Sweet potato boosts health and incomes

RIU

Validated RNRRS Output.

Simple techniques for improved sweet potato transport, curing, packaging and storage can help farmers, market traders and consumers to cut their post-harvest losses. This crop's hardiness and, more recently, its promise for combating vitamin A deficiency have rightfully gained it a reputation as a lifesaver. Yet problems after the harvest limit its contribution to incomes, food security and health. These technologies, which have enormous potential for saving lives and improving livelihoods, have been tested in Tanzania with good results and are now ready for wide dissemination. Consumers also have shown their approval of new vitamin A-rich orange fleshed varieties, which are being promoted in Kenya, Tanzania, Uganda, Mozambique, Ghana, Nigeria, Rwanda, Ethiopia and Zambia.

Project Ref: **CPH40:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Post Harvest Programme**

Document Contents:

Description, Validation, Current Situation, Environmental Impact,

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Description

CPH40

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

Geographical regions included:

Ethiopia, Ghana, Kenya, Mozambique, Nigeria, Rwanda, Tanzania, Uganda, Zambia,

Target Audiences for this content:

Crop farmers, Processors, Traders,

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.

Maximising the potential of fresh sweetpotato for farmer and trader incomes

Working title: **Maximising potential of fresh sweetpotato**.

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

Crop Post Harvest Programme

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.

R6508 (in part), R7498, R8282

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Farmers' representative, (Joachim Maige), Gezaulole village, Dar es Salaam

Root Crops Research Programme SRI-Kibaha, (Mr Marton Muhana), P.O. Box 30031, Kibaha, Tanzania. Tel: 023-2402170/38, Email: sri@africanonline.co.tz

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Lake Zone Agriculture Research and Development Institute, Ukiriguru, (Theresia Ngendello), PO Box 1433, Mwanza, Tanzania, E-mail: tngendello@hotmail.com, Fax: 00 255 28 500676, Tel: 00 255 28 2550215

Tandale Food Product Dealers and Exporters Cooperative Society Ltd. (contact person Mr H. Mbukuzi), P.O. Box 9583, Dar es Salaam, Tanzania

Imalaseko Supermarket Investment Ltd, (Francis), P.O. Box 1015 Dar es Salaam, Tanzania, Tel. 2121066

Trust for Rural Food and Development (TRUFOOD). (Mr Joswhua Simbeye), P.O Box 30371 Kibaha, Tanzania. Email: trufood2003@yahoo.com

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 cluster of outputs on **sweet potato** was produced between 1998 and 2004 in Tanzania. In many developing countries, sweetpotato is a traditional crop for subsistence farmers and considered to be a poor person's crop. However, in the post-harvest **value chain** there are significant losses during **marketing**, **handling**, **transport** and **storage**. In addition, the seasonal availability and market price fluctuations present opportunities for storing fresh sweet potato for **income generation** and **food security** purposes. In addition, vitamin A deficiency is a prevalent **nutritional problem** in many developing countries; young children are most at risk from Vitamin A deficiency and deficiency leads to greater risk from other infectious diseases such as measles, diarrhoea, PEM, tuberculosis, pneumonia and bronchitis. However, many subsistence farmers grow white fleshed varieties that are low in vitamin A. Recently introduced **orange-fleshed sweetpotato** varieties are very rich in β-carotene and can potentially contribute to reduced vitamin A deficiency. For example, it is estimated that up to 50 million people in African can benefit from consuming more vitamin A. Additionally, sweet potato is often consumed by low-income rural and urban groups who are most at risk from Vitamin A deficiency. The RNRRS outputs have contributed by developing **post-harvest technologies** that support the l**ivelihoods** of **farmers**, **market traders** and **consumers**. This was achieved by:

- developing improved methods for **transporting/handling** sweetpotato capable of improving market value by up to 13%;
- improving the **shelf-life/storability** through pre-harvest **curing** which reduces losses by up to 40%,
- developing **low-cost storage technologies** capable of improving incomes by up to 53 %;
- establishing that the **consumer acceptance** of newly introduced vitamin A rich orange fleshed sweetpotato varieties were acceptable to the majority of children and mothers with pre-school aged children in rural locations.
- Models were tested involving **farmer – private sector** initiatives that led to the private sector transferring technologies regarding packaging to poor rural farmers so that they could access the higher value supermarket sector.

Sweetpotato is widely grown in many of the DFID PSA Countries in **Africa** and **Asia**. The crop is currently receiving support from international initiatives such as HarvestPlus (a CGIAR Program) and the CIP promoted VITAA. The ISTRC can provide a platform for wider dissemination in the scientific community. These technologies can be promoted through a **partnership approach** in selected countries. The partners will be selected from throughout the sweetpotato value chain from **farmer to fork**.

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

Sweet potato. Components could be applied to cassava, yams and other tropical root crops.

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				

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			

*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**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

Elements of RNRRS outputs that could potentially add value to the outputs include the following:

- Participatory Market Chain Analysis (PMCA) - R8182 R8418 – the livelihoods of those working in the market chain that supplies the informal food sector require support but food vendors may be highly vulnerable;
- Knowledge management - R8402 –information and ideas need to be effectively shared and discussed;
- Farmer access to markets - R8275, R8274, R8498 – the size and value of the informal markets can be significant. Support for this sector will provide secure and sustainable incomes for farmers;
- Market information tools - R7151, R8250, R7494, R8422 - Improved information and access to it will help support and sustain livelihoods;
- Sweet potato- storage and processing R7520, R6769, R6507 – improved knowledge of the physiology of fresh sweetpotato and cultivar selection methods will reduce losses in the value chain;
- Sweet potato virus disease management and promotion - R8243 – improved farmer production will

support the post-harvest value chain for fresh sweetpotato;

- Sweet potato management and promotion through FFS - R8457, R8243, R8458, R8167 - improved farmer production will support the post-harvest value chain for fresh sweetpotato;
- Rapid multiplication of sweetpotato - R8040 - improved farmer production will support the post-harvest value chain for fresh sweetpotato;
- Sweetpotato varieties for food security, health, local and export markets - R8273 – knowledge in Uganda can those in the fresh sweetpotato value chain in Tanzania

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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)**.*

Projects R6508 and R7498 were research projects where validation was not the primary objective while in project R8282 there were elements of validation. Using validation in its wider sense, outputs were validated by the following methods and by research organisations, NGOs, the private sector, international organisations and NARs working with end users (who were partners in the project R8282)

a) Quarterly project coalition meetings (2003 to 04 only) – coalition partners assessed and reviewed project outputs.

b) On-Station testing and development of storage approaches for fresh sweetpotato roots – using suitable replication, pit and clamp stores with variations in the degree of root damage, ventilation and lining with grass were evaluated. When the stores were opened after three months to inspect and assess the roots, local farmers and consumers were invited to evaluate the roots (and hence the technology).

b) On-farm testing of storage technology at two locations in the Lake Zone (Sengerema and Ukerewe). In addition to researchers from NRI, TFNC and LZARDI, a total of 20 local farmers and local market traders participated in the on-farm evaluations over a two-year period that included two harvest seasons.

c) Improving the shelf-life/storability through pre-harvest curing was done by removing the canopies of sweet potato plants 14 days before harvesting. When roots were harvested from on-farm trails, farmers were invited to evaluate the roots for quality and thereby contribute to the validation of the technology..

d) Consumer acceptance of orange and white fleshed sweetpotato involved 60 mothers with pre-school aged children and 100 school children. This work was carried out in collaboration between NRI, TFNC, LZARDI and TAHEA. The panellists assessed the acceptability of the products.

e) Testing by marketing agents of improved handling technologies was done by simulating the methods used by the farmers and traders in harvesting, packaging and transporting the roots from 160km to 360km away from the farm to the market. Working in collaboration with end users, researchers from TFNC, NRI and LZARDI assessed the quality of the roots along each operation in the marketing chain. This work was done for two reasons. The primary one was for health and safety reasons because the sacks were too heavy for porters to carry and the other was to reduce damage to roots.

f) Evaluation of the shelf-life of fresh sweetpotato under market conditions – the research evaluated the length of time that fresh sweetpotato roots would keep post-harvest at ambient temperature.

g) Expanding markets for fresh sweetpotato to the supermarket sector in Dar es Salaam – Supermarkets. TFNC, commercial farmers and NRI tested the models involving farmer – private sector initiatives that led to the private sector transferring technologies regarding packaging to poor rural farmers so that they could access the higher value super market sector. Discussion was made between farmers and commission agents on the strategy to reduce the 140 bag of sweet potatoes to a standard 100 kg bag.

*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)**.*

Project R7498 was a research project where validation was not one of the primary objectives while in project R8282 there were elements of validation. Using validation in the wider sense, elements of the outputs were validated in three sites of the country: Gezaulole in Dar es Salaam, Gairo in Morogoro and Sengerema in Mwanza between 1999 and 2004.

The social groups targeted included the 'extremely vulnerable poor' who are 'assetless, male and female headed households in rural areas including subsistence' farmers who may have small areas for food production' and 'children of the extreme poor' who are likely to be vulnerable to vitamin A deficiency.

The production system is 'forest-agriculture' and the farming system is 'smallholder rainfed humid' and 'smallholder rainfed highland'.

Considering when the outputs were validated, this occurred during the following:
a) Quarterly project coalition meetings (2003 to 04 only) – coalition partners assessed and reviewed project outputs.

b) On-Station testing and development of storage approaches for fresh sweetpotato roots – This took place in the Lake Zone of Tanzania and Dar es Salaam between 2000 and 2001. Using suitable replication pit and clamp

stores with variations in the degree of root damage, ventilation and lining with grass were evaluated. When the stores were opened to inspect and assess the roots, local farmers and consumers were invited to evaluate the roots.

b) On-farm testing of storage technology at two locations in the Lake Zone (Sengerema and Ukerewe) from 2001 to 2002. A total of 20 local farmers and local market traders participated in the on-farm evaluations over a two-year period that included two harvest seasons.

c) Consumer acceptance of orange and white fleshed sweetpotato by mothers with pre-school aged children and school children took place in the Lake Zone of Tanzania during 2004.

d) Testing by marketing agents of the handling technology – This research was undertaken in the Eastern Zone and the Lake Zone of Tanzania in 1998 and disseminated to the commission agents in Dar es Salaam. Follow-up has indicated by 2005, the recommendations of using small and lighter sacks weighting less than 100kg has now adopted at the Tandale market, Dar es Salaam. This was for two reasons. The primary one was for health and safety reasons (because the sacks were too heavy for porters to carry) and the other was to reduce damage to roots.

e) Evaluation of the shelf-life of fresh sweetpotato under market conditions – the research was undertaken in the Eastern Zone and Lake Zone of Tanzania in 1999.

f) Expanding markets for fresh sweetpotato to the supermarket sector in Dar es Salaam – Supermarkets, TFNC, commercial farmers and NRI was done in 2004.

Current Situation

C. Current situation

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

Improved handling and transport of sweetpotato. In Tandale Market, the main sweetpotato wholesale centre in Dar es Salaam has reduced the sack size so that the quality of the sweetpotato roots and also for the health and safety of the porters who were carrying the sacks are improved. Some farmers and traders are now using bamboo baskets (tengas) to pack sweet potatoes from the farm to the market.

Leaflets on low cost sweet potato storage have been disseminated to farmers in Gezaulole and Mwanza. These leaflets have also been distributed to extension workers around the sweet potato growing areas where the low cost storage technology was validated. Knowledge of the technologies is also available now more widely in East and Southern Africa.

Some project farmers in Mwasonge village still store their produce in pits for sale in Mwanza city during off season period.

TAHEA Mwanza, Kizimabani Research Centre in Zanzibar and Sokoine University of Agriculture are promoting production and consumption of orange flesh sweet potato as a result of project outputs indicating the high acceptability of OFSP. TRUFOOD has also been promoting the consumption of sweet potato in Gezaulole, area near Dar es Salaam.

Supermarkets, farmers and traders now use paper cartoons to pack sweet potatoes for sale. This is because of the link which the project established between commercial sweetpotato farmers at Gezaulole, 20km from Dar es Salaam and Imalaseko supermarket. Relatively this is a limited scale.

Promotion of Orange-fleshed sweetpotato as a source of pro-vitamin A – this research was linked to a wider initiatives with CIP and VITAA. OFSP is currently being promoted to farmers in Tanzania and also more widely in Africa, particularly in Uganda and Mozambique as part of the Reaching End User Component of the HarvestPlus initiative (www.harvestplus.org) [the marketing and product development component is led by NRI]..

Knowledge from the project on sweet potato storage has been promoted to some extent in the Eastern and Southern Africa regions including Mozambique (M. Andrade, Personal communication).

*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).***

The project outputs are currently being used (to a limited extent compared with the maximum potential) in Dar es Salaam, Coast, Morogoro, Mwanza and Kagera regions.

In Dar es Salaam, Market Commission Agents have passed a by-law so that farmers transport sweetpotato in smaller sacks.

The outputs on OFSP make a contribution to VITAA and HarvestPlus. NRI and TFNC are key members of VITAA. NRI is the consortium key partner on marketing and product development issues. NRI also leads the Marketing and Product Development Component of HarvestPlus sweet potato activities in Uganda and Mozambique.

The study of acceptability of consumers (mothers with pre-school aged children and school children) has provided useful information for researchers and policy makers involved in the promotion of orange fleshed sweetpotato in Africa.

VITAA is promoting OFSP utilization in Kenya, Tanzania, Uganda, Mozambique, Ghana, Nigeria, Rwanda, Ethiopia and Zambia.

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

The scale of current use varies and no precise figures are available.

Transport and handling recommendations are used by Market Commission agents in Dar es Salaam.

Sweetpotato storage in pit and clamp stores has limited current use in Tanzania and elsewhere. This is because the project was mainly research and did not seek to promote the technology. There is now currently great demand in Tanzania and Uganda because of big prices between main and low season. During the main season prices are lower than during the low season of supply by between 40 to 55% (Project R6508). Demand elsewhere has not yet been assessed.

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).***

In Tanzania the control of Vitamin A Deficiency Programme encourages the use of OFSP for the control of vitamin A deficiency. The National Agricultural Research Centres assisted in breeding, multiplication and dissemination of varieties of sweet potato to farmers around the project area for promotion.

The existence of NGOS such as TAHEA, Africare, TRUFOOD and the Norwegian Peoples Aid (NPA) have are implementing programmes on sweetpotato production, marketing and consumption.

This crop has been prioritized as number two food crop in terms of researchable problems. The recognition of sweetpotato being important is a means of targeting it for use by poorest people to depend on it for their livelihood improvement.

Policy change contributed to the increased emphasis on orange fleshed sweet potato. Impacts achieved through linkages with the VITAA (Vitamin A for Africa Programme) and the “HarvestPlus” challenge programme. NRI is currently helping HarvestPlus develop the post-harvest and marketing component of their programme which is largely based on CPHP project outputs reflecting the intellectual ideas developed by TFNC and NRI.

VITAA is an international platform for the promotion OFSP to overcome vitamin A deficiency. It provides a platform for widespread dissemination, but has not yet been fully exploited.

HarvestPlus (Reaching End User Component) has provided since 2006 the opportunity to expand promotion of post-harvest technologies to one region of Mozambique and two regions of Uganda.

In general, success factors related to experiences in Tanzania are considered to be:

a) Commitment to improve farmers through sweet potato production and marketing
b) Presence of key “champions” to catalyse uptake of the outputs
c) Responding to real needs of market demand of sweet potato.

The study of acceptability of consumers (mothers with pre-school aged children and school children) has provided useful information to researchers and policy makers involved in the promotion of orange fleshed sweetpotato in Africa.

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.

There are several direct environmental benefits of the outputs and the major ones are described below:

Sweet potato is normally gown in rain-fed humid areas and highlands where there is a lot of soil erosion due water run–off. The crop forms a canopy which protects the soil. So the crop can be used to contribute to the control of soil erosion in the farming system.

Charcoal production is an alternative livelihood activity in potential sweet potato growing areas. There may be less burning of charcoal if more farmers are involved in sweet potato production and marketing. So the environment can be protected by farmers not cutting forest trees.

The debris (tops and stems) of sweet potatoes can be ploughed in the soil and improve its fertility.

[106 words]

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

There no significant environmental impacts of these outputs. However, if sweet potato production and marketing is profitable, farmed areas may be increased, which result in increased land clearing. Sweet potato is however a rapid ground cover crop which reduces soil erosion.

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)***

The major impacts of climate change in the short-medium term will be in terms of climate variability. The ability to store sweet potato over the dry season will increase the resilience and food security of communities dependent on the crop. Increased incomes from sweet potato marketing will also contribute to enhanced resilience.