



**RESEARCH
PROGRAM ON
Roots, Tubers
and Bananas**

Expanding utilization of RTB and reducing their postharvest losses

**Proposal under EC 2012 Contribution
August 2012**

Submitted to:

The International Fund for Agricultural Development (IFAD)

Submitted by:

The International Potato Center (CIP) and the CRP-RTB alliance centers

Collaborating CGIAR Centers





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Grant Title	Expanding utilization of RTB and reducing their postharvest losses
Recipient	CRP 3.4 (RTB) through CIP as lead center
Alignment to CRPs	Promoting postharvest technologies, value chains, and market opportunities is Theme 6 of CRP 3.4. Some joint activities with CRP 2 and potential links with CRP 1.2 are anticipated.
SRF/SLOs	The proposal addresses primarily SLOs: reducing rural poverty and improving food security, with emphasis on the latter. In addition, as some varieties of root, tuber, and banana (RTB) crops are biofortified, it will contribute to improving nutrition and health.
Rationale	<p>Roots, tubers, and bananas (RTB) are consumed as a staple or supplementary food by the rural poor across much of the developing world. Their importance increases in the transition to more market-based food systems, especially through added-value products, both fresh and processed. In Sub-Saharan Africa (SSA), as a group they contribute over 20% of caloric requirements and constitute nearly two-thirds of per-capita food production. RTB are potentially important sources of minerals and vitamins as well. For example, there are varieties of sweetpotato, cassava, and banana that can contribute significantly to reducing widespread vitamin A deficiency. Potato is a significant source of potassium and vitamin C. As part of robust value chains in SSA, RTB are also becoming a significant source of income, though their full potential has yet to be realized.</p> <p>The trade in sweetpotato, cassava, yam, potato, and banana in SSA is characterized by short and direct marketing channels. But postharvest losses (PHL) are much higher with this group of crops than with grains, as inherent bulkiness and perishability have traditionally limited RTB use to on-farm and local markets. Moreover, specialized storage conditions or postharvest processing is required to extend their use beyond harvest periods and for more distant markets. In developing countries, PHL of RTB are higher than the global average and affect more severely already endangered livelihoods. The overall problem of PHL is often compounded by an unfavorable policy environment.</p> <p>There is considerable scope for repositioning RTB as added-value cash crops through expanding their use for processing and sales of preferred varieties to satisfy emerging markets in small and large cities. Market development research envisaged under this project, funded by the European Commission (EC), will complement the genetic enhancement activities underway in the CRP-RTB's Theme 2: <i>Accelerating the development and selection of varieties with higher, more stable yield and added value</i> and address postharvest constraints to food security. This research will target issues of storage, transportability, and gaining market share through processing into diverse products.</p> <p>Significant welfare gains are possible by increasing shelf life and reducing PHL. Some technology is already available amongst the four CRP-RTB alliance centers (Bioversity, CIAT, CIP, and IITA) and partners, but further research and validation of promising options are necessary. Technologies for reducing PHL include varietal characteristics such as cassava varieties with tolerance to postharvest physiological deterioration, reduction in percentage of roots with insect and other damage, specialized storage facilities, and market information for timely delivery and use. Uptake and adoption of these technologies require that the whole array of value chain actors works closely to address PHL and constraints. Women often play a critical role in the postharvest area as the</p>

	<p>guardians of harvest, small-scale processors, and market agents. So it will be particularly important to recognize and build on this role to enhance gender equity.</p> <p>As urbanization proceeds in SSA, reduced PHL will be vital for RTB to continue playing a major role in food security and income generation across the continent. Also key is capturing value addition in the transition from marketing undifferentiated commodities to differentiated commodities, and then to specialized products. The crops and its products to improve will be selected at the initial stage of the project, and the technologies to develop in order to reduce PHL will subsequently be identified.</p> <p>For RTB to continue to move from subsistence to commercial systems, product development, processing technologies, and markets need to be expanded and strengthened. Links with different industries and joint development of alternative products have proven to be very useful. Areas where this approach has been successful range from the promotion of traditional potato landraces in the highlands of Peru to the development of a waxy (amylose-free) starch for cassava in Thailand. In SSA, farmers' storage and marketing are vital requirements to increase their bargaining power, concentrate product supplies, and reduce transaction costs. During the last few decades, the bulkiness and short shelf life of RTB, which have long hampered their wider marketability, have been gradually attenuated. As alternative approaches for processing RTB are developed, stronger markets for these products are emerging. Strong markets for these crops, in turn, are essential to promoting the adoption of technologies and to reducing food insecurity and poverty.</p> <p>The CRP-RTB's Theme 6: <i>Promoting postharvest technologies, value chains, and market opportunities</i> aims to overcome the challenges linked to bulky and perishable crops, as well as unfavorable policy environments, and realize the opportunities of RTB in postharvest systems. Its overarching objective is to promote research to identify, develop, and promote diffusion of relevant technologies to reduce postharvest food losses and develop organizational models for value chain linkages to growing markets that enhance income generation and improve food security. This objective needs technological, market, and organizational innovations, as well as strong linkages to policy development and public-private partnerships. This implies strong linkages with CRP 2 on Policies, Institutions, and Markets to Strengthen Assets and Agricultural Incomes for the Poor. We anticipate drawing on each center's familiarity with recent methods to link the proposed project to relevant components of Theme 6 with its three product lines (PLs):</p> <ol style="list-style-type: none"> 1. Postharvest approaches to improve food security 2. Improving linkages to markets for environmentally friendly income generation activities 3. Marketing strategies and policies to add value and promote RTB consumption. <p>The four centers responsible for the CRP-RTB seek the EC's support in implementing a proposed project under Theme 6. Complementarities and synergies are especially high amongst these centers in the case of RTB, and nearly every aspect of the crop improvement program benefits from their close collaboration. The centers are developing and sharing a full set of production, processing, and marketing research outputs so that no single center need develop the critical mass for all activities. Through inter-center alliance and synergies come more optimal access to the technologies and lessons learned in each center's research and development (R&D) communities of practice. Collective</p>
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	<p>science and experiential knowledge transfer can often enrich the strategy of collaborative project design, approach, and likely impact.</p> <p>Among the RTB crops, two centers share mandates for cassava and three for bananas. CIAT and IITA have worked together on multiple aspects of cassava since the founding of the two programs in the mid-1970s. This collaboration has intensified in recent years with better communication and greater stakeholder demand for products that can be provided best with joint efforts, such as high-vitamin A cassava. Likewise, in banana, IITA, Bioversity, and CIAT have been using the different capacities of the respective centers to enhance research synergies (e.g., in the framework of the Consortium for Improved Agriculture-based Livelihoods in Central Africa). Banana research at CIAT is relatively recently established. CIP has a large and active portfolio of potato and sweetpotato projects in SSA seeking to add value and promote RTB consumption. In Latin America, SSA, and Asia, it has pioneered the methodology and application of the participatory market chain approach, multistakeholder platforms for linking smallholders to new agricultural economies, and farmer business schools.</p>
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<p>Links to IFAD and Divisional Grant Priorities</p>	<p>The proposed project potentially links with several IFAD/EC initiatives in Eastern and Central Africa (EAC):</p> <p>Kenya</p> <ul style="list-style-type: none"> ▪ South Nyanza Community Development Project ▪ Smallholder Dairy Commercialization Programme (sweetpotato vines owing to their nutritive value to be used as fodder for dairy animals) <p>Uganda:</p> <ul style="list-style-type: none"> ▪ IFAD Loan: Community Agricultural Infrastructure Improvement Programme Agricultural Technology and Agribusiness Advisory Services Programme ▪ EC Support to the CGIAR: Pig value chains support in Uganda (sweetpotatoes will be used to formulate pig feed to address shortage of this type of feed in Uganda) <p>Tanzania</p> <ul style="list-style-type: none"> ▪ Marketing Infrastructure, Value Addition and Rural Finance Support Programme ▪ Agricultural Sector Support Programme (extension services). <p>The CRP-RTB project team will explore opportunities to link with these initiatives for uptake of promising technology.</p> <p>The project will capitalize on the ongoing projects and activities of CIP on sweetpotato (SASHA) and potato, IITA on cassava and banana (breeding, seed system, and postharvest), Bioversity on all aspects of banana in Africa, and CIAT's and CLAYUCA's experience and expertise on cassava processing in Latin America. Numerous national research institutions, nongovernmental organizations, and private entrepreneurs in Uganda also have considerable expertise, experience, and interest in RTB. All of these actors expressed interest during the planning workshop for this proposal in partnering with the centers in conducting joint research to achieve the objectives of the project.</p>
<p>Grant Objectives and their monitoring indicators</p>	<p>The goal of the project proposed for EC funding is to contribute to improved food security for RTB-producing communities in EAC. The objectives are to improve food availability and income generation through better postharvest management and expanded use of RTB, based on (1) postharvest and processing technologies, (2) extension advice, and (3) capacity development (see log frame in Annex A).</p>

Beneficiary Countries	SSA: Uganda is an appropriate focal point country for the EAC, as all groups of RTB are present and contribute very significantly to smallholder welfare and rural and urban diets. We expect that additional EAC countries will benefit from the technologies and model created in Uganda.
Proposed EC Grant Amount	Euro: 2.9 million
Co-financing	Euro: N/A
Total Program Cost	Euro: 2.9 million
Program Duration	3 years (November 2012–October 2015)*
Deliverables and Outputs	<ul style="list-style-type: none"> ▪ Contribute to 25% increase in consumption of RTB and to 20% higher and more stable income of RTB producers, and at least three more gender-equitable value chains in EAC (5–10 years). ▪ Postharvest and processing technologies for RTB validated with women and men in farmer groups and market chain actors in selected sites in Uganda. ▪ Value chain of the selected products analyzed and improved technology available for addressing and resolving the production, postharvest, and marketing constraints and bottlenecks along the chain. ▪ Sustainable multistakeholder platform for RTB value chain and postharvest development created with the public-private sector. ▪ Capacity developed through online platform for SSA and training of national partners through CG centers in postharvest and processing for RTB.
Target Group and Benefits	Target groups and the intended beneficiaries of this proposal are the RTB farmers who may be poor, food-insecure, and malnourished populations in rural and peri-urban areas of SSA (and specifically EAC).
Mode of Operation	<ul style="list-style-type: none"> ▪ As the lead center CIP will coordinate the project, with substantive involvement of CRP international scientists from the other CG centers and partners with expertise in postharvest and value chain work in Uganda. ▪ The value chain and postharvest scientists of the four CG centers and partners will design and implement the agreed research agenda under the coordination of the project coordinator hired as a CIP scientist. ▪ Each participating CG center will receive a grant for training of national staff. ▪ CG scientists and their partners will jointly implement validation trials at sites in Uganda.
Supervision Arrangements	The governance and management arrangements for CRP 3.4 follow the guidelines set out in the CGIAR Strategic Results Framework. The project would be implemented under CRP 3.4, window 3 funding, with CIP as the lead institution. In addition, there will be linkages with CRP 1.2 for humid tropics and more specific linkages with CRP 2 for value chain approaches.

*Actual start date is subject to having all legal agreements in place, or CIP has received official communication approving retroactivity in any project costs incurred as of the date of that communication.

TABLE OF CONTENTS

ACRONYMS	vi
1. BACKGROUND	1
1.1 Importance of RTB and RTB Research.....	1
1.2 Challenges for RTB in Africa.....	1
2. LINKAGES WITH OTHER THEMES	2
3. THE PROPOSED PROGRAM	2
3.1 Overall Goal and Objectives of the Program.....	2
3.2 Setting The Research Agenda: Strategy, Approach, and Methodology.....	2
3.2.1 MARKET AND PRODUCTION OPPORTUNITY ASSESSMENT.....	2
3.2.2 INITIAL PRODUCT OPTION IDENTIFICATION.....	3
3.2.3 RESEARCH DESIGN.....	3
3.3 Target Populations.....	4
4. EXPECTED OUTCOMES	5
5. PROGRAM IMPLEMENTATION ARRANGEMENTS	5
5.1 Implementing Organization and Program Management.....	5
5.2 Monitoring, Evaluation, and Reporting.....	6
6. PROGRAM COSTS AND FINANCING	7
7. FINANCIAL GOVERNANCE	7
7.1 Procurement Procedures for Goods, Services, and Human Resources.....	7
7.2 Financial Controls.....	7
7.3 Accounting Specifications.....	8
7.4 Audited Financial Statements and Audit Reports.....	8
ANNEX A. RESULTS-BASED LOGICAL FRAMEWORK	A-1
ANNEX B. LINKAGES TO BE EXPLOITED AMONGST THE CRP-RTB'S THEMES, PLS, PRODUCTS, AND OUTPUTS	B-1
ANNEX C. CROP PRODUCT TABLES	C-1

ACRONYMS

CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CLAYUCA	Latin America and Caribbean Consortium to Support Cassava Research and Development
CRP	CGIAR Research Program
DM	Dry matter
EAC	Eastern and Central Africa
EC	European Commission
IITA	International Institute of Tropical Agriculture
NGO	Nongovernmental organization
PHL	Postharvest loss
PL	Product line
R&D	Research and development
RTB	Roots, tubers, and bananas
SSA	Sub-Saharan Africa

1. BACKGROUND

1.1 Importance of RTB and RTB Research

Roots, tubers, and bananas (RTB) are consumed as a staple or supplementary food by the rural poor across much of the developing world. In Sub-Saharan Africa (SSA), as a group they contribute over 20% of caloric requirements and constitute nearly two-thirds of per-capita food production. As food security crops, RTBs are potentially important sources of minerals and vitamins as well. For example, there are varieties of sweetpotato, cassava, and banana that can contribute significantly to reducing widespread vitamin A deficiency. As parts of Africa grow increasingly arid, cassava, a highly drought-tolerant crop, will assume a greater role in addressing food security for the rural population. Moreover, RTB crops are far less susceptible to price fluctuations in the world food market than are grains and legumes. They thus serve as the food security products for the urban poor when grains and legumes suffer from periodic price hikes, seen in recent years.

While generally serving as food security crops, RTB are also important income sources. They enter in the transition to more market-based food systems, especially through added-value products, both fresh and processed. As part of robust value chains in SSA, RTB have also become a significant source of income, though their full potential as crops and as products has yet to be realized as it has in other parts of the world, particularly in Asia. Sweetpotato is being used in diverse products, such as flour, starch, snacks, feed, and alcohol, though not as widely processed as cassava flour, starch, biofuel, and animal feed. Banana is a most important staple crop in Uganda, but the potential of diverse banana products made from different banana varieties has not yet been thoroughly explored. Currently, some varieties have been made into wine and spirits, but given the massive appetite for steamed mashed cooking bananas (*Matooke*) in Uganda and the need to save time and fuel for cooking, instant *Matooke* has a tremendous potential to add value to fresh banana and to satisfy the market. Fresh potato is a favored food crop among both urban and rural households, though farmers do not always get the highest prices due to lack of proper storage of their crop. The value of potato may greatly increase if sold to food industries; however, postharvest issues can undermine the continuous supply of quality product in this market segment.

RTB farmers may produce livestock fed on cassava and/or sweetpotato roots and vines or banana leaves. In SSA, Uganda has the most active pig production that is based on sweetpotato diet, whereas other countries use sweetpotato vines to supplement Napier grass for dairy production. The potential for using sweetpotato and cassava roots and vines and banana trunk and leaves in backyard livestock production has not yet been fully captured as it has in Asia, where it is well developed. The RTB-livestock feed production system is yet to be explored in SSA for its contribution to food security and income generation.

Proper research for any of these RTB crops, adapting technologies developed elsewhere in the world to the conditions in Africa, and tapping into the alternative global markets all bear significant potential of both contributing to food security and adding value to the fresh product.

1.2 Challenges for RTB in Africa

The trade in sweetpotato, cassava, yam, potato, and banana in SSA is characterized by short and direct marketing channels but with high rates of loss due to the bulky nature and perishability of these crops and lack of appropriate handling and storage technologies. Postharvest losses (PHL) are much higher with this group of crops than with grains, as inherent bulkiness and perishability have traditionally limited RTB to on-farm and local markets. Moreover, specialized storage conditions or postharvest processing is required to extend their use beyond harvest periods and for more distant markets. In developing countries, RTB postharvest crop losses are higher than the global average and affect more severely already endangered livelihoods. The overall problem of PHL is often compounded by an unfavorable policy environment.

There is considerable scope for repositioning RTB as added-value cash crops through expanding their use for processing and sales of preferred varieties to satisfy emerging markets in small and large cities. Many of the processed products from these RTB are known elsewhere in the world, but

their feasibility and relevance to Africa depend on the access to, and competitiveness in, the market. These products must be market-driven and competitive with other similar products and with other suppliers. Market development research envisaged under this EC-funded project will complement the genetic enhancement described in the CRP-RTB's Theme 2: *Accelerating the development and selection of varieties with higher, more stable yield and added value*, and provide a strong demand pull. It will target issues of storage, transportability, processing efficiency, and gaining market share through processing into diverse products.

2. LINKAGES WITH OTHER THEMES

CRP-RTB seeks the EC's support in implementing activities within Theme 6, with its three product lines (PLs): **promoting postharvest technologies, value chains, and market opportunities**. The original CRP-RTB proposal (CIP et al. 2011) identified and discussed in much detail the seven themes, their PLs, and their products, as well as the potential for each theme and set of PLs to reinforce the desired outputs and impacts through linkages with one another (see, e.g., Fig. 1, and Annex B).

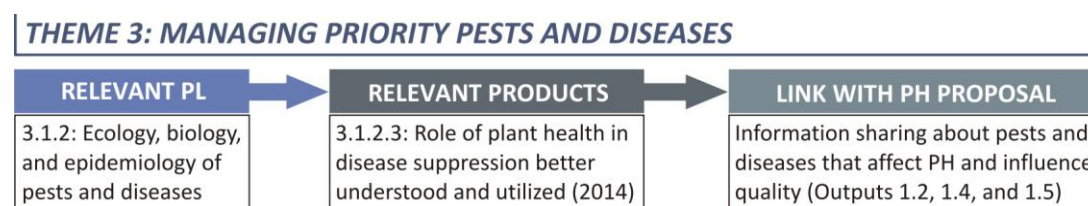


Figure 1 Example of Theme 3's linkage between PL, product, and potential application to the EC proposal.

The proposed set of activities aims to overcome the challenges associated with bulky and perishable crops and posed by unfavorable policy environments, and to realize the opportunities of RTB in postharvest systems. Its overarching objective is to promote research to identify, develop, and promote diffusion of relevant technologies to reduce PHL and organizational models for value chain linkages to growing markets that enhance income generation and improve food security. This objective needs technological, market, and organizational innovations, as well as strong linkages to policy development and public-private partnerships. This implies strong linkages with CRP 2 on Policies, Institutions, and Markets to Strengthen Assets and Agricultural Incomes for the Poor.

3. THE PROPOSED PROGRAM

3.1 Overall Goal and Objectives of the Program

Goal: To contribute to improved food security for RTB-producing communities, including both the producers and other stakeholders along the chain, in EAC.

Objectives: To improve food availability and income generation through better postharvest management and expanded use of RTB, based on (1) postharvest and processing technologies, (2) value chain development, and (3) capacity development.

3.2 Setting The Research Agenda: Strategy, Approach, and Methodology

3.2.1 MARKET AND PRODUCTION OPPORTUNITY ASSESSMENT

The first step in identifying the products to develop for the market, whether for fresh consumption or processed products, will be to conduct a market and production opportunity assessment. Although anecdotal evidence indicates that these opportunities exist, this rigorous assessment will more precisely match production with market in order to identify the products of the greatest potential to satisfy food consumption needs and income generation. Both the market and production need to be considered because the supply-and-demand dynamic must match in order to create a profitable and sustainable market.

Past experiences and market situation elsewhere in the world have revealed the potential products that can be developed from RTB crops, the technologies available to develop these products, and the

market demand for these products. Still, a local assessment is essential to determine the feasibility of developing these products for the accessible markets. The project will use the market and production opportunity assessment as a tool to identify the final products to be developed—and the research agenda needed—to develop the relevant technologies.

Most of the possible products, fresh or processed, of each crop are known. An assessment will examine the production potential in the area and consider a number of important variables such as:

- Comparative advantages of fresh or processed products
- Supply quantity, quality, and seasonality
- Competing crops and competing suppliers
- Access to market and cost to transport
- Credit necessity and accessibility
- Cost and benefits analysis
- Overall sustainability of the supply and demand.

Final selection will depend on which products have the most favorable balance of these variables and where postharvest and expanded utilization represent major constraints. Once the products have been selected, the value chain analysis will form the basis to identify areas for improvement—be it assessing PHL, or developing technologies to reduce loss, or research on ways to improve market linkages. The final selection also will consider the areas where postharvest improvements can most benefit from research activities to make them more efficient.

The value chain analysis maps out the chain of a specific product. The chain spans production to postharvest activities, with or without transformation, to marketing the products, along with the existing and potential business development services along the chain. The analysis assesses the constraints and bottlenecks along the chain that hinder the development of the product, and identifies the research and development (R&D) agenda that can resolve the constraints and make the whole chain function more efficiently. This proposed project will concentrate on identifying postharvest options within the value chain context.

Postharvest research opportunities include both activities that do not require transformation and those that do. Non-transformation activities include cleaning, sorting, packaging, and branding. Transformation activities involve drying, juicing, canning, extracting, and processing. Postharvest considerations also include the process of transporting the products to market, so PHL during transport is another area to assess and improve. These are the R&D activities that are commonly undertaken to improve the efficiency of the chain (though not all will be included in this proposed project). The research agenda will be determined based on the relevance to the objectives, budget available, timeframe required, and expertise.

3.2.2 INITIAL PRODUCT OPTION IDENTIFICATION

During the proposal planning workshop in Uganda on 26 June 2012, the experts from the international and national institutions identified two to three potential products of each of the RTB crops that can be further developed by some research interventions in Uganda. These selections were complete with the rationale (selection criteria), market access, current constraints, opportunities (research agenda to overcome these constraints), where the research should be carried out, and gender implications (see crop product tables in Annex C). Nevertheless, the project strategy is to examine no more than four or five products to achieve focused results. These selections will be narrowed to one product per crop, or perhaps one or two crops may be dropped to make way for products of greater potential of the remaining crops. The final selections will be based on the identification of the products that have the greatest potential to benefit the target populations through a participatory analysis with stakeholders considering market potential.

3.2.3 RESEARCH DESIGN

Once the potential products have been selected based on the market, production, and PHL assessment, research options will be designed to improve the system by overcoming the constraints and bottlenecks along the selected product chain. The tables in Annex C present some preliminary

constraints that will be fine-tuned into a detailed research agenda for each product chain. This will include training and capacity building for national institutions to become proficient at assisting the stakeholders along the chain in addressing the targeted constraints. The main emphasis here is on helping the producers improve the agenda while it is being implemented.

This is a research-for-development project that will place research in the context of value chains and the demands and needs of its actors in production, postharvest handling, processing, marketing, and business organization to make the chain function more efficiently. Research activities will be defined in the first phase of the project, focusing on characterizing and minimizing PHL. Postharvest research may begin with assessing PHL along the chain, as well as a mechanism for cleaning, sorting, packaging, and branding. Or, if the product requires transformation to expand utilization, the research agenda could include improving processing and extraction efficiency.

The kind of PHL assessment undertaken will be related to the nature of losses that are most important for any particular product opportunity. Losses can be physical (waste due to damage in transport, rotting, etc.), weight loss (due to moisture loss during transport/storage), quality loss (reflected in lower prices but not in any physical loss), or nutritional loss (e.g., loss in beta-carotene) through the chain. Loss assessment will be tailored to the crop and value chain. Hence, including quality/nutritional losses in the assessment will add to costs but may be critical for some markets/uses.

The project will review and build on current and previous R&D attention paid to RTB crop storage. For example, in the 1990s NRI had a very strong project in the Soroti/Lira area trialling on-farm sweetpotato storage technologies (including traditional practices) and looking at factors influencing adoption.¹ The project will explore options for increased RTB utilization linked to animal feed both for use on farm and potentially as an input to commercial feed rations for cassava. This might include value chain assessments of linked value chains for cattle, pigs, or other livestock beyond the farm gate. Depending on the option selected, this may require institutions with relevant expertise in animal feed.

3.3 Target Populations

The proposed project targets the RTB producers, often poor farmers who rely on these low-value crops mainly for food security. Increasingly, potato and cooking banana are regarded as higher value cash crops and can potentially contribute to valuable income to farmers. However, many women rely on these products to ensure that the family gets sufficient caloric and nutritional intake. Overcoming the constraints of the fresh product chain directly helps women achieve their goal of feeding the family. Our proposed activity further narrows to target the women of these poor households who are responsible for food consumption and security for the family that fresh product provides.

Processed products also may target women directly as they are often involved in small-scale home processing to add value or to prolong shelf life of RTB crops. These traditional processing technologies are usually cumbersome and labor intensive and incur unnecessary waste. The products are low quality and often command low prices. Improvements in processing technologies reduce waste and labor inputs, while quality, value, and income for the women are increased.

Although the target populations are the RTB producers, the value chain approach often requires the improvement of the overall chain efficiency in order to benefit the downstream producers. In such cases, the other stakeholders along the value chain may also be targeted, as appropriate and within the scope of the activity's resources.

¹ Hall, A. 1998. "Sweetpotato postharvest systems in Uganda: Strategies, constraints, and potentials." Working Paper. Lima: CIP. Wheatley, C. 2008. "A Critical Review of Sweetpotato Processing Research Conducted by CIP and Partners in Sub-Saharan Africa." Working Paper. Lima: CIP.

4. EXPECTED OUTCOMES

Table 1 lists the short- and long-term outcomes envisaged by the proposed project.

Table 1 Expected Short- and Long-Term Outcomes and Linkage to Project Log Frame Outputs

Outcomes	Log Frame
Short term	
Researchers identified priorities for improvement with key RTB production communities (women and men) and value chain actors	1.1
Researchers identified RTB storage technology to decrease loss by 15% while increasing storage life by 20%	1.2
Researchers identified RTB varieties with improved postharvest characteristics	1.3
Researchers tried and tested on-farm processing systems	1.4
Researchers identified postharvest technologies that promoted expanded utilization	1.5
Researchers identified market opportunities for four products and piloted these products with improved and equitable participation in the value chain	2.2–2.4
Online platform established to document methods, technologies, and products to be used by researchers, extension services, and communities	3.1
Capacity built in key national partners for reducing PHL and increasing use of RTB	3.2
Long term	
Farmers increase income by 10% with reduced PHL, expanded utilization, and improved processing and overall more efficient value chain	1.1–1.5
Farmers decrease RTB storage losses by 15% while increasing storage life of fresh RTB by 20% in pilot sites	1.2
Farmers increase production and productivity using the improved RTB varieties	1.3
Farmers engage in 10% more processing to add value	1.4
Farmers increase income by 10% while participating in value chain of processed products benefiting from value addition and more equitable distribution	2.1–2.5
RTB stakeholders have greater access to knowledge and information, thus increased capacity, on RTB fresh uses and postharvest processing	3.1–3.3

5. PROGRAM IMPLEMENTATION ARRANGEMENTS

5.1 Implementing Organization and Program Management

The governance and management arrangements for CRP-RTB follow the guidelines set out in the CGIAR Strategic Results Framework. The project would be implemented under CRP-RTB, with CIP as the lead institution, under window 3 funding. This project will be linked in various ways with other CGIAR Research Programs that focus on a wide range of commodities, production systems, and nutrition and environmental issues but also include RTB or value chain development.

As the lead center of CRP-RTB, CIP will provide overarching project management. CIP will hire an international scientist as project coordinator, with expertise in postharvest and value chain work in Africa. The project coordinator will report to the relevant CIP programs and to the CRP-RTB director to ensure coherence with the RTB program. A small advisory group will be set up, including representatives of other CG centers and of NARS partners who form part of RTB.

The proposed activities involve many partnerships among CGIAR centers, IITA, CIAT and the Latin America and Caribbean Consortium to Support Cassava Research and Development, CIP, and Bioversity, the national research institutes, the private sector, farmer organizations, and specialized NGOs. Together, this complementary network of partners powers the research needed to accelerate the development of new varieties and postharvest technologies, and to obtain critical feedback from all users in the RTB value chains. There will be specific linkages with CRP 2 for value chain approaches and with CRP 1.2 for humid tropics.

The coordinator will liaise with value chain and postharvest scientists in four participating CG centers as well as with partners, some of who are represented in Figure 2, who will jointly implement validation trials at sites in Uganda. CIP will assume responsibility for technical reporting and financial management of the project under its policies and procedures. The CIP team will establish memoranda of agreement with partner institutions for implementation of project activities and provision for disbursement of funds where needed.

During the June workshop, participants were asked to identify the relevant experiences and expertise they had in relation to the four crops. Figure 2 summarizes these institutions' expertise on different aspects and product development of each crop, and indicates where there is duplicating expertise. On the basis of the findings of the market opportunity assessment and product selection, potential partners can then be identified to design and implement the various aspects of the proposed project.

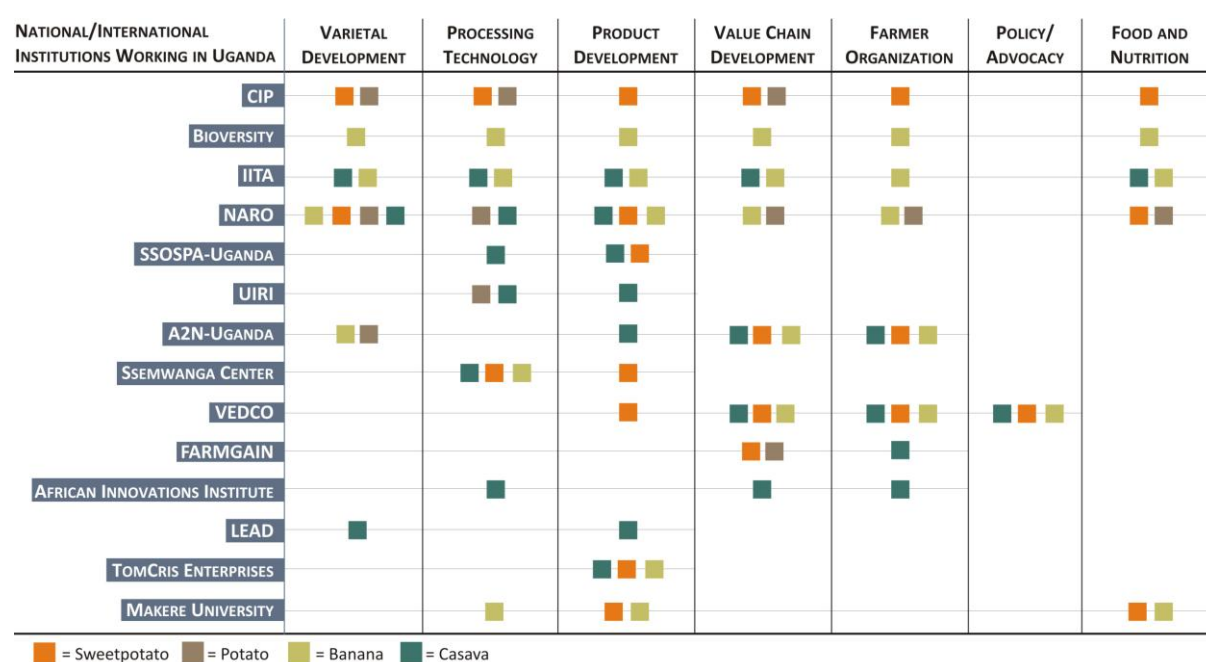


Figure 2 Institutional expertise by crop and product development.

5.2 Monitoring, Evaluation, and Reporting

Some of the key indicators for monitoring and evaluation have been identified in the log frame (Annex A). Sets of specific indicators will be detailed based on the outcomes of the initial market opportunity assessment, which will select the products and identify the intervention R&D activities needed. These sets of meaningful, measurable performance indicators can be assessed on a regular basis at the product level, but also be aggregated for monitoring overall CRP-RTB progress and impact. These indicators will focus on the key elements of the CRP-RTB vision of success—that is, *improving food security and nutrition, minimizing postharvest processing loss, alleviating poverty, and achieving greater income generation, with emphasis on gender equality*. Once the set of project-relevant CRP-RTB products are identified, research to impact pathways for each product will be explored in detail early on to establish a successive set of intermediate indicators. Progress along impact pathways will be assessed.

Project success will be measured on the basis of achievement of milestones and outcomes defined in the log frame. Product-specific measurable milestones, with clearly assigned roles and responsibilities of lead and partner institutions, will form the basis for all monitoring and reporting. Reporting on progress by measurable indicators will thus be done at the product level and aggregated up to PLs and CRP-RTB themes, which also form the major budget elements.

6. PROGRAM COSTS AND FINANCING

Table 2 shows a budget summary for the proposed project.

Table 2 Proposed IFAD Budget Summary (in EURO)²

Category	Year 1	Year 2	Year 3	Total Grant
Personnel	228,457	239,879	251,800	720,136
Supplies and services	195,483	177,521	183,527	556,530
Travel	67,263	68,094	68,948	204,305
Training	39,024	39,024	39,024	117,073
Equipment	34,147	—	—	34,147
CG Partners	211,301	211,301	211,301	633,903
National Partners	211,302	211,302	211,302	633,906
Grant Total	986,977	947,121	965,902	2,900,000

The assignment of budget to the CGIAR partners (Bioversity, CIAT, and IITA) and to the national partners—including national research organizations, NGOs, and private sector partners—will depend upon the portfolio of products and the linked research agenda that is identified during participatory, demand-led assessments.

7. FINANCIAL GOVERNANCE

7.1 Procurement Procedures for Goods, Services, and Human Resources

CIP and implementing partners will follow established policies on procurement procedures for goods, works, and services that are in accordance with the CGIAR Financial Guidelines, Series No. 6. The policies and procedures in these guidelines are designed to meet the following main principles effectively:

- Economy and efficiency to achieve quality, cost effectiveness, and timely delivery in procurement
- Equitable, fair, and open competition giving all eligible/qualified bidders an opportunity to participate
- Accountability and cost-effective use of funds
- Transparency of procurement process.

CIP has standard guidelines and procedures for the recruitment and employment of both international and locally hired staff at all of its locations.

7.2 Financial Controls

An integral part of CIP's financial management system is internal control. A proper system is designed to provide reasonable assurance that assets are safeguarded and transactions are properly recorded and executed to provide reliable financial information and minimize possibility of error, fraud, and misappropriation.

Currently, CIP uses a fully integrated in-house financial accounting system that allows all of its offices worldwide to connect via online. At the end of the 2012, CIP will implement Agresso Business World, by Unit4, a fully integrated role-focused Enterprise Resource Planning system. The system brings together financial accounting and core operational functionalities, including human resources, procurement, inventory, payroll, budgeting and forecasting, and grant and project management. This new system will provide not only operational efficiency, but also a high standard of internal control.

² A 20% overhead on CIP direct costs and 5% pass-through have been factored into the budget.

7.3 Accounting Specifications

CIP's accounting policies and reporting practices in preparing the financial statements are in accordance with the CGIAR Accounting Policies and Reporting Practices Financial Guidelines, Series No. 2. The guidelines follow relevant, internationally accepted accounting standards, U.S. generally accepted accounting standards applicable to not-for-profit organizations, and CGIAR accounting standards and practices.

7.4 Audited Financial Statements and Audit Reports

CIP's external audit is performed annually by a recognized and accredited public accounting firm. Ernst & Young performed the annual audit in 2011 on the Financial Statements and expressed the following opinion:

In our opinion, the aforementioned financial statements, present fairly, in all material respect, the financial position of the International Potato Center as of 31 December 2011 and their statements of activities, changes in net assets and cash flow for the year ended December 31, 2011 in conformity with the guidelines supported by the Accounting Policies of the CGIAR Financial Guidelines Series No. 2 - Accounting Policies and Reporting Practices Manual revised in March 2004 and updated in February 2006.

ANNEX A. RESULTS-BASED LOGICAL FRAMEWORK

	Objectively Verifiable Indicators	Means of Verification	Assumptions
Goal:			
Contribute to improved food security for RTB-producing communities in Eastern and Central Africa	<ul style="list-style-type: none"> • 25% increased consumption of RTB • Improved nutritional quality of 15% of consumption • 20% higher and more stable incomes of RTB producers • At least 3 more gender-equitable value chains 	Household consumption surveys Rapid appraisal of producer associations	
Objectives			
To improve food availability and income generation through better postharvest management and expanded use of RTB, based on: <ul style="list-style-type: none"> • Postharvest and processing technologies • Value chain assessment and development • Capacity development 	<ul style="list-style-type: none"> • Decreased RTB storage losses by 15% in value in pilot sites • 20% increased storage life of fresh RTB in pilot sites • 10% increased processing of RTB for on-farm use (where relevant) in pilot sites • 10% increased income from RTB and their products, including livestock where relevant, for rural producers in pilot sites • More equitable distribution of benefits between men and women in community 	Project baseline study and evaluation	<ul style="list-style-type: none"> • Macro-economic situation conducive to scaling out • Competitive position of RTB not undermined by subsidies to grains
Outputs			
1.1 Current RTB food availability situation assessed and priorities for improvement identified with key RTB production communities (women and men) and value chain actors	Four crop production and marketing assessments completed and organizational assessments of producers, etc. <ul style="list-style-type: none"> • Production constraints identified • PHL along the chains quantified according to relevant criteria for all crops • Marketing opportunity and constraints understood 	Project reports	
1.2 RTB technologies and their application for reducing PHL and expanding utilization inventoried and gaps for research identified	At least 10 technologies for each crop group inventoried and product development/pilot experiences reviewed via online sources and literature review and gaps identified	Website	
1.3 RTB varieties with improved postharvest characteristics identified, tested, and validated with target communities (women and men) and value chain actors across a range of production and storage environments	At least 6 RTB varieties with improved postharvest characteristics, including where relevant nutritional factors, selected for dissemination with stakeholder platform	<ul style="list-style-type: none"> • Project reports • M&E visits 	Functioning extension organizations with mandate for RTB
1.4 RTB on-farm storage and processing systems trialed and validated	At least 4 on-farm storing and processing technologies selected for dissemination with stakeholder platform	<ul style="list-style-type: none"> • Project reports • M&E visits 	
1.5 Other RTB technologies to reduce PHL and expand utilization validated	At least 4 other RTB technologies to reduce losses selected for dissemination with stakeholder platform	Minutes of stakeholder meeting	

	Objectively Verifiable Indicators	Means of Verification	Assumptions
2.1. Current RTB value chains and food access situation assessed and priorities for improvement and enhanced gender equity identified with key chain actors/stakeholders	Priorities for improvement shared and agreed with stakeholders in three value chains	Minutes of stakeholder meeting	Policy environment favorable to expanding RTB
2.2. New market opportunities to expand use of RTB assessed and prioritized with stakeholder participation	1 new market opportunity identified per RTB crop	Project reports	
2.3. RTB producer/processor groups strengthened for equitable participation and innovation in value chains	2 producer/processor groups strengthened per pilot site	<ul style="list-style-type: none"> • Project reports • M&E visits 	
2.4. Sustainable multistakeholder platforms for further RTB value chain innovation created with public/private sector and NGO and CBO participation	4 platforms created and operational (one per crop)	<ul style="list-style-type: none"> • Project reports • Stakeholder reports 	Sufficient demand creation to sustain enlarged value chain
3.1. Online platform containing documented methods, technologies, and knowledge products from Outputs 1–3, suited to target audiences (researchers, extension services, communities, health sector workers, etc.)	<ul style="list-style-type: none"> • 1 platform established and operational • Series of project publications available online and hard copy • No. of website hits • Targeted distribution of publications • No. of invited international participants to project events 	<ul style="list-style-type: none"> • Website • Series of project publications/knowledge products 	Adequate innovation absorption capacity
3.2. Capacity built in key national partners for reducing PHL and increasing use of RTB	3 training events held per RTB crop	<ul style="list-style-type: none"> • Project reports • Reports of national partners 	Stable partners committed to capacity development
3.3 Communication products to enable partners to disseminate outputs of research throughout agricultural knowledge and information systems developed	<ul style="list-style-type: none"> • Communications plan developed to guide project and identify target audiences, needs, and appropriate communication channels for delivery of strategic messages • At least 2 articles published and available in print and online • At least 3–5 presentations and posters given at fora and symposia • 5 technical manuals and protocols developed and disseminated 	<ul style="list-style-type: none"> • Project communications plan • Peer-reviewed journal articles • Presentations and posters • Standardized protocols for researchers and technicians • Reports, working papers, and datasets 	
Activities			
1.1 Conduct participatory RTB food availability assessments	At least 3 assessments conducted	Online inventory	
1.2 Liaise with RTB R&D organizations and researchers in Eastern Africa and internationally	At least 25 R&D organizations involved in compiling list	Online inventory	

	Objectively Verifiable Indicators	Means of Verification	Assumptions
to compile list of current technology and previous experiences from formal and gray literature			
1.3 Search catalogues by crop to identify advanced materials and varieties with improved postharvest traits	At least 10 technologies and varieties identified per crop	Online inventory	
1.4 Conduct village-level diagnosis to identify key postharvest constraints and market and organizational constraints for expanded utilization of targeted crops	At least 6 village-level diagnosis completed	Project reports	
1.5 Conduct an assessment of RTB along the value chains to quantify PHL and identify causes at different steps in the value chain	6 PHL assessments in value chains completed	Project reports	
1.6 Establish village-level research groups including women and men for RTB postharvest research	<ul style="list-style-type: none"> • At least 8 village-level research groups established • RTB variety trials completed in 3 pilot sites • Storage and processing trials completed in 3 sites with both women and men in research groups 	Field books of local research groups	
2.1 Identify and prioritize value chain opportunities in RTB where there is a significant role for postharvest technologies, marketing, and organizational innovations	At least 5 value chain opportunities identified	Online inventory	
2.2 Conduct participatory market mapping to identify key postharvest and utilization constraints and opportunities across targeted value chains	At least 3 participatory mapping studies conducted	Project reports	
2.3 Training of RTB producer and processor groups in innovation and market analysis	At least 15 producer and processor groups trained	Participant scores in end of training test	
2.4 Organize stakeholder meetings for innovation in postharvest and value added in value chains	At least 5 stakeholder meetings held per year in three stakeholder platforms	Minutes of meetings	
3.1 Set up online documentation platform	At least 150 inventory items in online platform available	Website	
3.2 Organize training activities in PHL technologies and on conducting PHL assessments at national level	At least 3 national training activities in PHL conducted	Workshop reports	
3.3 Documenting, presenting, and publishing project activities and results	At least one synthesis document available at end of each year	Project reports	

ANNEX B. LINKAGES TO BE EXPLOITED AMONGST THE CRP-RTB'S THEMES, PLs, PRODUCTS, AND OUTPUTS

Relevant PL	Relevant Products	Link with PH Proposal
Theme 1: Conserving and accessing genetic resources		
1.1.1: Ex-situ and in-situ conservation methodologies optimized	1.1.1.4 Identifying in-situ data sources and best practices for traditional knowledge management of RTB crops	Information-sharing opportunity
Theme 2: Accelerating the Development and Selection of Cultivars with Higher, More Stable Yield and Added Value		
2.1.1: Breeding tools, strategies, and approaches	2.1.1.3 Efficient analytical techniques and procedures: user-friendly web access to NIRS scales for relevant nutritional and other quality traits	Can inform Output 1.3: <i>RTB varieties with improved postharvest characteristics identified, tested, and validated with target communities and value chain actors across a range of production and storage environments</i>
2.1.3: Population development and pre-breeding	2.1.3.1 Accelerated breeding strategies for population improvement (2014)	Can inform Output 1.3 and vice versa
2.1.4: Variety development	2.1.4.3 Data management platforms (2015)	Can inform Output 1.3 and vice versa
2.1.5: Aligning research with farmers' and end-users' priorities	2.1.5.1 Reinforced methodologies to increase adoption of new varieties (2014) 2.1.5.2 Tools for identifying end-users' preferences (2015) 2.1.5.3 Common framework for the interaction with private seed or processing companies and PPP (2014)	Can inform Output 1.3 and vice versa and Output 2.4: <i>Sustainable multistakeholder platform for further RTB value chain innovation created with public/private sector and NGO and CBO participation</i>
Theme 3: Managing priority pests and diseases		
3.1.2: Ecology, biology, and epidemiology of pests and diseases	3.1.2.3 Role of plant health in disease suppression better understood and utilized (2014)	Information sharing regarding PH pests and diseases and to pests and diseases that influence PH quality (Outputs 1.2, 1.4–1.5)
Theme 4: Making available low-cost, high-quality planting material for farmers		
4.3.1: Farmer-based quality seed production and management	4.3.1.1: Platform for enhanced knowledge sharing about methods for characterizing and reaching priority farmer clients, on-farm clean seed production and on-farm seed-borne disease management, including approaches to capacity building and scaling out (2016) 4.3.1.2: Quality declared seed approaches assessed for their contribution to improving seed systems in RTB (2016)	Information-sharing opportunity. Quality planting material essential for high-quality products. Output 1.1: <i>Current RTB food availability situation assessed and priorities for improvement identified with key RTB production communities and value chain actors</i> ; Outputs 1.3; 2.1: <i>Current RTB value chains and food access situation assessed and priorities for improvement and enhanced gender equity identified with key chain actors/ stakeholders</i> ; and Output 3.2: <i>Capacity built in key national partners for reducing postharvest losses and increasing use of RTB</i>

Relevant PL	Relevant Products	Link with PH Proposal
Theme 5: Developing tools for more productive, ecologically robust cropping systems		
5.1.2: Increasing productivity in RTB cropping systems through nutrient/water/light management practices	5.1.2.1. Approaches to improve nutrient supply, recycling and efficiency, considering soil and climatic interactions, for small holders validated (2016)	Can inform Output 1.1
Theme 6: Promoting postharvest technologies, value chains, and market opportunities		
Theme 7: Enhancing impact through partnerships		
7.1: Targeting and setting priorities	7.1.1 Improved databases developed with baseline data on RTB production, consumption, and trade with data at sub-national level and for different relevant groups, including socioeconomic characterization of producers by income group, poverty and nutrition indicators, and gender (2014) 7.1.2 Participatory needs and opportunities analyses for CRP-RTB in hotspots (2015) 7.1.3 Strategic economic and geospatial analyses for targeting and priority setting 7.1.4 Overlays of maps identifying CRP-RTB target areas by crop ecology, crop production, and poverty/food security indicators (2012)	Information-sharing opportunity (Outputs 1.1–1.3, 1.5, 2.1, 2.2) Synergy with Outputs 3.1, 3.2
7.3 Communication and knowledge sharing	7.3.1 RTB web portal online with space for partners' interaction and linked social media (2013) 7.3.2 Digital RTB knowledge resource centers 7.3.3 Enhanced planning, information exchange, and documentation, including interviews with stakeholders, in existing RTB meetings and symposia (2014) 7.3.5 Promotion and advocacy of RTB crops, systems, knowledge, and technologies 7.3.6 Tools to enhance internal communication among partner centers (2013) 7.3.7 Enhanced RTB knowledge-sharing platforms (2014)	Synergy with Outputs 3.1, 3.2
7.4 Capacity-strengthening (guidelines, tools, methods, good practices)	7.4.3 Research on capacity-strengthening network (2013) 7.4.4 Enhanced effectiveness of capacity strengthening 7.4.5 Online and blended training courses 7.4.7 Professional and student fellowships (annually 2012–2014)	Synergy with Outputs 3.1, 3.2
7.5 Outcome and impact assessment	7.5.1 Shared methodology for impact assessment, with disaggregated poverty and gender impacts (2013) 7.5.4 New impact assessment methods for RTB research are developed and empirically tested (2014)	This can inform M&E activities of PH project

ANNEX C. CROP PRODUCT TABLES

Cassava

Product	Option 1	Option 2	Option 3
	Fresh Roots	Chips	Starch
Selection criteria	<ul style="list-style-type: none"> • Famine reserve crop for Uganda • High-calorie staple food for most homes 	<ul style="list-style-type: none"> • Local and international market demand for <ul style="list-style-type: none"> ○ livestock feed ○ flour production ○ beer production 	<ul style="list-style-type: none"> • Growing industrial demand
Markets/ utilization	<ul style="list-style-type: none"> • Urban and rural households 	<ul style="list-style-type: none"> • Household utilization • Industrial markets <ul style="list-style-type: none"> ○ regional ○ international 	<ul style="list-style-type: none"> • Industrial markets <ul style="list-style-type: none"> ○ domestic ○ regional ○ international
Postharvest constraints	<ul style="list-style-type: none"> • High perishability • Short shelf life after harvest 	<ul style="list-style-type: none"> • Drying technologies <ul style="list-style-type: none"> ○ ineffective ○ inefficient • Low dry matter (DM) varieties • Inappropriate harvest age leading to low yield • Poor household processing 	<ul style="list-style-type: none"> • Low competitiveness with alternative starch sources and with other suppliers <ul style="list-style-type: none"> ○ low DM varieties ○ poor production practices ○ inefficient processing technologies
Research agenda	<ul style="list-style-type: none"> • Prolonged shelf life <ul style="list-style-type: none"> ○ varietal selection ○ postharvest technology • Nutrient enhancement <ul style="list-style-type: none"> ○ varietal selection 	<ul style="list-style-type: none"> • Identify optimal chip size for optimal drying • High DM varietal selection • Developing processing by-products 	<ul style="list-style-type: none"> • High DM varietal selection • More efficient production practices • Improved processing technologies • Developing processing by-products
Possible sites	Masindi, Lango subregion, and Acholi subregion	Teso subregion, Paliisa, Tororo, Busia, West Nile region	Lango subregion, Busoga region, Acholi subregion, West Nile, Masindi
Gender consideration	Assisting women who are responsible for household food security	Develop gender-friendly technologies, such as the chippers and dryers, for women processors	Improve women's income from value addition

Sweetpotato

Product	Option 1	Option 2
	Fresh Roots and Vines for Food and Feed	Sweetpotato Composite Flours
Selection criteria	<ul style="list-style-type: none"> • For food security and famine reserve • Highly nutritious, such as vitamin A 	<ul style="list-style-type: none"> • Potential to add value • To overcome short shelf life
Markets/ utilization	<ul style="list-style-type: none"> • Home consumption and utilization 	<ul style="list-style-type: none"> • Food industry
Postharvest constraints	<ul style="list-style-type: none"> • Weak chain from producer to buyer <ul style="list-style-type: none"> ○ rapid perishability ○ bulkiness for transport • Unavailability of seed during dry season • Seasonality of root availability <ul style="list-style-type: none"> ○ seasonal price fluctuation • Short shelf life without proper storage technologies 	<ul style="list-style-type: none"> • Narrow utilization base and unidentified demand • Lack of suitable high DM varieties • Low drying and processing techniques • Lack of storage and packaging technologies for flour
Research agenda	<ul style="list-style-type: none"> • Varietal improvement to increase micronutrient levels and stability postharvest • Fresh root value chain analysis • Storage technologies (merge indigenous knowledge with improved technologies) <ul style="list-style-type: none"> ○ protection from pests ○ prolonged shelf life 	<ul style="list-style-type: none"> • Value chain analysis to assess demand and economic feasibility • Screening for high DM varieties • Develop processing technologies • Shelf-life stability (processing and storage options for flours)
Potential sites	<ul style="list-style-type: none"> • Eastern and Central Uganda 	<ul style="list-style-type: none"> • Eastern and Central Uganda
Gender consideration	<ul style="list-style-type: none"> • Women predominate sweetpotato production and feeding the family • Women, elderly, and children more prone to vitamin A deficiency 	<ul style="list-style-type: none"> • Women have predominate role in processing and would be the ones to process and receive the value addition

Banana

	Option 1	Option 2	Option 3
Product	Market-acceptable Fresh Cooking and Desert Fruit with Long Shelf Life and Minimal PH Damage	High-quality Beverages (wine and gin) Targeted for Urban and Export Markets	Instant Mashed Cooking Banana Product (instant Matooke)
Selection criteria	<ul style="list-style-type: none"> The need to exploit new market opportunities and increase investment in the banana subsector The need to reduce postharvest loss (PHL) The need to diversify products on market The need to increase shelf life of desert bananas 	<ul style="list-style-type: none"> Utilization of surplus cooking-banana production during peak season (wine) Increased use of cooking-banana biodiversity (wine) Demand for beer-banana outstrips supply (gin) Suitable for both on-farm and industrial processing (wine and gin) Add value for farmers in marginal (beer) banana areas (gin) 	<ul style="list-style-type: none"> Need for exploiting new market opportunities Matooke is the traditional and most popular dish in Uganda Preparation of Matooke is labor and time consuming Utilization of surplus production during peak season
Markets/ utilization	<ul style="list-style-type: none"> Fresh fruit for rural, urban and export markets 	<ul style="list-style-type: none"> Rural, urban, and regional markets Utilization of residues for feed/soil amendments 	<ul style="list-style-type: none"> Urban and export markets
Postharvest constraints	<ul style="list-style-type: none"> PHL not quantified along the banana value chains Biochemical and physiological processes associated with fruit ripening in local varieties are not clearly understood Cultivar susceptibility to postharvest fruit diseases not yet determined Optimum harvest time for different cultivars not yet determined Potential demand for differentiated fresh fruit along the value chain is not determined 	<ul style="list-style-type: none"> No clear quality standards for banana-based beverages (wine and gin) Cost-benefit for various processing methods not known (wine and gin) Juice properties of various beer-banana cultivars not established (gin) Qualities of banana wines from different cultivars and age not yet known Cost-effectiveness of Current marketing approaches/practices not known 	<ul style="list-style-type: none"> The Presidential Initiative in Banana Industrialization (PIBID) mean to, but not yet, develop such a product Start-up investments of a factory is high Consumer acceptability not yet known PIBID experiences showed farmers' unwillingness to sell raw material at low prices to factory
Research agenda	<ul style="list-style-type: none"> Quantify PHL along the value chains Evaluate biochemical and physiological qualities associated with ripening of selected cultivars Evaluate extended shelf life, susceptibility to PH diseases, PH damage resistance in relation to consumer preferences Evaluate best harvest age across cultivars Evaluate best harvesting 	<ul style="list-style-type: none"> Determine best practices to optimize juice yields (gin) Analyze costs-benefits of all processing methods (wine and gin) Assess market demand for improved banana-based beverages (wine and gin) Establish quality procedures/standards (wine and gin) Evaluate juice properties across cultivars (gin) Develop various products based on cultivar and age 	<ul style="list-style-type: none"> Analyze cost-benefits of instant matooke processing Assess consumer acceptability Developing parameters for processing instant Matooke

	Option 1	Option 2	Option 3
Product	Market-acceptable Fresh Cooking and Desert Fruit with Long Shelf Life and Minimal PH Damage techniques <ul style="list-style-type: none"> Assess value chains of various fresh fruit 	High-quality Beverages (wine and gin) Targeted for Urban and Export Markets (wine and gin) <ul style="list-style-type: none"> Evaluate marketing strategies to identify areas for improvement (wine and gin) 	Instant Mashed Cooking Banana Product (instant Matooke)
Sites	<ul style="list-style-type: none"> Cooking bananas: Rakai, Bushenyi Desert bananas: Mukono, Mubende 	<ul style="list-style-type: none"> Wine: areas with high production of cooking banana such as Bushenyi Gin: areas with high production of beer-bananas such as Luwero and Kiboga 	<ul style="list-style-type: none"> Areas with high production such as Mbarara, Bushenyi
Gender	<ul style="list-style-type: none"> Men and women have different roles in banana production and cultivar diversity is maintained on farm by women Rural-urban wholesale is dominated by men, while women dominate urban market retailing Purchase and preparation of cooking bananas mainly by women 	<ul style="list-style-type: none"> Wine: women provide processing while men control marketing Gin: women and men of all ages process, while young men take on labor-intensive aspects of work Gin: child-bearing or elderly women retail in rural bars All members of household are affected by alcoholism; men more likely have problems with alcohol 	<ul style="list-style-type: none"> Instant Matooke could considerably reduce labor and time women spent on food preparation; this is especially valuable for urban working women A instant-Matooke processing factory could provide employment for rural men and women

Potato

Products	Option 1	Option 2
	Ware Potato (table potato) + Seed Potato	Processed Products*
Selection criteria	<ul style="list-style-type: none"> • High urban and rural demand for table potato • High income source for potato farmers • High potential for export • Short growing season, allowing 3 crops a year 	<ul style="list-style-type: none"> • High urban demand for processed potatoes • High potential for export
Market/ utilization	<ul style="list-style-type: none"> • Staple food in potato growing region • Local and regional markets (E. African Region) 	<ul style="list-style-type: none"> • Local and regional markets (E. African Region)
Constraints	<ul style="list-style-type: none"> • Poverty (cash flow constraint) forces farmers to sell table potato early at very low prices • Lack of appropriate storage technologies • Pest and diseases • Poor harvest techniques 	<ul style="list-style-type: none"> • Instability of the raw materials prices (potatoes) and other inputs • Lack of adapted varieties with good processing qualities • Lack of storage facilities
Research agenda	<ul style="list-style-type: none"> • Assess appropriate storage facilities for increased shelf life • Management of both in-field and postharvest diseases and pests • Selection of appropriate varieties • Test models for the best access to credit 	<ul style="list-style-type: none"> • Research in appropriate storage facilities for increased shelf life • Management of both in-field and postharvest diseases and pests • Selection of appropriate processing varieties
Sites	<ul style="list-style-type: none"> • Southwestern region and eastern region in the Mt. Elgon area 	<ul style="list-style-type: none"> • Southwestern region and eastern region in the Mt. Elgon area and central region (Kampala)
Gender	<ul style="list-style-type: none"> • Equity in sharing and utilization of outcomes from the potato industry by women, youth, and men 	<ul style="list-style-type: none"> • Equity in sharing and utilization of outcomes from the potato industry by women, youth, and men

*Process products: crisps (snacks), chips (French fries), potato starch, frozen potato (fries), potato flour, feed (potato peels)



The **International Potato Center** (known by its Spanish acronym CIP) is a research-for-development organization with a focus on potato, sweetpotato, and Andean roots and tubers. CIP is dedicated to delivering sustainable science-based solutions to the pressing world issues of hunger, poverty, gender equity, climate change and the preservation of our Earth's fragile biodiversity and natural resources.



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