that over 34,000 tons of improved sweetpotato worth over UK £1,200,000 was produced in the project area during the project's lifetime.
- Selling fresh improved sweetpotato at local markets fetched over UK£ 200/hectare every after 5 months, while producing local types led to loss. Nine varieties were promoted for export, a market that fetches 2 to 8 times higher than selling locally.
- Selling vines of improved varieties fetched up to16 times more returns than selling fresh roots locally.
- Over 6,000 farmers and school children were trained on production, nutrition and utilization aspects.
- Promotion of production and consumption of OFSP registered positive development in alleviating Vitamin A deficiency. The OFSP variety SPK004 promoted in the project got adopted across all targeted districts, as a potential source of vitamin A.
- A medium-scale private firm, **MAGANJO MILLERS LTD**, used OFSP and OFSP-based recipes to produce and market a porridge it branded "**Nutri-porridge"**

Consequently, the major on-farm constraint shifted from lack food security to lack of access to markets and high post-harvest losses in the range of 25-30%.

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	Technology	Service	Process or Methodology	Policy	Other Please specify
X	X	X	X		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

Sweetpotato is the focal crop. However, the generated outputs could well be relevant to other major Eastern and Central African staples notably potato, bananas and cassava that are also vegetatively propagated.

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options. Leave blank if not applicable

Semi-Arid	High potential	Hillsides	Forest-Agriculture	Peri-urban	Land water	Tropical moist forest	Cross-cutting
X	X	X		X			

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

Smallholder rainfed humid	Irrigated	Wetland rice based	Smallholder rainfed highland	Smallholder rainfed dry/cold	Dualistic	Coastal artisanal fishing
X			X	X		

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Project **R8040** was successful in alleviating food insecurity to the extent that the major on-farm constraints shifted to problems like poor market access, high post-harvest losses, lack of market information and shortage of capital, all of which could broadly be categorized as marketing, institutional, policy and productiona. Worse still was the lack of an apex organization to mobilize stakeholders for collective action against the named bottlenecks. However three years after the end of the project, A Uganda Sweetpotato Development Association (USPDA) is now in place to serve as the apex body. This or any other body could do the following to add value to the outputs of Project **R8040**.
Marketing: The apex body's efforts should be geared towards developing and making use of market opportunities that are capable of absorbing large amounts of sweetptato. Here the outputs of projects **R8182** and **R8418** on participatory Market Chain Approach (PMCA) are particularly relevant.

Policy: The apex body should strengthen its capacity as a forum, where stakeholders in the sub-sector come together for joint advocacy and lobbying for appropriate policies. Outputs from **R8366, R7502, R6306, R8113, R8114** together with PRAPACE's outputs that identify priority areas for policy action with regard to the seed

system are relevant.

Increasing production: Partnering with the private sector that is willing to commercially produce quality vines should be stressed. Also important is liaising with relevant credit institutions for provision of such services to stakeholders. Outputs from projects **R8182, R8243, R8302 and R8303** could be of great use.

Technology/information dissemination: The apex body's capacity as a centre where stakeholders regularly meet to share experiences and best practices should be strengthened. Outputs from **R8167, R8402 and RZB0380 are relevant**

Validation

B. Validation of the research output(s)

*10. **How** were the output(s) validated and **who** validated them?*

*Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation **(max. 500 words)**.*

Clean nuclear seed stocks were initially multiplied by NARO scientists at Namulonge Agricultural and Animal production Research Institute (NAARI) to constitute what is referred to as a Primary Multiplication Site (PMS). From the PMS planting material directly went to BUCADEF to establish Secondary Multiplication Sites (SMS) at the organization's official sites or at Local Group Leader's (LGL) sites or both. Moreover, the primary sites were also used to supply vines the tertiary and individual levels (see fig. 1).

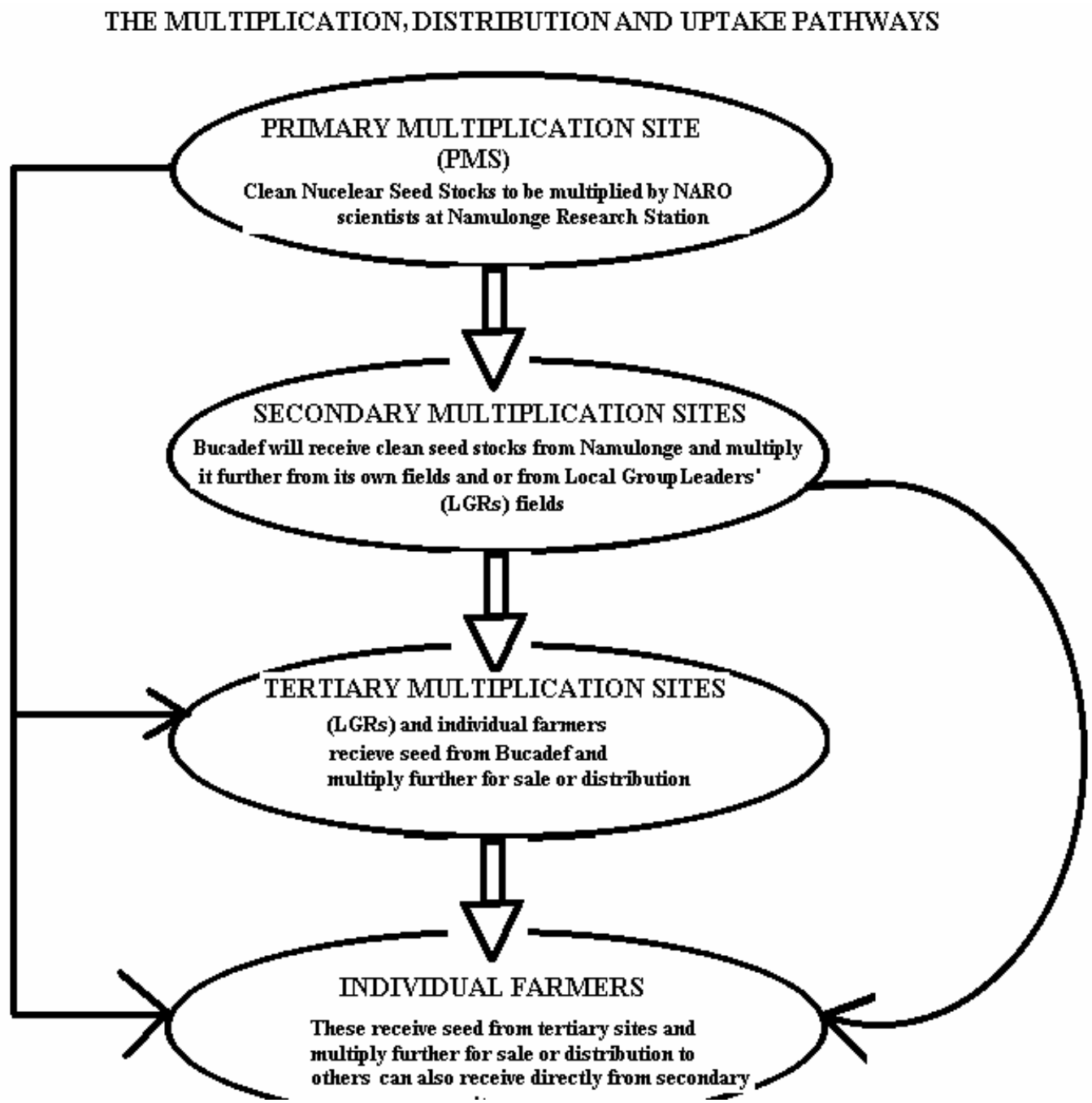
From secondary multiplication sites, planting material was distributed and or sold to farmers multiplying at the tertiary level who in turn supplied individual farmers. The later could also, be supplied by multipliers at the secondary level.

Farmers were taught the use of rapid multiplication techniques in addition to being encouraged at all multiplication stages. All multiplication sites had to be located near water sources or on marshy land during the dry seasons.

Pathways for promoting the adoption, production, consumption and sustenance of vitamin A rich sweetpotato varieties to alleviate vitamin A deficiency

Having multiplied the vitamin A rich varieties (which at project onset were only three), farmer groups were

selected to grow the new varieties plus one local variety for comparison. Prior to planting, they were first sensitized on the importance of vitamin A, particularly for child health and the role of the new varieties in alleviating vitamin A deficiency. At harvest (5 to 6 months later) the varieties were jointly evaluated with farmers, researchers and extensionists for agronomic and organoleptic qualities.



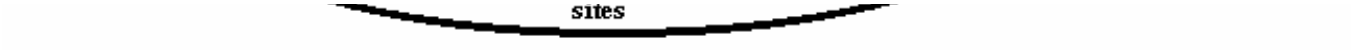


Figure 1.**Pathways used for evolving a sustainable, cost effective and efficient system for multiplication and timely distribution of planting material of improved sweetpotato varieties**

Pathways for educating communities (rural women groups) about the role of vitamin A in the diet of both children and adults and building capacity among farmers to combat vitamin A deficiency through use of sweetpotato

Nutritionists, health workers and researchers trained Trainers of Trainers (TOTs) that is, BUCADEF's field staff who in turn had to pass on the knowledge to farmers. The training focused on nutrition, VAD related aspects, sweetpotato production, marketing and utilization.

Also planned were surveys and group discussions with key informants (local community leaders and community health workers) in the target districts. These aimed at clearly documenting the vitamin A deficiency status in the target districts and establishing the degree of familiarity of the problem among the local people, health and extension personnel. Quantitative assessment surveys were based on the modified Food Frequency methodology (HKI, 1994). Households were randomly selected in the survey area and children below 6 years of age listed. A child within this age bracket was then randomly selected for interviews.

*11. **Where and when** have the output(s) been validated?*

*Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which production system and farming system, using the options provided in questions 7 and 8 respectively, above **(max 300 words)**.*

The project outputs were validated during June 2001 and May 2003 in eight central Uganda districts of Mubende, Luwero, Wakiso, Mpigi, Masaka, Mukono, Kiboga and Rakai that lie 1,000 – 1,300 m.a.s.l, under rain-fed farming systems [smallholder rain-fed, both humid and semi-arid systems] in agro-ecological environments in which forest or trees plus tall grass would be the natural climax vegetation [High potential + Forest agriculture]. Targeted groups comprised:

Current Situation

C. Current situation

*12. **How and by whom** are the outputs currently being used? Please give a brief description **(max. 250 words**).*

- Commercially-oriented **informal farmer-based systems (IFBSS)** were established and are operating in all

eight target districts, serving mainly smallholder farmers, CBOs and NGOs with quality planting material for over six improved sweetpotato varieties. IFBSS are supposed to work in a manner that empowers the farmer to avail quality vines all the year-round with little intervention from scientists and or extension officers.

- Not only are smallholder farmers maximally making use of IFSS and vines for maximum production, politicians too usually buy and distribute the quality seed while soliciting for political votes/support.
- BUCADEF's extension officers and those of other NGOs use IFSS to train local trainers to pass on production to consumption continuum-related knowledge.
- More that 10 rural schools adopted the practice of setting up multiplication sites at their premises with the view of sensitizing and training the future generation about Vitamin A Deficiency (VAD) and sweetpotato's role to alleviate the deficiency
- Women and children showed great interest in producing and eating particularly the orange-fleshed sweetpotato types that are vitamin A potent. These two categories are the main target for the food-based strategy to fight VAD.
- One medium-scale private firm, **MAGANJO MILLERS LTD**, used OFSP and OFSP-based recipes to produce and market porridge it branded "**Nutri-porridge".**
- The Buganda Kingdom-owned NGO (BUCADEF) has won respect and prestige from the success of IFSS scheme and hence exposed greater opportunities support from development partners.

*13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used **(max. 250 words).***

Collaboration with PRAPACE has enabled rapid dissemination of the project's researched results to many other end users not only in Uganda, but also in other PRAPACE member countries as follows;

1. Quality planting material from BUCADEF's IFSS has supplied all (over 50) districts of Uganda, including Karamoja in Uganda's the semi-arid zone in the North-East. Some International NGOs bought large amounts of planting material from the project area, taking to as far as D.R. Congo, Western Kenya, North-West Tanzania, Southern Sudan and even Eastern Chad
2. In 3 districts (Apac, Lira and Gulu) of the war-torn northern Uganda, BUCADEF collaborated with PRAPACE, CIP, NARO, the NGO World Vision to work with a local NGO, the *James Arwatta Foundation* (JAF) to mitigate war-related famine by sending there both planting material and fresh roots of vitamin-A potent varieties

*14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading **(max 250 words).***

- In Uganda, thousands copies of a manual on SP production and marketing were published in English and a local language (Luganda). These were distributed to interested end-users of the outputs in many sweetpotato growing areas of Uganda, North-western Tanzania and Western Kenya
- New Agriculturist, an on-line Magazine, Reporting Agriculture for the 21 century reported on two sweetpotato activities that PRAPACE conducted with BUCADEF. The topics were Eat up – it's good for you (www. wrenmedia.co.uk/post@wrenmedia.co.uk) and Chipping in on sweetpotatoes (www.new-agri.co.uk)
- Three major workshops and many demonstrations were carried out in Central Uganda with participants coming from various parts of Uganda
- The project's activities were presented at various workshops, meetings, and seminars in addition to being

reported upon in all PRAPACE's reports

- The outputs were also made available through a website (http://www. Sweetpotato coalition.org) that the project opened up and through PRAPACE's official website (http:// www.asareca.org).
- Used were mass media particularly national and regional radio stations together with those at international level (Two interviews with WREN media, which is usually broadcast on BBC) and newspapers

15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? ***(max 350 words).***

- Networking with the regional network PRAPACE facilitated mutual learning and dissemination of the project outputs and hence provided a unique opportunity for accelerated scaling up among its 10 member countries. PRAPACE's significance to the consortium is best underscored by the role it plays regionally to add value to what is being done nationally by the various institutions of the member countries.
- Government policy on agriculture emphasizing commercialization of this sector was very instrumental for at one time, funds were even secure from the National Agricultural Research Organization (NARO) to assist in promoting the project's outputs.
- Donor support in favour of technology transfer. There are apparent concerns that a lot of technologies have been developed but are shelved, thus leading to increased donor interest in dissemination and adoption studies to facilitate and enhance technology transfer, fortunately this agrees with our scaling-up and scaling-out vision.
- Use of an institution that is preferred and respected by the target people can be of strategic importance. In this case use of the Buganda (located in Central Uganda and with a population of over six million) monarchy's institutions as the principal mover of the technology transfer project was very effective in transferring research outputs. The successful and cherished centuries-old traditional/cultural practices and traits of traditional community mobilization and developmental guidance were much exploited in formulating the project's implementation. The '**Royal Reward System'** whereby excellent performers, in recognition of exemplary performance towards blending of culture with modern Science and technology (individuals or groups/ communities), are appropriately honoured, was also a major implementation strategy that bore fruit.
- Prioritizing broadening and strengthening partnerships (right from project planning, technology development through marketing and utilization) particularly with the private sector helped us create room to harness the nexus of opportunities and resources offered by the rich mix of partners. In the process because the partners share synergies, scarce resources are more effectively used to impact more people's lives.

Current Promotion

D. Current promotion/uptake pathways

16. ***Where*** *is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion* ***(max 200 words).***

- A number of training and dissemination materials keep on being developed. These continue to be distributed to stakeholders. For example the manual on SP production and marketing is updated yearly and thousands of copies disseminated to interested end-users mainly within and to neighbouring countries to some extent.
- Video documentaries on national and regional TV stations whenever financial support is secured
- Project outputs keep on being presented at various workshops, meetings and seminars that are usually organized mainly by PRAPACE

- The same outputs are available through the Uganda Sweetpotato Development Association's website (http:// www.USPDA.org) and through that of PRAPACE (http:// www.asareca.org).
- Collaboration with the ASARECA market information network (FOODNET) to disseminate price and product information to end users

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

To this regard identified were; Lack of collective action, poor linkages to market outlets, storage, processing techniques, market information, shortage of capital, lack of control of unlicensed traders, Lack of policies that are supportive of the informal seed sector and high transportation costs as the current major limitations to the sweetpotato sub-sector. The study also identified important factors that affected adoption of new technologies/ innovations.

Table 1
Factors that affected adoption of sweetpotato production technologies.

Factor	**Remarks**
1. Unavailability of credit	90% responded not having access to credit services to improve production.
2. Variations in consumer preferences	In the commercial districts (Mpigi and Wakiso), 63% preferred local varieties for home food, 85% of market respondents preferred the improved variety NASPOT 1.
3. Unavailability and high prices of planting material	High and unaffordable cost of planting material was also reported by the non-adopters. A bundle of 600 vines costs UK. 2£. making it unaffordable.
4. Poor transportation facilities from farm to market and vice versa.	Accessibility to farmers' villages like in Luwero, Kiboga, Rakai and Mubende for market also has a considerable influence on the adoption of improved sweetpotato and related technologies.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

- Promote value addition and post-harvest technologies especially those that reduce storage losses as priority areas for increasing market access for rural sweetpotato producers
- Formation of apex body at the national level to cater for the sector's interests including mobilizing stakeholder

for collective action and lobbying for policies that are supportive of the sweetpotato sector
- Establish an input supply network hinged on the private sector and the concept of producer organizations
- Promote Information flow and capacity building through training, exchange visits, etc

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

- Use of an institution that is loved and respected by the target people can be of strategic importance. Use of the Buganda (over six million) monarchy's institutions as the principal mover of the technology transfer project was very effective in transferring research outputs.
- Broadening and strengthening partnerships (right from project planning, technology development through marketing and utilization) particularly with the private sector should be priority for this creates room to harness the nexus of opportunities and resources offered by the rich mix of partners. Networking with the regional network PRAPACE facilitated mutual learning and dissemination of the project outputs, hence provided a unique opportunity for accelerated scaling up among its 10 member countries.
- Farmer-to-farmers technology transfer is a very effective means of technology dissemination.
- Increasing awareness to partnership and linkage with stakeholders including NPPs outputs as in a strategic position to join efforts and expertise to make better impacts in a short time with existing capacities of implementing agencies.
- Donor support in favour of technology transfer. There are apparent concerns that a lot of technologies have been developed but are shelved leading to increased donor interest.
- A growing urban market for French fries and crisps. There is a very good opportunity for the development of the potato sector.
- The promotion of orange-fleshed sweetpotato as a dietary source of ß-carotene, a precursor to vitamin A is a very important opportunity for the sub-sector.
- Micro-enterprises in urban and rural communities are coming up that will transform sweetpotato into value-added products for expanded markets, promoting partnership in sub-sector.
- Regionalization. The network looks forward to take advantage of regional integration arrangements such as the East African Community.
- Willingness of staff scientists of implementing institutions in member countries to participate in PRAPACE R & D activities.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

- To better plan for future technology deployment, two Participatory Rural Appraisals (PRA) and formal surveys

were carried out in the eight target districts of central Uganda (Luwero, Kiboga, Masaka, Mubende, Mukono, Mpigi, Rakai and Wakiso). The studies were to assess adoption of the intervening technologies and their impact on the livelihoods of rural smallholder sweetpotato producers and medium-scale food processors to an extent. The two PRAs/surveys were;

i. Ahabwe G., Kyewalabye M., Berga L., Nsumba J., 2003. **Adoption and impact study assessment of efforts by BUCADEF to disseminate improved sweetpotato varieties in central** Uganda. A report of a survey that was carried out at the end of PROJECT No. **R8040/ZA0483**: RAPID MULTIPLICATION AND DISSEMINATION OF SWEETPOTATO VARIETIES WITH HIGH YIELD AND ß-CAORTENE CONTENT in 2003 by BUCADEF's field staff under the supervision of one subject matter specialist.

Among the study's major findings are the following:

- About 90% of respondent farmers adopted two improved varieties NASPOT 1 (non orange-fleshed) and SPK004 (Orange-fleshed) mainly on the basis of their high productivity and culinary acceptability. It was also found that farmers are adopting improved varieties due to their considerable economic benefits for both local and export markets.
- About 76% of respondet farmers reported that lack of improved varieties was no longer the main constraint to sweetpotato production
- When asked to point out just one particular aspect that farmers liked most about the informal farmer-based seed system, 48% of respondents said that it had helped to reduce the chronic shortages of planting material. Sixty-two percent pointed out that the system had saved them the hustle of travelling long distances to research stations just to collect a few vines. Because seed and planting are tradition the women, these benefits go to them
- In 50% of the target districts of Luwero, Kiboga, Rakai and Mubende, sampled farmers experienced low rates of poverty reduction compared to farmers in Wakiso, Mpigi, Mukono and Masaka due to poor market access in the former districts, as they are off the road.

ii. Tindiwensi K.C., Berga L., Nsumba J., 2005: **Cost benefit analysis of sweetpotato on farm enterprises in central Uganda**: A report of a survey that was carried out in 2005 by a hired consultant at the end of PROJECT No. **R8273, ZB0342**: IMPROVING THE LIVELIHOODS OF SMALL-SCALE SWEET POTATO FARMERS IN CENTRAL UGANDA THROUGH A CROP POST HARVEST-BASED INNOVATION SYSTEM. This study was commissioned after realizing a number of gaps with regard to the economic viability of enterprises that had been promoted by previous interventions.

Among major findings:

o sweetpotato production is a financially viable enterprise with low start-up capital, above average profit margin, payback period of less than 1 year and with a positive Net Present Value(Annex 1). Because the enterprise remains viable whether land is hired or purchased, sweetpotato production has great potential to improve household incomes and can hence be instrumental in fighting poverty among the moderate and extreme vulnerable poor both in rural and urban areas.

o Improved varieties have increased on-farm yields by around three-fold and result in better production returns, consequently attracting over 90% adoption among farmers. The varieties can fetch over UK £200 per hectare compared to losing money when production is based on traditional varieties (Annex 2). Fresh sweetpotato can be marketed both locally and for export. The current operational export market can be about twice more rewarding than selling to local markets (annex 3).

- Production of local varieties especially Dhimbuka and Kyebandula is still widespread only for food security purposes, particularly in the districts of Luweero, Mubende and Kiboga. Ninety percent of interviewed farmers who still grow local varieties reported that they produce them because of their taste and good in-ground storability.

- **At national level in Uganda**, a three-phased sub-sector systems analysis of the sweetpotato sector was carried out drawing upon a range of both secondary and primary sources. The study; **Sweetpotato sub-sector market survey in Uganda (by** Kelly W., Luwandagga D., Berga L., Nsumba J., 2003) used Holmatz's approach and focused on both demand and supply covering the major production and marketing sites in the country. It sought to understand the structure and performance of sweetpotato markets in Uganda and also to identify constraints and opportunities for commercialisation of sweetpotato against a background of trade liberalization, poverty alleviation, food insecurity and trade competitiveness.

- Namutebi A., Berga L., Nsumba J., 2003: **Investigating the potential of sea freighting sweetpotato from East Africa**. A technical report handed to the sweetpotato coalition project.

- At regional level in together with PRAPACE and ECAPAPA (two networks of ASARECA), a review of sub-sector status, constraints, opportunities and investment priorities was carried out for potato and sweetpotato: Released in March 2005, this is an executive report of the potato and sweetpotato sub-sector study conducted in Ethiopia, Kenya, Rwanda and Uganda, major potato and sweetpotato producing countries in the ASARECA region. The analysis had as overall objective to identify obstacles, opportunities and the way forward for increased efficiency and competitiveness of the two sub-sectors. In conceptualizing and commissioning the study, ECAPAPA and PRAPACE worked closely together to identify a Resource Person who in turn was able to work with a team of experts drawn from within the PRAPACE network and the broader commodity sub-sectors. The study approach utilized the ECAPAPA Policy Change Cycle model. ECAPAPA is an ASARECA network focusing on policy matters.

- David Yanggen and Stella Nagujja-April 2005: ORANGE-FLESHED SWEETPOTATO IN UGANDA:A STUDY OF VARIETAL PREFERENCES, EXTENSION STRATEGIES AND POST-HARVEST UTILIZATION: **Both the Harvest Plus and VITAA initiatives are focusing on promoting orange fleshed sweetpotato (OFSP) rich in beta carotene (a precursor of vitamin A) as a means of fighting vitamin A deficiency (VAD) in Uganda**. The Harvest Plus Initiative undertook a number of studies to document the situation of sweetpotato in Uganda with a focus on OFSP. These studies examined producer and consumer preferences extension strategies and post harvest utilization.

Major findings

- First, sweetpotato is eaten by nearly all households in Uganda (over 90%). Second, Uganda has one of the highest rates of sweetpotato consumption in Africa. There is an average per capita consumption of 82.5 kg/ year
- According to the disability adjusted life years (DALY) analysis, the economic impact in terms of lost human productivity is in a range of 306 to 613 million dollars a year.
- Surveys were conducted and data collected from four regions of Uganda while considering intervention (communities in which some OFSP promotional activities had taken place) and non-intervention areas.

- Low J.,Walker T. and Hijmans R., 2001. **The potential impact of Orange-fleshed sweet potatoes on**

vitamin A intake in Sub-Saharan Africa. A paper presented at a regional workshop on food based approaches to human nutritional deficiencies. 9-11 May 2001, Nairobi, Kenya. The VITAA Project, vitamin A and Orange –fleshed sweet potatoes in sub-Saharan Africa. The paper was a presentation of findings that the team made from an ex ante impact assessment.

Among major findings:

o A 100g serving (about half a cup full) of boiled roots can supply about 50% of the daily vitamin A requirement for children under five years of age. Weight for weight current varieties of OFSP contain 20-30 times more ß-carotene than does Golden rice

BUCADEF CPP Final Report:

- In 50% of the target districts of Luwero, Kiboga, Rakai and Mubende, sampled farmers experienced low rates of poverty reduction compared to farmers in Wakiso, Mpigi, Mukono and Masaka due to poor market access in the former districts, as they are off the road.

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

- **Improved food security:** Sweetpotato is resilient, propagates, grows fast and easily, it produces stable yields reducing hunger when other crops fail or in specific seasons before the main harvest. For over 36,000 households that accessed over six improved varieties, the crop is increasingly becoming important in terms of food security especially in light of the fact that other major stables notably cassava and bananas have of late been devastated by disease and degenerating soil fertility. On-farm productivity has at least tripled attracting over 90% adoption in surveyed areas. Over 34,000 metric tons of improved sweetpotato worth over UK £1,200,000 was produced in the two years lifetime of project. For the last two years since closure of the project, production has been growing at a rate of 8% valued at UK £ 106,000 per year. Increased production for food security stands to benefit both men and women.

Improved incomes, lifestyle and a shift towards commercialization: Varieties provided both on-farm and off-farm employment and a flexible source of income to over 2,000 youths and women that predominantly target local retail markets that offered about UK£200 per hectare of fresh roots. By 2003, field surveys estimated the value of domestic trade in sweetpotato to be about UK£ 35 million of which over 75% is attributed to improved varieties. Survey estimates also showed that domestic trade in sweetpotato in the target districts grew by at least 4% between 2003 and 2005.

There is a gradually changing status of sweetpotato from subsistence to a commercial commodity through the sale of quality planting material (vines) in the region which makes it more profitable than the sale of fresh roots to either local or export markets. Thus improving women's incomes and livelihoods like; buying land, building permanent houses, increased ability to send children to school and meeting medical needs. This enhances the balance of benefits from increased commercialization between men and women. Earnings of over UK£ 6,000/hectare/year have been reported by three predominantly women-farmer groups.

Improved health: Based on Uganda's high (**82.5 kg/year**) per capita consumption for sweetpotato coupled with high adoption rates for Orange-fleshed Sweetpotato (OFSP) among the most vulnerable groups to Vitamin A Deficiency (VAD), OFSP has an enormous potential for inexpensive provision. Between 41 and 57% of mothers suffer from VAD while the corresponding figure for children under 6 is between 22 and 35%. In Luweero district, 78% of the interviewed children preferred OFSP as compared to only 17% that preferred white-fleshed. A half cup of boiled roots of OFSP provides 50% of the RDA for children. DALY analysis indicated that OFSP has the potential to decrease the health burden of VAD by 40 to 67%. This health improvement has a potential positive economic impact of 122 to 206 million dollars a year due to increased labour productivity.
Partnerhips developed for development: Collaborative ties with DFID's CPP/CPHP programs and PRAPACE for example enabled BUCADEF access the grant that supported the outgoing project that has directly impacted several thousands of households. Inter-institutional partnerships were established and/or the existing ones further strengthened.
The Vitamin A study part of the project contributed to bringing together various strategic partners in agriculture, health & nutrition.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

- Sweetpotato is ideally suited to African agriculture in several respects. Stable yields are possible little demand to soil nutrients and water; cultural management practices are basic, planting material can be rapidly reproduced locally and hence has great potential to quickly cover even less fertile soils hence reducing soil erosion. The crop can produce high yields in short growing seasons 90- 120 days hence enabling flexible piecemeal harvesting and offering a flexible source of food and income to rural households that are mostly vulnerable to crop failure and fluctuating cash incomes. The crop is particularly suited to the land-scarce farm

households in densely populated areas.

- Secondly, for a crop like sweetpotato that is resilient, propagates and grows fast and easily as described above, in case it absorbs and translocates pollutants (particularly heavy metals), then this could then be the basis for a novel plant (phytoremediation)-based technology to the removal and recovery of pollutants for environmental sustainability and potential commercial exploitation by municipal, water purification, mining and industrial authorities

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? (100 words)

To ensure year-round supply of the crop, sweetpotato is often produced on wetlands. This poses the risk of degrading the environment, exacerbating erosion and desertification. In urban areas where the crop is increasingly becoming a fallback source of carbohydrate for especially cash-strapped urban dwellers in East Africa where what have been major food staples bananas and cassava, are succumbing to disease epidemics and urbanization is rapidly leading to increasing levels of wetland pollution due to Industrial and domestic effluents.
This raises the question of suitability for human consumption of a crop grown on urban wetlands. Especially in case of heavy-metal pollution, if sweetpotato proves to take up metals yet its consumption is being promoted among children to combat VAD. What if it takes up lead for example, which metal is known to be mainly absorbed by children causing brain-related problems?

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

Yes based on the environmental features elaborated in section 24.
But also based on the reasoning that sweetpotato produces high yields in short growing seasons 90- 120 days hence enabling flexible piecemeal harvesting and offering a flexible source of food and income to rural households that are mostly vulnerable to crop failure and fluctuating cash incomes.
