Cassava processors reap the benefits of new techniques

RIU

Validated RNRRS Output.

New processing technologies are enabling resource-poor cassava growers in sub-Saharan Africa to produce popular products for the market. They are selling high quality cassava flour and chips at a range of outlets in Tanzania, Madagascar, Zambia, Uganda and Mozambique. Processing equipment, produced locally at low cost, is reducing drudgery and credit schemes are allowing the cassava processors to get their businesses off the ground. Manuals and participatory methods are helping to spread the use of the new technology, monitor adoption and link cassava processors to markets.

Project Ref: **CPH30:**
Topic: **5. Rural Development Boosters: Improved Marketing, Processing & Storage**
Lead Organisation: **Natural Resources Institute (NRI), UK**
Source: **Crop Post Harvest Programme**

Document Contents:

Description

CPH30

A. Description of the research output(s)

1. Working title of output or cluster of outputs.

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

Geographical regions included:

Kenya, Madagascar, Mozambique, Tanzania, Uganda, Zambia,

Target Audiences for this content:

Crop farmers,

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

Improved cassava processing for resource poor households for income generation and to ensure safety.

Working title: Improved cassava processing for resource poor households

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

The main RNRRS Programme was the Crop Post Harvest Programme

Other activities have been supported by the Common Fund for Commodities and DFID on Regional Africa Project on Non Grain Starch Staples (NGSS), 1993 -1998.

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.

R6332
Improved cassava processing technology for vulnerable households in Tanzania

R6639
Improved cassava utilisation practices in Tanzania

But also:

R5079
Development and field testing of needs assessment methodologies in traditional root crop post-harvest systems:

R6506:
Development and orientation of cassava chip production in relation to national and international markets for food consumption and animal feed in Ghana

R7580
Improved cassava chip processing to access urban markets

R7497
Commercialisation of Cassava Processing to Enhance Rural Livelihoods

R7495
Commercialisation of traditional processed cassava products to maximise benefits and sustain rural livelihoods

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Ms Elizabeth Ndedya, Rural Integrated Project Support (RIPS), P.O. Box 113, Mtwara, Tanzania.

Dr Regina Kapinga/ Theresa Ngendello, Lake Zone Agricultural Research Institute, PO Box 1433, Mwanza, Tanzania.
(Dr Regina Kapinga now works for the International Potato Centre (CIP), Uganda).

IITA Tanzania, c/o Mikocheni Agricultural Research Institute, P.O. Box 6226, Dar es Salaam

Dr Paa Nii Johnson, Food Research Institute, Accra, Ghana

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.*

This portfolio of outputs started with strategic research in the late 1980s and was continued through to more adaptive research up to 2004.

Cassava is an important **food security** and **income generation** crop for **resource poor** households in many countries of **sub-Saharan Africa**. The cyanogen content of cassava roots is a drawback, but research has shown that this can be over-come by the use of appropriate low cost processing methods. An important concern for resource poor households is the need to generate income from marketing of cassava and its products. This portfolio of projects has developed and tested low-cost processing technologies to produce high quality products to be marketed. Although knowledge of safe processing methods is important, it is the linkage to market that is a more significant factor in adoption.

Specific outputs from this portfolio of projects include:

- Identification of processing techniques that produce **safe cassava products**
- A **distance learning guide** for **safe cassava processing**
- Low cost systems for the **value-added** processing of **high quality cassava flour (HQCF) and chips** for a range of market outlets including supermarkets and animal feed.
- Specific pieces of locally fabricated **processing equipment** that can be purchased/fabricated at low cost to reduce drudgery in cassava processing.
- A **market chain-based approach** to **cassava sector development**
- (from related projects) motorised processing equipment.

- Approaches to involvement of **small and medium scale enterprises (SMEs)** in linking cassava processors to markets
- How to take a coalition-based **livelihoods approach** to develop markets for dried cassava flour and chips.
- Approaches to provision of **credit** for **cassava processing**.

Cassava is widely grown in many of the DFID PSA Countries in **Africa** and **Asia**. These technologies can be promoted through a **partnership approach** in selected countries. The partners should be selected from throughout the cassava processing value chain from **farmer to consumer**.

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

Product	***Technology***	***Service***	***Processor 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

The main commodity the outputs focused on is cassava and its products. The principals of the approach that supports commercialisation could apply to any tropical roots crop and other food products that have commercial potential through improved processing for value addition.

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

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						

*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.

There are effectively a cluster of three sets of cassava post-harvest outputs that all could add value to cassava production. These are:

a. The ones from this cluster for resource poor households for improving food security and to diversify cassava utilisation.
b. The ones from cluster entitled "Commercialisation of traditional processed cassava products to maximise benefits and sustain rural livelihoods" (R7495 and related projects) that deal with meeting urban food needs and
c. The ones from ""Cassava as an industrial commodity High Quality Cassava Flour" [R6504/ R7418/R8268] that deals with meeting commercial demand and for market access.

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

- Participatory Market Chain Analysis (PMCA) - R8182 R8418 – the livelihoods of those working in the market chain that supplies the cassava traditional processing chain require support but rural processors 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 cassava sector can be significant. Support for this sector will provide secure and sustainable incomes for farmers, rural processors and market traders;
- Market information tools - R7151, R8250, R7494, R8422 - Improved information and access to it will help support and sustain livelihoods;
- Decision tools for institutional change in public and private sectors -R7502, R6306 – these projects have involved key institutions (public and private) in the traditional processing sector. These tools may support this process;
- Promotion of control for cassava brown streak disease - R8227, R8404 –farmers need to be able to meet the demand for cassava by processors;
- PPT breeding disease resistant cassava - R8405, R8302, R7565 - farmers need to be able to meet the demand for cassava by processors;
- Extending the control of cassava mosaic disease - R8456, R8303 - farmers need to be able to meet the demand for cassava by processors;
- Improved storage for wet cassava starch & Small to medium scale cassava starch - R6316 - components of these technologies can be transferred to rural processors.

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)****.*

There are several different types of outputs from this cluster of projects – most focus on rather basic processing of cassava by resource poor households. Each has been validated in different ways. A problem in describing the portfolio of outputs is that the cluster has emerged from initially being focussed on ensuring safe processing of cassava to the production of cassava products for the market. The outputs were:

A. Three improved methods for processing cassava to ensure food safety and food security and their dissemination
B. Products from improved processing with less than 90% of initial cyanogen content
C. A community-based participatory methodology for monitoring adoption of the new technology in the villages
D. A package of methods for assessing the quality characteristics of root and tuber crops in the field and the laboratory.
E. Processing systems developed for resource poor farmers that enabled efficient processing to market outlets

Output A (effective means of cassava processing to ensure food safety and security) was validated in on-station trials at Naliendele Agricultural Research Institute and on-farm trials in the four selected villages namely Makukwe, Nakahako, Mumbaka and Mkarango in Mtwara region, Southern Tanzania. Participatory monitoring was installed in the villages to monitor the uptake and spread of the technology. In addition a distance learning package (Bainbridge *et al.* 1997) on improved cassava processing was developed and validated through testing with resource poor households in Southern Tanzania.

Output B (products from improved processing with less than 90% of cyanogens produced by the methods) was validated by testing the acceptability of the processed products in the selected villages in Southern Tanzania . The equipment that was used in producing the HQCF was also validated in each village in 1997/98.

Output C (A community-based participatory methodology for monitoring adoption of the new technology in the villages) was validated at a workshop involving Village Extension Officers (VEOs) and District Extension Officers (DEOs) and project participants was convened to develop indicators for monitoring technology uptake of the technology in the selected villages by VEOs.

Output D (A package on methods for assessing the quality characteristics of root and tuber crops in the field and the laboratory was developed and disseminated) a training workshop involving laboratory technicians from four laboratories was carried out to test the package on methods for assessing the quality characteristics of root and tuber crops in the field and the laboratory.

Output E. The methods have been replicated and hence validated in other regions of Tanzania, such as Coast and Dar es Salaam region and Zanzibar by TFNC, Ministry of Agriculture Food and Cooperatives (MAFC),

Agricultural Research Institutes, Small Industrial Development Organisation (SIDO), women groups and some NGOs In addition, the CFC funded project on “Small scale cassava processing and vertical integration of the cassava sub-sector in Eastern and Southern Africa” is being implemented in five countries where farmer groups in some villages, NGOs and MAFC are using it for processing of HQCF and for training other groups.

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 outputs were validated at Naliendele Agricultural Research Institute, Mtwara in 1997/98 and in the four selected villages before evaluation and completion of the project. The validation of technology was undertaken by NRI, TFNC, Naliendele Agricultural Research Institute, Rural Integrated Programme Support. Two NGOs namely TADENA and Plan International together with Kibaha Sugar Research Institute (SRI) were involved in technology dissemination.

End users include farmers, processors, traders, bakery industries and household consumers. The export sector is a potential end-user of HQCF in the near future.

The package on methods for assessing the quality characteristics of root and tuber crops in the field and the laboratory was validated in 1997 during a training course in TFNC, Tanzania Bureau of Standards (TBS) and Sokoine University of Agriculture laboratories.

Current Situation

C. Current situation

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

The slight difficulty in answering this question is the fact that the initial outputs were developed 10 years ago and this has led to a series of other outputs and initiatives. We have focussed on Tanzania, but there are other activities in other countries that may not have been so well covered.

Currently a limited number of farmer groups and processors in Mtwara region southern Tanzania, Coast, Zanzibar and Dar es Salaam regions are using the outputs for processing HQCF which is on great demand in the supermarkets, retail shops and restaurants for household consumers and in the textile industry where it can be transformed into starch in Dar es Salaam. This is not currently a concerted effort but a series of initiatives.

As a result of validation of the processing equipment in southern Tanzania, a private company called Intermech Engineering in Morogoro is fabricating cassava processing equipment for various clients.

The distance learning package was translated into Portuguese using USAID funds and used in nutritional education programmes in Mozambique.

The analytical manuals, produced through the Regional Africa Project, are being used for assessing quality characteristics in cassava by various laboratories such as Tanzania Bureau of Standards, Sokoine University of Agriculture and Tanzania Food and Drugs Authority (TFDA) in Tanzania. Use is also widespread through sub-Saharan Africa.

*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 processing technologies or variations of them are being used in the former project areas in southern Tanzania especially in Mtwara, Coast, Dar es Salaam, Mwanza, Kigoma regions and Zanzibar and in Madagascar, Zambia, , Uganda and Mozambique where the project on Small scale cassava processing is being implemented.

The analytical manuals are being used in different countries which participated in the regional training workshop such as Tanzania, Kenya, Uganda, Zambia and Mozambique. They are also being used in West African countries as a consequence of training workshops there.

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

The current scale of use of the technology differs from region to region. For example in Mtwara region, there are about eight farmers groups/processors while in the Coast region there are eighteen and in Zanzibar there is one farmers group processing HQCF. At the same time there is only one equipment fabricator in the whole country currently supplying cassava processing equipment. Plan International supplied more than 25 cassava processing equipment to various villages in one district namely Kisarawe.

In the use of quality assessment manual the laboratories which were involved are still using the different methods of assessing the root and tuber characteristics.

It took at least two years for the technologies to spread from Southern Tanzania to Coast and Dar es Salaam regions until when they were initially taken up by Southern Africa Root crop Research Network (SARRNET) and later by CFC project on small scale cassava processing started in the year 2003. Usage of the technologies is still spreading in some regions such as Kigoma in western Tanzania and Mwanza in Lake Victoria zone.

Fabrication of equipment has remained the mandate of one company the Intermech Engineering Co. Ltd of Morogoro, although two other companies in Lake Zone of Tanzania have also fabricated chipping cassava machines.

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).***

Currently promotion/ uptake of outputs is taking place in Tanzania and in four other countries implementing the project on small scale cassava processing where efforts to process HQCF for industrial use and marketing are going on. In Tanzania, four pilot sites for processing HQCF have been established in four different regions to meet the demand of the commodity in the urban areas. After supporting them with equipment and training farmers/ processors are producing HQCF flour to supply to the markets which were identified by the project.

Various workshops (national and regional) that were convened specifically to discuss implementation and project progress assisted in the promotion and/or adoption of the outputs. Reports and publications from data generated by this work has been presented in various forums such as the International Society for Tropical Root Crops (ISTRC) meetings, cassava safety workshop, FOODNET and SARRNET Scientific meetings and internal seminars in respective institutions. Some of the data has been published in peer reviewed journals such as the Food Chemistry and Journal of Horticulture.

Participation in various exhibitions such as the World Food day, the UN Week, and Farmers day has also promoted products produced by these technologies.

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.

Direct environmental benefits related to the outputs include the following:

1) Men may be attracted in cassava processing because it has been realized to be an income generating activity and will get involved in cassava production, processing and marketing. In this way they will refrain from the activity of generating funds from other activities, such as charcoal making, and will concentrate on cassava processing and marketing.

2) Cassava peels are usually consumed by animals such as cows, goats and pigs. The peels and leaves will be useful in feeding animals instead of depending only on grass/fodder. Note that cassava leaves are a good source of iron and β (beta) carotene and are always eaten by several people as a food relish. This could serve as a food source to the farmers/processors.

3) The cassava peels can be used to make compost manure which in turn could be used by farmers to restore fertility of the soils in their fields.

4) In marketing of added value cassava products the government will tax the traders and this is the best way for local governments to collect revenue which will in turn be used for improvement of infra structure or other social services.

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

The cassava processing methods promoted are generally environmentally friendly relying mainly on sun-drying to dry the products. However, two adverse environmental impacts could be that:

1. Cassava processing leads to accumulation of wastes mainly the peels. Measures should be taken to ensure appropriate disposal of waste products.

2. As cassava production systems become more profitable farmers might expand the area under cultivation. Clearly this needs to be done in a sustainable manner.

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 outputs of these projects contribute to ensure the safety of cassava producers especially during times of food insecurity. Climate change in the short to medium term is likely to lead to more climate variability, leading for example to more frequent drought. The technologies generated in this project were developed to cope with periods of drought (i.e. rapid processing of cassava when cassava is the only food crops available) and so the outputs have great capacity to increase resilience effects of climatic change and variability.

More generally cassava is a drought resistant crop which has the capacity to withstand climate variability, e.g. drought tolerance. Promotion of cassava products will increase the capacity of poor people because there is market for the products and is beneficial to enable poor people cope with climate variability.