

Progress Report

2nd YEAR

Project Title: **Expanding Utilization of RTB and Reducing Their Postharvest Losses**

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**International Potato Center (CIP) on behalf of the
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to

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ACRONYMS AND ABBREVIATIONS

AFRII	Africa Innovations Institute
BugizARDI	Buginyanya Agricultural Research and Development Institute
CBO	Community-based Organization
CGIAR	Consultative Group on International Agriculture Research
CHAIN Uganda	Coalition for Health, Agriculture and Income Networks
CIAT	International Centre for Tropical Agriculture
CIP	International Potato Center
CIRAD	French Agricultural Research Centre for International Development
CoP	Community of Practice
EC	European Commission
IFAD	International Fund for Agricultural Development
IFDC	International Fertilizer Development Center
IIRR	International Institute of Rural Reconstruction
IITA	International Institute for Tropical Agriculture
ILRI	International Livestock Research Institute
LoU	Letter of Understanding
MAIF	Ministry of Agriculture, Animal Industries and Fisheries
MBADIFA	Mbarara District Farmers' Association
MUZARDI	Mukono Zonal Agricultural Research Institute
NaCRRRI	National Crop Resources Research Institute
NaLiRRI	National Livestock Resources Research Institute
NARL	National Agriculture Research Laboratories
NARO	National Agricultural Research Organisation
NGO	Non-Governmental Organization
PI	Principal Investigator
PIM	CGIAR Research Program on Policy, Institution and Markets
PMCA	Participatory Market Chain Approach
PHL	Postharvest losses
PPD	Postharvest physiological deterioration
PPM	Pig Production and Marketing Uganda Ltd
RH	Relative humidity storage
RTB	Roots, Tubers and Bananas
RTB	CGIAR Research Program on Roots, Tubers and Banana
SSA	Sub-Saharan Africa
UFPEVA	Uganda Fruits and Vegetable Exporters and Producers Association
UMU	Uganda Martyrs University
VEDCO	Volunteer Efforts for Development Concerns
WCRTC	World Congress of Root and Tuber Crops

SUMMARY REPORT

In Sub-Saharan Africa, root, tuber and banana crops are characterized by high postharvest losses (PHL), short marketing channels and limited value adding due to their bulkiness and high perishability, poor postharvest management and lack of storage and processing facilities. The *Expanding Utilization of RTB and Reducing Their Postharvest Losses* (RTB-ENDURE) project is addressing these constraints by testing and validating technological, commercial and institutional innovations for improved postharvest management, expanded processing and targeting changing needs of emerging urban markets in a bid to reposition RTB crops as added-value cash crops. In particular the project assesses the innovations' technical feasibility, economic viability and social acceptability for male and female value chain actors. The project is a 3-year initiative (2014-2016) implemented in Uganda by the CIP-led CGIAR Research Program on Roots, Tubers and Bananas (RTB) with funding from the European Union and technical support of IFAD.

Since the project aims at stimulating innovation processes; specific activities were impossible to predict at the outset. The Participatory Market Chain Approach (PMCA) adopted by the project recognizes that they emerge from the participatory process itself, driven by opportunities identified by the private and public actors involved. Therefore, during the first year, the project set up a participatory process to catalyze cooperation and jointly identify postharvest research needs for RTB crops. This was followed by *ad hoc* capacity strengthening of the research teams and the selection of the best-bet interventions for four key RTB crops in the country; namely, banana, sweetpotato, potato and cassava. These are important food security and income generating crops in Uganda, which make it an ideal country to test innovations and share knowledge on cross-crop issues. In fact, although each of the four research sub-projects is unique in design, substantial complementarities exist in approach and participatory methodologies for value chain development and gender mainstreaming, thus offering opportunities for cross-crop learning and integration. The ultimate goal is identifying promising innovations that can be applied elsewhere in the region.

The banana sub-project aims at identifying varieties, pre- and postharvest practices for evening-out the market supply and diversify the way cooking banana is sold in order to reduce PHL and provide value addition opportunities along the value chain. During the reporting period, 10 mother gardens and four macro-propagation chambers were established and host farmers groups trained to enhance access to clean planting material of selected varieties and research in multiplication techniques is underway. The effectiveness of sucker staggering in evening out supplies and reducing PHL is being tested with 56 pilot farmers and trials to estimate the optimal harvest time for enhanced postharvest properties commenced. Piloting of convenient presentation forms (bunches, clusters, unpeeled and peeled fingers) coupled with better handling practices, cushioning and a weight-based pricing mechanism is ongoing with the participation of farmers, wholesalers, retailers and supermarkets. Trainings were provided to increase the capacities of farmers in sucker staggering (266 farmers) and to comply with stringent food safety and quality standards of exporters and supermarkets (222 farmers). Storage temperature experiments started and preliminary results show high potentials for extending the shelf-life of the different presentation forms. Findings from a market and value chain analysis confirmed, among the others, the challenge of seasonality, high level of PHL and demand for the proposed innovations. A study to understand gender, natural, institutional and policy context of the value chain and how these

can be harnessed to promote adoption of innovations and equitable benefits sharing was also completed. The team is linking up with the Western region banana platform and is part of the efforts for establishing the national platform.

The sweetpotato sub-project aims at improving the utilization of sweetpotato residues as pig feed. Opportunities for on-farm silage making using vines and non-commercial roots as well as for silage making as a business and for the provision of related services (e.g. mobile choppers) are being tested. During 2015 an assessment of the current feeding practices of 16 pilot and 8 control farmers was conducted to generate baseline data. The 1st round of on-station trials to evaluate four dual-purpose varieties and different cutting regimes was concluded and other on-station/on-farm trials are underway. Preliminary findings indicate that two varieties are particularly suitable for producing both food and feed. Microsilos trials to evaluate options for silage supplementation were concluded and four treatments were selected for digestibility and on-station/on-farm feeding trials. Initial data collection for an in-depth study to assess potentials for silage making and commercialization was completed. Local implementing partners and 277 farmers were trained in a number of areas, including on biosecurity measures and silage making. Training materials were produced accordingly. Finally, some of the existing pig platforms that have been financially supported by ILRI until recently were facilitated.

The potato sub-project aims at testing varieties, pre-harvest and storage innovations to reduce production gluts and PHL. During the reporting period, the 1st season of on-station evaluation of new CIP clones and varieties commonly grown elsewhere in Uganda was completed and the 2nd season is underway. The construction of four collective ambient stores was finalized and the 1st round of assessments of stored potatoes commenced. The design of the individual stores has been finalized and 12 farmers have been selected for hosting them. Farmers' potato will be also analyzed to assess the storability of different varieties and the potential for shelf-life extension. The evaluation of the impact of improved pre-harvest practices (dehauling) and harvesting methods on storability is ongoing. Data for the market and value chain study were collected and data analysis and report writing are underway. Based on the findings of business capacity need assessments of the associations hosting the collective stores, a curriculum for management and business skills training was developed and several trainings have been provided to 119 farmers. The team is establishing an Eastern region potato platform from scratch.

The cassava sub-project tests varieties, agronomic innovations and postharvest technologies for extending the shelf-life of the roots. During the reporting period six researchers participated in a 9-day training organized by CIAT Colombia to strengthen their capacities in postharvest physiological deterioration (PPD) assessment and shelf-life extension, being these technologies completely new in Uganda. 17 varieties were analysed to determine varietal differences in PPD and, in turns, how this affects the root quality. Large varietal difference in PPD was found. On-station trials and sensory evaluations were conducted to assess the effectiveness of two shelf-life extension technologies (waxing and high relative humidity storage) as well as pruning. Preliminary findings show that pruning can considerably slow PPD down and improve the taste of cassava. Furthermore, in combination with the two proposed technologies, it can extend the shelf-life to several weeks. One farmers group and one trader were selected to host pilot pack-houses whose construction is scheduled for early 2016. Selected farmers (25) and traders (5) were trained in agronomic practices conducive to shelf-life extension

(i.e. pruning, ridging, planting techniques and improved harvesting methods) that are being piloted on farm. A market and value chain analysis was finalized. Finally, the team developed plans for revamping and strengthening the multistakeholder platforms operating around the project sites.

Overall, despite a number of challenges, the project is progressing well. A number of research outputs have been already produced and disseminated through scientific publications, symposia and the project website. Strong partnerships have been established within the commodity teams, among them and also between the research teams and other organizations and programmes operating in the RTB arena in Uganda. In this regard, it is worth noticing that all members of the RTB CGIAR Research Programme and several national partners working in R&D of RTB crops are involved in the implementation of the project that represents, as recognized in the final report of the RTB evaluation recently conducted by the CGIAR Independent Evaluation Arrangement, an excellent example of the collegial research that the programme aims at promoting and facilitating. In spite of these promising results, a lot is still to be done before the project ends and initial thoughts should be given on how to promote the adoption of the innovations that will be successfully validated, so that the research outputs may lead to development outcomes. While this is expected to be facilitated by the current involvement of private sector players, additional research and follow up support may be needed and, by developing several diverse business plans, the project is paving the way for possible interventions beyond the timeframe of the current one.

MAIN REPORT

Project Title: Expanding Utilization of RTB and Reducing Their Postharvest Losses (RTB-ENDURE)

I. BACKGROUND

Project goal: Contribute to improved food security for RTB-producing communities in Eastern and Central Africa

Project objectives: 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 assessment and development; 3) Capacity development.

Specific objectives

- Decreased RTB storage losses by 15% in pilot sites;
- 20% increased shelf-life of fresh RTB in pilot sites;
- 10% increased processing of RTB for on-farm use in pilot sites;
- 10% increased income from RTB and their products, including livestock where relevant, for rural producers in pilot sites;
- Increased participation of women in higher and more profitable levels of the value chain and more equitable distribution of benefits between men and women in the community;
- NARS, development organization and private sector players engaged in a continuous collaborative innovation process to tackle different constraints in RTB value chains.

Details about how each project component contribute towards the project's broader objectives can be found in Annex 1 and in the project logframe (see Appendix 1).

Project Components

The project consists of four sub-projects that have been defined in the course of the first year ("preparatory phase"), as described in Section II. Although each research sub-project is unique in design, substantial complementarities exist in approach and participatory methodologies for value chain development, thus offering opportunities for cross-crop learning and integration. The four sub-projects are briefly outlined here below:

- **Reducing postharvest losses and promoting product differentiation in cooking banana value chain**

The cooking banana value chain is characterized by high postharvest losses (PHL) due to short shelf-life of bananas, highly seasonal production and poor postharvest handling. Furthermore, there are opportunities to promote product differentiation through different presentation forms of bananas and new marketing approaches. This sub-project i) explores ways to reduce PHL and even out annual supplies through use of diverse varieties and sucker staggering; ii) investigates options for upgrading storage, transport and marketing in response to changing consumers' preferences; iii) studies the feasibility of introducing a weight-based pricing mechanism; and iv) strengthens the capacities of value chain actors to respond effectively to emerging market opportunities.

The research team is led by Bioversity International and comprises IITA, CIRAD, NARO, the Ssemwanga Centre for Agriculture and Food Ltd., Kaika InvestCo, Uganda Fruits and Vegetable Exporters and Producers Association (UFVEPA) and other value chain actors in Isingiro, Rakai and Kampala districts.

- **Improving the utilization of sweetpotato and other root and tuber crops residues for pig feeds**

Feeding is one of the main production constraints for smallholder pig farmers due to the seasonality, high cost and poor quality of feeds; coupled with limited knowledge of supplementation strategies. As a coping strategy, farmers extensively use crop residues, grasses, weeds and kitchen leftovers to feed their animals. Sweetpotato vines are the most commonly used fodder but they are highly seasonal and perishable. Simple silage making for feed conservation combined with strategic supplementation is an easy and affordable option for pig feeding during periods of feed scarcity and will contribute to reduce wastage of sweetpotato residues. This sub-project i) investigates options for silage making and supplementation; ii) identifies models for proper organization of value chain actors for production, conservation and marketing of sweetpotato-based feeds; iii) strengthens the existing linkages between pig farmers and sweetpotato traders; and iv) builds business capacity for profitable silage making and pig raising.

The research team is led by CIP and comprises the International Livestock Research Institute (ILRI), NARO, VEDCO, CHAIN-Uganda, Iowa State University, Makerere University, Uganda Martyrs University, Pig Production and Marketing Ltd. and other value chain actors in Masaka and Kamuli districts.

- **Postharvest innovations for better access to specialized ware potato markets**

In eastern Uganda there are two potato cropping seasons. The market supply is highly seasonal, with period of gluts and scarcity and, therefore, high price fluctuations. The team aims at exploring the opportunity to take advantage of the higher price during the off-season by expanding the cropping period and introducing storage technologies. This will ensure higher and more stable income for small-scale farmers and consistent market supplies. In particular, this sub-project i) assesses the effect of variety, local climatic conditions, pre-harvest and harvest practices on storability of ware potatoes; ii) exploits varietal differences in maturity and dormancy to prolong harvest and marketing periods; iii) strengthens business skills and collective marketing; and iv) identifies gender-sensitive approaches to ensure gender equity in exploiting new market opportunities.

The research team is led by CIP and comprises NARO, Self Help Africa, Makerere University and other value chain actors in Kapchorwa, Mbale and Kampala districts.

- **Extending the shelf-life of fresh cassava roots for increased incomes and postharvest loss reduction**

Cassava roots are characterized by very short shelf-life due to rapid postharvest physiological deterioration (PPD). This results in substantial level of price discount during marketing. Innovations that prolong the shelf-life of fresh roots are demanded by farmers and traders to reduce PHL, relieve marketing pressures and target new markets. Using lessons learnt from West Africa and Latin America, the project will assess the feasibility of introducing two shelf-life extension technologies, namely high relative humidity storage and waxing of the fresh roots. This sub-project i) identifies the market segments for fresh cassava and best marketing models; ii) assesses PPD of different varieties and study the effectiveness of the shelf-life extension technologies; iii) investigates the effect of the treatment on eating quality and safety; and iv) promotes South-South collaboration and knowledge sharing for capacity strengthening.

The research team is led by IITA and comprises CIAT, NARO, CIRAD, International Institute of Rural Reconstruction (IIRR), Makerere University, Kyambogo University and value chain actors in Masindi, Kabarole and Kampala districts.

II. IMPLEMENTATION PROGRESS:

A. Project expenditure by year

Total Project Budget	Year 1	Year 2	Year 3	Total Expenditure
Funds received				
Expenditure				
Balance				

B. Brief comments on expenditure

C. Summary of Progress in Year 1

It is possible to identify two main phases of the project: a “preparatory phase” and a “research implementation phase”. The first year of the project can be referred to as “preparatory phase”.

The preparatory phase has primarily entailed the establishment of crop specific research teams, a preliminary identification of the postharvest innovations to work on, a validation of the proposed innovations and the selection of the most promising ones to be tested and validated during the research implementation phase. Furthermore, training and capacity building activities have been conducted to strengthen the required capacities of the different teams in order to successfully contribute to achieve the overall project objectives.

During the inception workshop in March 2014, the participants were facilitated to form crop specific research teams (potato, banana, sweetpotato and cassava) for jointly identifying some postharvest innovations with high potential to contribute to the project objectives. The different teams included representatives of various CG (CIP, IITA, CIAT, Bioversity International and ILRI) and non-CG potential partners (CIRAD, NARO, MAIF, Makerere University, NGOs, private sector, etc.). Each team, taking also into account the outcomes of a planning workshop held in mid-2012,

selected one to two options and developed short proposals for undertaking scoping studies for exploring and validating the feasibility, likely adoption and potential impact of the proposed interventions. Following *ad hoc* facilitation (e.g. training sessions on gender responsive market studies and analysis) and based on the results of the scoping studies, the four teams developed and submitted seven business cases for research funding.

Even though continuous support has been provided to the different teams in order to help them strengthening their proposals, during the preparatory phase the project has adopted a rather competitive approach and the teams were aware that only the most robust and convincing options would have been funded. The business cases went through rounds of internal (by the project management and the project's Process Committee that was established at the inception of the project in order to guide the process of developing and selecting the options for subsequent research implementation) and external reviews (by leading experts in the area of RTB postharvest and value chains). Finally, four research options have been selected for funding, one for each crop. They are outlined in Section I.

The selection of the four research options to be funded officially closed the "preparatory phase" and marked the beginning of the "research implementation phase" (a meeting-cum-training workshop was organized in December 2014 to officially launch the new phase). The different team members had worked together for a number of months for jointly identifying and analysing new market opportunities and the most promising innovations. The scoping activities and the development of the business cases had contributed to validate (or otherwise) some of their preliminary assumptions and strengthen the teams' social capital and capacity to conduct research in partnership. By the end of the first year, all research teams had been brought up to speed about the expected project outputs and outcomes and their capacities to implement the Participatory Market Chain Approach (PMCA) methodology and mainstream gender in their research activities have been strengthened.¹ The four teams could now confidently move into the research implementation phase and conduct on the ground testing to provide evidence of their proof of concepts and of the technical feasibility, economic viability and social acceptability of the proposed innovations.

At the end of the year, a Steering Committee has been established to provide *ad hoc* guidance to the project management team. The Steering Committee took over the responsibilities of the project's Process Committee.

Upon recommendations from the Steering Committee, and following rounds of consultations with the Principal Investigators (PIs), it has been decided to identify a shorter name to be used along with the original one in order to facilitate the communication and improve the visibility of the project. The name RTB-ENDURE (ExpaNDing Utilization through Research) has been selected.

More details of project's activities and outputs during the preparatory phase can be found in the 1st Progress Report submitted to IFAD in 2015 and accessible at the project website. At the project website it is also possible to access the following documents produced during year 2014: i) Report of Inception Meeting (March

¹ The PMCA is a methodology developed by CIP in order to help small farmers link up with profitable markets by stimulating innovation process and long-term partnerships among farmers, market agents, and service providers. It requires improving communication, building trust and facilitating collaboration among participants so that they can jointly identify, analyse, and exploit new market opportunities.

2014); ii) Report of PMCA Training Workshop (June 2014); iii) Report Meeting-cum-Training Workshop (December 2014); and iv) Business Cases and Posters of the four funded and three non-funded research options.

D. Progress by Outputs

The project consists of 12 outputs. In order to keep the main report short, only information about the current status and a brief description of the achievements and progress against the targets are presented in this section. More details are available in Appendix 2.

Output 1.1: Current main RTB postharvest challenges and priorities for improvement identified with key RTB production communities (women and men) and value chain actors.

Status: Completed

Narrative: During the inception workshop in March 2014 four crop-specific multi-agency teams were established to jointly identify the main RTB postharvest challenges, opportunities and priorities. Taking also into account the outcomes of the planning meeting held in mid-2012, seven preliminary business cases for research were developed by the teams. Following training to equip the teams in adopting the PMCA approach and tools, scoping studies were conducted to validate initial hypotheses and assumptions. Based on the findings of the scoping studies, final business cases for research funding were produced.

Output 1.2: RTB technologies and their application for reducing PHL and expanding utilization prioritized and gaps for research identified

Status: Completed

Narrative: The scoping studies conducted by the four teams entailed a review of relevant literature and collection of primary data. The seven business cases presented options for funding research around a number of technologies and other innovations. Eventually, following the feedback received by lead experts during a specific poster session organized during the 2014 RTB Annual Review and Planning meeting as well as transparent internal and external reviews of the business cases, four were selected for funding in October 2014 (the sub-projects).

Output 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, marketing and storage environments

Status: On-going

Narrative: Banana - Four varieties have been participatory selected because of market preference or longer shelf-life. Ten mother gardens have been established, supplied with tissue culture plantlets and linked to farmers groups hosting macro-propagation chambers to enhance farmers' access to clean planting material as well as conducting research and strengthening capacities in multiplication techniques. Sweetpotato - The 1st round of on-station trials to evaluate four dual-purpose varieties and different cutting regimes has been concluded and the 2nd round for determining the role of NPK fertilization on vines and roots' yield is ongoing. The 1st season of on-farm trials is underway. Potato - Eight CIP clones and ten varieties commonly grown in Western Uganda possessing various traits are being evaluated on-station in Eastern Uganda. The 1st season of trials has been completed and the 2nd season is underway. Cassava - 17 varieties have been analysed to determine varietal differences in PPD and, in turns, how PPD affects the root quality.

Biochemical analysis, PPD scoring and sensory evaluation are being conducted and the best performing varieties will be selected for shelf-life extension treatments (see 1.4).

Output 1.4: RTB on-farm storage and processing systems trialed and validated

Status: On-going

Narrative: Sweetpotato - Options for on-farm silage making for pig feed using sweetpotato vines and non-commercial roots are being tested. Data collection is underway to assess the current feeding practices of 16 pilot and 8 control farmers to generate baseline information. Micro silos trials to evaluate options for sweetpotato silage and supplementation have been concluded and four treatments have been selected for digestibility and on-station feeding trials scheduled to begin in early 2016. Pilot farmers have also prepared silage for the on-farm feeding trials. Potato – Two types of on-farm stores are being tested, i.e. collective ambient stores (capacity of 40-50t) and improved traditional individual stores (capacity of 4-8t). The construction of three collective stores was completed and the 1st round of assessments of stored potatoes has commenced. The design of the individual stores has been finalized and 12 farmers have been selected for hosting them. Their construction is scheduled to be finalized in early 2016 and samples of farmers' potato will be also analyzed to assess the storability of different varieties and the potential for shelf-life extension. Cassava - Two shelf-life extension technologies are being tested, i.e. root waxing and high relative humidity (RH) storage. On-station trials are being conducted: PPD scoring, biochemical analysis and sensory evaluation of the treated roots (from both pruned and unpruned plants, see 1.5) are being conducted at day 0, 7, 14, 21, 28 to assess the effectiveness of the technologies. Suitability for processing the roots on-farm will be assessed through setting up a pilot pack-house hosted by a farmers' group that has been selected and trained in required agronomic practices (see 2.3) based on the capacities that have been built during the visit to Colombia (see 3.2). Construction of the pack-house is scheduled to be finalized in January 2016 and the best combination of technologies will be market tested.

Output 1.5: Other RTB technologies to reduce PHL and expand utilization validated

Status: On-going

Narrative: Banana – The effectiveness of sucker staggering in evening out supplies and reducing PHL is being tested with 56 pilot farmers. Trials to estimate the optimal harvest time for enhanced postharvest properties and eating quality have commenced. Piloting of convenient presentation forms (bunches, clusters, unpeeled and peeled fingers) coupled with better handling practices, cushioning and a weight-based pricing mechanism is ongoing with the participation of farmers, wholesalers, retailers and supermarkets. One female farmer has moved from just production to wholesale trading of three presentation forms for both domestic and export markets and training has been provided to increase farmers' capacities to comply with food safety and quality standards. The 1st round of storage temperature experiments to determine potential for shelf-life extension has been concluded. Sweetpotato - Options for silage making as a business (not necessarily on-farm) and for the provision of related services (e.g. mobile choppers) are being explored. Potato - The construction of one collective store hosted by the local potato trader association has been finalized and postharvest assessment of the stored potatoes is underway. The evaluation of the impact of improved pre-harvest practices (dehauling) and harvesting methods on storability is ongoing. Cassava - Options for adopting shelf-life extension technologies at trader level (not necessarily on-farm) are being

explored. A trader has been selected for hosting a second pilot pack-house and construction is scheduled to be finalized in February 2016. On-station research is underway for assessing the effectiveness of pruning and the preliminary results are promising.

Output 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

Status: On-going

Narrative: Market and value chain studies are being conducted by all teams in order to i) map the value chain of which pilot farmers and traders are part of; ii) assess margins along the chain; iii) validate priorities for improving postharvest management; iv) further refine the estimation of the demand for the proposed innovations and end products; v) deepen the analyses of PHL and vi) collect baseline data for M&E. General guidelines have been produced in order to harmonize the research design and outputs and each team has then developed *ad hoc* tools for data collection. Banana – Study completed and report finalized. A study to understand gender, natural, institutional and policy context of the value chain and how these can be harnessed to promote adoption of innovations and equitable benefits sharing was also completed and the report is being drafted. Sweetpotato – A 2-phase study is being conducted. Data collection for Phase 1 completed and methodology for Phase 2 developed. Potato - Data collection completed; analysis and report writing underway. Cassava - Study completed and report drafted. Finally, details on the project strategies to ensure gender equity are provided in Section V.

Output 2.2: New market opportunities to expand use of RTB assessed and prioritized with stakeholder participation

Status: Completed

Narrative: During the “preparatory phase” the different teams identified and analysed new market opportunities and the most promising innovations that culminated into the four sub-projects that are currently implemented.

Output 2.3: RTB producer/processor groups strengthened for equitable participation and innovation in value chains

Status: On-going

Narrative: Banana – 10 farmers hosting the mother gardens were trained in multiplication techniques. 266 farmers were trained in sucker staggering and the uptake of the technology is being monitored. 222 farmers and one trader were trained in collective marketing, food safety, quality requirements and traceability for export. Selected pilot farmers were trained on weight-based pricing systems. Sweetpotato – After completing the ToT in biosecurity measures, data collection and calibration of feeding equipment (see 3.2), the implementing partners imparted the acquired knowledge to 69 farmers. A total of 277 farmers were trained on sweetpotato silage making by participants to the ToT training on silage making (see 3.2). A manual and a brochure were developed for training purposes (see Section IV and Annex 2). Potato – Based on the findings of business capacity need assessments of the four associations hosting the collective stores, a curriculum for management and business skills training was developed. 119 members of the associations hosting the collective stores were trained on organizational structure and governance of associations. As a result, new functional committees were established in each association and committees’ members elected. Members were

also trained in: 1) Leadership & governance; 2) Enterprise analysis 3) Business planning; and 4) Store management and record keeping. This resulted in business plans and store management plans being drafted by each association. A brief guide to potato storage was produced (see Section IV and Annex 2) and will be used for the technical training on storage scheduled in January 2016. *Cassava* - 25 farmers and 5 traders were trained in agronomic practices that can minimize mechanical damages responsible for accelerating the PPD and increase the proportion of roots suitable for shelf-life extension technologies; i.e. pruning, ridging, planting techniques and improved harvesting methods. About one acre has been allocated by the selected farmers' organization for piloting the new pre-harvest and harvesting practices.

Output 2.4: Sustainable multistakeholder platforms for further RTB value chain innovation created with public/private sector and NGO and CBO participation

Status: On-going

Narrative: Simple landscape studies have been conducted to map the current relevant platforms in Uganda and the on-going interventions for supporting their establishment and development. Most of these platforms are not functioning well and are mostly project-based, raising concerns about their long-term sustainability. Therefore, in most cases, it has deemed appropriate to work towards their strengthening rather than establishing new platforms from scratch which, due to the short duration of the project, are likely to collapse at the end of the intervention. *Banana* – The team is linking up with the Western region platform and is part of the efforts for establishing the national platform. *Sweetpotato* – In order to further its work on sweetpotato silage for pig feeding, the team has opted to facilitate some of the existing pig platforms (national, Central region and Eastern region platforms) that have been financially supported by ILRI until recently. *Potato* – Since no potato platforms exist apart from a national Steering Committee supported by IFDC and focusing on potato seed distribution and new varieties for processing, the project is establishing an Eastern region potato platform that be facilitated by NARO-BugiZARDI. *Cassava* - While the project plans to work closely with and build on the existing national platform, the main focus is on revamping and strengthening the ones operating around the project sites.

Output 3.1: Project's website containing documented methods, technologies, and knowledge products suited to target audiences (researchers, extension services, communities, NGOs, etc.)

Status: On-going

Narrative: A functional project website has been developed and is currently up and running (<http://www.rtb.cgiar.org/endure/>). A number of project documents and publications have already been made available on line and the website's content is being regularly updated as the project progresses.

Output 3.2: Capacity built in key national partners for reducing PHL and increasing use of RTB

Status: On-going

Narrative: Two training events were held in 2014 to build the capacities of the commodity teams in market research, gender mainstreaming as well as design and implementation of M&E systems (see 1st progress report). In 2015, *Banana* – 3-day training for strengthening partners' capacities in PMCA and Phase 2 tools. *Sweetpotato* – 2-day training in PMCA tools and 2 ToT events to build partners' capacities in i) biosecurity measures, data collection and calibration of feeding

equipment; and ii) silage making. Potato – A 2-day event was held to officially launch the collective stores. In day 1 the potato team and other players in the potato research arena (FAO, IFDC, NARO-KaZARDI) presented the on-going and past potato postharvest work. On day 2, the participants visited two stores to appreciate the technology. The participants increased their awareness and understanding of the interventions, successes and challenges of other organizations working on potato. Furthermore, representatives of the other sub-projects could appreciate the work done by other colleagues in the RTB arena. This set the stage for facilitating the establishment of a Community of Practices in the postharvest area of RTB crops in Uganda. Cassava - Six members of the cassava team participated in a 9-day training organized by CIAT Colombia to strengthen their capacities in PPD assessment and shelf-life extension, being these technologies completely new in Uganda. The capacities of the cassava team were strengthened in the following areas: 1) varietal selection for waxing and RH storage; 2) PPD evaluation; 3) root waxing and RH storage; 4) pre- and postharvest factors affecting the effectiveness of shelf-life extension technologies; and 5) options for developing marketing channels and business models. Furthermore, a 4-day gender training was provided to the banana and potato teams (see Section V). Finally, researchers from NARO (5 different institutes) are involved in the research design and implementation of all sub-projects and 10 Master students were identified and granted fellowships for undertaking studies to complement project research.

Output 3.3: Outputs of research disseminated throughout agricultural knowledge and information systems

Status: On-going

Narrative: A Communications and Visibility Plan, initially drafted by the CIP-SSA Communication Specialist, was reviewed and validated during a 2-day workshop. Based on this, each sub-project team has then developed and finalized its own sub-plan that is currently being implemented. Details about already produced and expected research outputs can be found in Section IV and Annex 2-3.

E. Difficulties encountered and measures taken to resolve problems

Cross-cutting issues: Delays in starting the project and hiring the project leader, the multi-crop/multi-agency nature of the initiative and the approach adopted requiring the establishment of research teams and initial validation of the different options for improved postharvest management (despite the advantages described in Section II) have implied that a whole year has been spent for identifying the research options to work on over the next two years. Then, additional time had to be devoted in early 2015 for clearly defining the responsibilities, workplans and deliverables of each of the over 20 partners involved in the research implementation. Furthermore, delayed disbursement of funds from the donor led to cash flow problems that required slowing down the implementation. As a result of these issues, the project has little time left for conducting all activities and delivering the numerous research outputs it is committed to. In order to deal with this, the partners' workplans had to be revised several times and the LoUs modified accordingly. The weakening of the Euro has represented an additional financial challenge being the LoUs with partners in US dollars. Therefore, the financial loss has been so far fully absorbed by CIP and a number of cross-cutting activities as well as the possibility of proving top-up funds for supporting the innovations showing the most promising results had to be trimmed out.

Banana: the design of storage temperature trials was expected to take into account the results of optimal harvest time experiments. However, the latter was delayed by health issues of the student. A decision was made to start the storage trials so as to gain preliminary insights and the results from the harvest time experiments will be factored into the next round of storage trials. Furthermore, initial trials for sale by weight and sale of cushioned banana bunches have not been very successful in some markets due to reluctance of some traders to cover the additional costs as well as challenges in dealing with the requirements of supermarkets (one of which, Uchumi, has recently closed operations in Uganda). However, additional trading partners and market outlets have been identified and trials are on-going. Finally, the team lost two partners (MBADIFA and TRIAS) but the team dealt with this by employing the former key MBADIFA staff as a consultant and bring UFPEVA on board.

Sweetpotato: The greatest challenge was the delayed release of the micro silos laboratory results from Makerere University. This affected the research design since on-station silage trials depended on results from lab experiments, while on-farm trials were planned to commence once preliminary findings of the on-station trials had been available. In a quest to make up for lost time, the team made a strategic decision to use partial lab results for selecting the best treatments to use in the on-station feeding trials; and results from the digestibility trials to inform options for the on-farm trials. Moreover, the pigs that had earlier on been earmarked for the trials were no longer suitable. In order to deal with the resulting heterogeneity in piglets' age, the trials will be conducted on a phased basis. Other challenges related to the drought that destroyed the first on-farm sweetpotato trials (that had to be replanted) and the excessive excitement of some farmers that have stealthily opened the silage containers before reaching the ideal maturity for conducting the feeding trials. Also, no proper motorized choppers were available in the market and hammer mills had to be adapted. While these may be suitable for research purposes, the excessive processing capacity may be an obstacle to wider adoption (but this represents an opportunity for future research). Finally, there were some change in leadership at ILRI and MUZARDI that cause a setback as the leaders needed some time to familiarize themselves with the project and allot the time required to support research activities.

Potato: Construction of the collective stores was delayed due to a host of reasons including bad weather and inconsistency of bales' quality. Despite the additional effort of CIP staff to speed up the construction, one season of storage trials was lost. Furthermore, the ambient stores were affected by vermin that damaged several potato samples and had to be reinforced to avoid similar problems in the future. The construction of the individual stores was also delayed mainly due to the late submission of technical and progress reports by BugiZARDI and therefore deferred disbursement of funds by CIP. Moreover, the team had originally planned to validate a third storage technology (coolbot) but it has been decided to drop this component due to the unforeseen high cost of insulation material, concern about durability and the slow multiplication of tubers that led to insufficient quantities of potato to run all experiments. The associations hosting the collective stores showed some management weaknesses that the project is trying to address by strengthening the required management and business skills. One of these associations is experiencing financial and management problems ever since the demise of the chairman. As a result, some members fear to store potatoes but the decision to jointly develop store management plans should reassure them. The project was affected by two additional challenges: bacterial wilt that decimated

several CIP clones for variety evaluation that had to be replanted; and the delays in delivering the market and value chain study by the consultant to who additional time has been offered.

Cassava: The team was not familiar with the state of art methodology for PPD assessment and the two technologies for shelf-life extension. Therefore, strengthening the required capacities by training sessions organized by CIAT Colombia was deemed necessary. This resulted in practical skills and knowledge that the team has used to improve the research design but this has delayed the start of the trials and other research activities and led to amendment of the workplans. Some misunderstanding emerged between NARL and NaCCRI staff due to some overlaps in their official mandate and insufficient demarcation of the respective roles. However, this issues has been sorted out by successfully promoting a constructing dialogue for smoothing sometimes conflicting views and approaches. An additional challenges has been the lack of water access of the farmers group selected to host one pilot pack-house and delays were incurred until a solution was identified (digging a shallow well). Finally, AFRII, one of the partners, decided to pull out because the allocated financial resources were considered insufficient. Roles and responsibilities of AFRII has been taken over by IIRR, one of the other partners.

III. INNOVATIONS

The project tests and validates a number of technological, commercial and institutional innovations and assesses their technical feasibility, economic viability and social acceptability for male and female value chain actors. Due to the complexity of the project and in order to avoid repeating what already presented in other sections of the report, only some examples are presented below:

- Technological innovations (such as a new production or postharvest practice): banana sucker staggering, banana optimum harvest time, banana storage, sweetpotato vines cutting regime, potato storage, potato dehauling, cassava pruning, etc.
- Commercial innovations (such as a new or improved product): packaged peeled banana, sweetpotato silage, waxed cassava, etc.
- Institutional innovations (such as a new way for smallholder farmers to work with other value chain actors for improved market access and strengthened negotiating power): banana weight-based pricing mechanism, sweetpotato-pig value chains integration, chopping service-based model for sweetpotato silage, potato sorting and grading, best-bet supply models for cassava processing facilities, etc.

Apart from the specific innovations that are tested to address the constraints and opportunities identified in the “preliminary phase”, the project design can be seen as innovative itself. By adopting the PMCA methodology, different research teams made of researchers, development practitioners and value chain actors, including farmers’ organizations and private firms, have worked together from the onset to jointly design the interventions based on their experience and the findings of the scoping studies. While this has been a time consuming process, the different multi-disciplinary teams have gained in terms of social cohesion and deeper understanding of the target value chains. The competitive process that has characterized the first year of implementation has also been an innovative approach for motivating the different teams and discarding less promising options for

research. Last but not least, the teams have been asked to produce a number of business plans for investment for selected private sector players involved in the research. These aspects represent a valuable building block for private sector investments as well as follow up interventions for promoting the uptake of the innovations that the project will have validated.

IV. INTERNATIONAL PUBLIC GOODS

The project is expected to produce and disseminate a number of research outputs (see Output 3.3). These include articles in peer-review journals, presentations at fora and symposia and other project publications e.g., manuals, guidelines, technical reports, etc.

A. Articles

- One article has been published in the peer-reviewed journal *Livestock Research for Rural Development*.

B. Presentations at fora and symposia

- The presentation “The use of sweetpotato residues as feed in rural and peri-urban smallholder pig systems in Uganda” has been given at the Conference of the CoP on Sweetpotato Marketing, Processing and Utilization held in Nairobi in May 2015.
- A leaflet outlining the sweetpotato silage research has been produced for the 6th Annual Technical and Steering Committee Meeting of the Sweetpotato for Profit and Health Initiative (SPHI) held in Kigali in September 2015.
- A presentation entitled “Experiences of using the WEAI tool in Uganda” has been given at an IFPRI/CIAT seminar held in Uganda in December 2015.
- The following contributions presenting findings of the project have been accepted for presentation at the 1st World Congress of Root and Tuber Crops (WCRTC) held in Nanning, China, on 18-22 January 2016 (<http://www.gcp21.org/wcrtc/>):
 - Muyinza et al.: Effectiveness of cassava stem pruning for inducing delay in postharvest physiological deterioration (PPD) of fresh roots – Oral presentation.
 - Wanda et al.: The impact of PPD in the fresh cassava roots value chain and current mitigation measures in Uganda. Perspectives and actions of value chain actors – Oral presentation.
 - Wanda et al.: Extending the shelf-life of fresh cassava roots for increased incomes and postharvest loss reduction in Uganda: Current business case – Poster session.
 - Nyamutoka et al.: Postharvest physiological deterioration effects and gender dynamics in the retail marketing of fresh cassava roots; a case study in Uganda – Poster session.
 - Mayanja et al.: Understanding gender dynamics and their contribution to designing ‘winning’ sweetpotato postharvest interventions – Poster session.

C. Project publications

- Sweetpotato silage making manuals have been developed in both English and the most spoken local language (Luganda) for training purposes.
- A brochure originally developed by the SASHA project in Kenya describing an improved tube silage making method has been translated in Luganda and distributed during the training sessions.
- A brief guide to ware potato storage has been developed for training purposes

Additional details about these research outputs can be found in Section 3.3 of Appendix 2. The abstracts of article and presentations at fora and symposia as well as some examples of project's publications are available in Annex 2. Additional scientific articles, presentations and other publications are expected as the project progresses and will be accessible at the project's website. The full list is presented in Annex 3. Annex 4 presents some of the project-related highlights in various media.

V. GENDER ISSUES

In Uganda, gender roles in RTB crops' production, processing and marketing are often complex. Key decisions on potato and banana cultivation and marketing are made by men though women provide labour at various production stages. Men dominate wholesale trade while, in most cases, women are in charge of retailing. While sweetpotato and cassava may largely be seen as "women's crops", there is a concern that as markets improve or better processing technologies become available, men may take over roles previously dominated by women. It has also been noted that men are more likely to adopt new technologies, especially if they are capital intensive. As such, the project has developed a gender strategy which aims to i) sensitize sub-project teams on gender mainstreaming in the design and implementation of the interventions; ii) ensure comprehensive understanding of the gender dynamics involved the project interventions; iii) support the sub-project teams to ensure that both men and women benefit from the project; iv) monitor and assess the impact of the project on men and women; v) conduct postharvest and value chain gender research and disseminate the results; and vi) validate gender responsive value chain tools recently developed or adapted by RTB and its partners.

In 2014 a Gender Action Plan has been developed to guide the implementation of the strategy and ad hoc trainings have been conducted. During the reporting period, the gender team adopted and/or adapted tools (including validation of recently developed PMCA engendered tools for which complementary funds have been obtained from PIM) for conducting gender situational analyses for all sub-projects in order to develop strategies for ensuring gender equity. Field work for assessing gender-based constraints and opportunities in the potato and banana value chains has been completed and the two crop-specific gender strategies have been drafted. Gender situational analyses, and therefore the development of specific gender strategies, for sweetpotato and cassava have been postponed to early 2016 due to delays of the cassava team in identifying the pilot farmers and traders to work with. In December 2015, a 4-day training has been organized for the banana and potato teams to: 1) strengthen gender awareness among partners and beneficiaries; 2) impart skills and tools for identifying, analyzing and devising strategies for mitigating gender-based constraints in exploiting selected market opportunities; 3) build capacities in gender-responsive business planning; and 4)

review and customize the crop-specific draft gender strategies. Similar training is scheduled to be delivered to the sweetpotato and cassava teams as soon as gender baseline studies are concluded and gender strategies drafted.

VI. PARTNERSHIPS

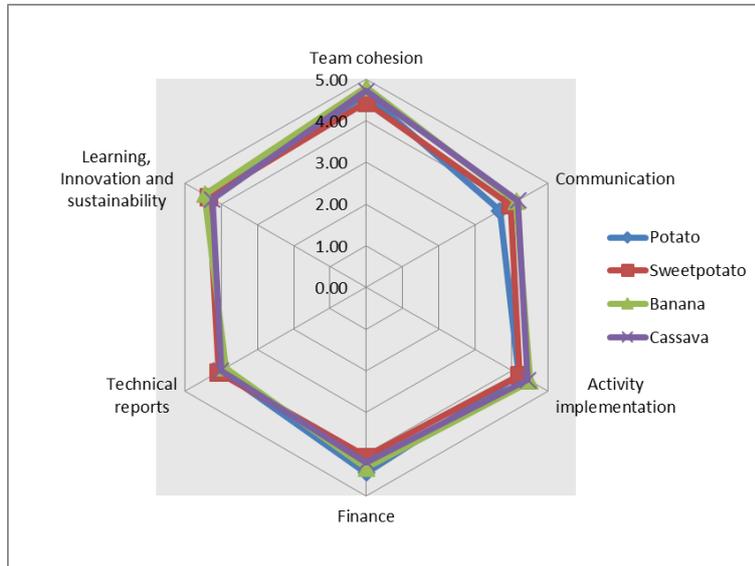
The PMCA contributed to establishing strong partnerships within and between the four commodity teams.

All RTB international members (CIP, IITA, CIAT, Bioversity and Cirad) are part of at least one research team and two of them, CIAT and Cirad, have agreed to contribute without their staff time being charged to the project. The recently concluded RTB external evaluation has showed appreciation for this project and pointed out the importance of these multi-agency initiatives for bringing together CG researcher and promoting integration in projects' design and implementation. Researchers from NARO are also involved in all sub-projects (see Annex 1) and new collaborations between different NARO institutes are emerging (a remarkable example is the strengthened collaboration between NARL and NaCCRI, the Regional Centre of Excellence for cassava, in the framework of the cassava sub-project). Over the course of 2015, new partners joined the research teams and they have agreed to collaborate without allocation of funds, e.g. three national universities (Makerere, Kyambogo and UMU through which a total of 10 MSc students are currently engaged in research under this project) and Iowa State University-Uganda Programme.

The project has also built collaborations with local authorities that have been instrumental in facilitating the implementation of activities. Notable examples are the allocations of communal land (e.g. for constructing the potato store in Mbale town and the cassava pack-house in Kyenjojo), the involvement of several District Agricultural Officers in the process of establishing the potato platform in Eastern Uganda and the extensive involvement of extension staff for successfully engaging with banana farmers and traders in Western Uganda.

The strength of the current partnerships has been recently assessed. The members of the research teams have been asked to anonymously evaluate the ongoing collaborations across six domains. A high level of satisfaction was exhibited and the domains with highest scores included Team cohesion; Activity implementation; and Learning, innovation and sustainability (Figure 1). The project is trying to consolidate these partnerships through the establishment of new multistakeholders platforms or the strengthening of the existing and poorly functional ones (details can be found in Annex 2, Section 2.4).

The project is fostering cross-crop learning among researchers, development practitioners and private sector players by building on the clear – but often ignored - similarities among RTB crops and promoting the adoption of shared methodologies wherever possible (e.g. for market and value chain studies, assessment of postharvest losses, gender mainstreaming, etc.). Furthermore, the organization of cross-subprojects events allow implementing partners to be exposed to the work conducted by others, thus contributing to broadening their research horizons.



Finally, the project has promoted and benefited of cross-CRP collaborations, e.g. the collaborative work of RTB (led by CIP) and Livestock (led by ILRI) CRPs in the framework of the sweetpotato sub-projects and the adoption and adaptation of gender tools developed by PIM that are being validated under this project (and for which complementary funds have been provided).

Figure 1: Results of the partnership self-assessment

VII. CONCLUSIONS

The project is progressing well thanks also to the teams' social capital and technical knowledge that has been built during the first year of project implementation ("preparatory phase"). The scoping studies and the market and value chain studies have confirmed that the high perishability of RTB crops and the postharvest losses that actors incur represent serious challenges to value chain development and expanded utilization of these crops; thus confirming the need for furthering work in the postharvest area. Despite the limited time available and a number of challenges encountered, the research activities are being carried out at good pace and some promising results are already emerging.

A number of research outputs have already been produced and disseminated and many more are expected to come as the end of the project approaches. Efforts are being made to ensure that the research outputs and main findings of the projects reach a wider audience through traditional and social media.

Since its onset the project has had a gender lens, and human as well as financial resources have been allocated to ensure that the challenges and priorities of both men and women (and youth) are properly understood and that they are involved in the identification and validation of the postharvest innovations.

The way the project is designed and implemented has facilitated the establishment of notable partnerships and collaboration within the commodity teams, among them and also between the research teams and other organizations and programmes operating in the RTB arena in Uganda. At this regard, the project represents an excellent example of the collegial research that the RTB CGIAR Research Programme aims at promoting and facilitating.

However, a lot is still to be done before the project ends (as reflected in the detailed workplans presented in Appendix 3) and initial thoughts should be given on how to promote the adoption of the innovations that will be successfully validated, so that the research outputs may lead to development outcomes. While this is expected to be facilitated by the current involvement of private sector players, additional research and follow up support may be needed and, by developing several diverse business plans, the project is paving the way for possible interventions beyond the timeframe of the current one. If a follow up intervention were agreed the following stepwise approach is recommended: i) develop relevant criteria and select the innovations that, by the end of the project, have proved most promising for scaling up taking into account their technical feasibility, economic viability and potential impact; ii) identify and address additional research gaps building on the knowledge that has been generated by this project; iii) build on the strong partnerships that are being built by the project and, possibly, further strengthen them by involving new research organizations that can contribute to address the identified knowledge gaps; and iv) develop models for private-public partnerships to promote the uptake of mature innovations informed by the business plans that are being developed

APPENDIX 1. LOGICAL FRAMEWORK

	Objectively Verifiable Indicators	Means of Verification	Assumptions
Goal			
Contribute to improved food security for RTB-producing communities in Eastern and Central Africa	<p>Long-term impacts at national and regional level:</p> <ul style="list-style-type: none"> • Increased and more stable consumption of RTB food (25% increase) • Improved diet quality among consumers (15% of consumers) • Increased crop incomes amongst RTB producers (20% increase) 	<ul style="list-style-type: none"> • National agricultural, household, and food consumption surveys. • Ex-post assessments where possible. 	<ul style="list-style-type: none"> • Technical feasibility of the proposed innovation • Proposed innovations economically viable and socially acceptable • Value chain actors provided with required inputs, information, technical skills and access to credit • Further donor and technical assistance likely to be needed to scale out most promising innovations • Macro-economic situation conducive to scaling out • Competitive position of RTB not undermined by subsidies to grains
Objectives			
<p>To improve food availability and income generation through better postharvest management and expanded use of RTB, based on:</p> <ol style="list-style-type: none"> 1. Postharvest and processing technologies 2. Value chain assessment and development 3. Capacity development 	<ul style="list-style-type: none"> • Decreased RTB storage losses by 15% in pilot sites • 20% increased shelf-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 • Increased participation of women in higher and more profitable levels of the value chain and more equitable distribution of benefits between men and women in the community • NARS, development organization and private sector players engaged in a continuous collaborative 	<p><i>Please see details in the Research Outcomes section below</i></p>	<ul style="list-style-type: none"> • Macro-economic situation conducive • Competitive position of RTB not undermined by subsidies to grains <p><i>Please see additional details in the Research Outcomes section below</i></p>

	Objectively Verifiable Indicators	Means of Verification	Assumptions
	<p>innovation process to tackle different constraints in RTB value chains</p> <p><i>Please see details about how each subproject is expected to contribute towards the project's objectives in the Research Outcomes section below</i></p>		
Research outcomes (intended next-users are pilot farmers, traders and project partners)			
Decreased postharvest losses of RTB crops	<p>Banana:</p> <ul style="list-style-type: none"> • 10% average reduction of on-farm physical losses (product no longer fit for human consumption or damaged to the point that it is used for other purposes other than human consumption) for male and female pilot farmers in comparison to status quo • 10% average reduction of on-farm economic losses (product sold at discounted price due to quality deterioration) for male and female pilot traders in comparison to status quo • At least 50% of male and female pilot farmers extending sucker selection period to at least 5 months <p>Potato:</p> <ul style="list-style-type: none"> • 15% reduction in the amount of potato incurring quality deterioration, and therefore market price discount, after 3 months from harvest under current on-farm storage practice as a result of improved preharvest and harvest practices. <p>Sweetpotato:</p> <ul style="list-style-type: none"> • 50% average reduction of the amount of wasted vines for pilot male and female farmers involved in on-farm trials • Utilization of at least 20% of non-marketable roots (roots of such a poor quality that cannot be sold or that, if sold, would fetch such a low price that the commercialization results unattractive) for silage making by male and female pilot farmers involved in on-farm trials 	<ul style="list-style-type: none"> • M&E • Project progress and final reports 	<ul style="list-style-type: none"> • Technical feasibility of the proposed innovation • Farmers/traders willing to adopt recommended improved preharvest, harvest and postharvest practices • Farmers/traders willing to use sweetpotato roots for silage making

	Objectively Verifiable Indicators	Means of Verification	Assumptions
	<p>Cassava:</p> <ul style="list-style-type: none"> • 50% average reduction of physical losses (product no longer fit for human consumption) at the pilot packing houses (between purchase and sale of the fresh roots) in comparison to status quo • 20% average reduction of economic losses during storage (product sold at discounted price due to quality deterioration) at the pilot packing houses (between purchase and sale of the fresh roots) in comparison to status quo 		
Increased shelf-life of RTB crops	<p>Banana:</p> <ul style="list-style-type: none"> • Varieties from mother gardens with at least 20% longer shelf-life (quality characteristics retained) <p>Potato:</p> <ul style="list-style-type: none"> • 3 months average extension of the shelf-life of ware potato <p>Sweetpotato:</p> <ul style="list-style-type: none"> • Utilization of vines extended from the current 3 days (in fresh form) to at least 1.5 months (as silage) for male and female pilot farmers involved in the on-farm trials <p>Cassava:</p> <ul style="list-style-type: none"> • Quality characteristics of fresh cassava retained for at least 2 weeks (zero economic losses) 	<ul style="list-style-type: none"> • M&E • Project progress and final reports 	<ul style="list-style-type: none"> • Technical feasibility of the proposed innovation • Farmers/traders willing to postpone the sales of ware potato
Increased processing of RTB crops and their products	<p>Sweetpotato:</p> <ul style="list-style-type: none"> • Male and female pilot farmers involved in on-farm trials able to feed pigs on sweetpotato silage for at least 3 months in a year 	<ul style="list-style-type: none"> • M&E • Project progress and final reports 	<ul style="list-style-type: none"> • Technical feasibility of the proposed innovation • Farmers willing to use silage for pig feeding
Increased income from sales of RTB crops and their products by adopting innovations for improved postharvest management	<p>Banana:</p> <ul style="list-style-type: none"> • Male and female pilot farmers and traders selling an average of 15% of their bananas in graded form • Male and female pilot farmers and traders selling an average of 15% of their bananas with weight-based pricing mechanism 	<ul style="list-style-type: none"> • M&E • Project progress and final reports 	<ul style="list-style-type: none"> • Technical feasibility of the proposed innovation • Farmers/traders willing to adopt recommended

	Objectively Verifiable Indicators	Means of Verification	Assumptions
	<ul style="list-style-type: none"> Pilot traders selling an average of 10% of their bananas in different presentation forms (e.g., clusters, peeled and unpeeled fingers) <p>Potato:</p> <ul style="list-style-type: none"> Average 20% higher profit margin obtained by male and female pilot farmers and traders because of deferred sales of stored ware potato <p>Sweetpotato:</p> <ul style="list-style-type: none"> 5% of male and female pilot farmers selling sweetpotato silage At least 20% savings on purchased pig feed cost by male and female pilot farmers 20% average increase in pigs' weight gain for male and female pilot farmers involved in on-farm trials <p>Cassava:</p> <ul style="list-style-type: none"> Average 10% higher income obtained by traders because of sales of treated roots (traders model) Average 10% higher revenue obtained by farmers running the pilot packhorse because of sales of treated roots (farmers model) 		<p>improved postharvest practices</p> <ul style="list-style-type: none"> Consistent market demand for banana value adding as identified during scoping activity Farmers/traders willing to postpone the sales of ware potato Farmers willing to use silage for pig feeding
Initial adoption of proposed post-harvest innovations by next-users	<p>Banana:</p> <ul style="list-style-type: none"> At least 25% of male and female pilot farmers planting varieties with intrinsic longer shelf-life from mother gardens in their own fields (excl. on farm trials) At least 25% of male and female pilot farmers adopting sucker selection in their own fields (excl. on farm trials) At least 10 additional farmers/traders (among those not involved in the trial and supported by the project) adopting at least one of the proposed technological and/or commercial innovations <p>Potato:</p>	<ul style="list-style-type: none"> M&E Project progress and final reports 	<ul style="list-style-type: none"> Technical feasibility of the proposed innovation Proposed innovations economically viable and socially acceptable Consistent market demand for banana value adding as identified during scoping activity Demand for treated cassava roots large enough to justify investments Access to credit

	Objectively Verifiable Indicators	Means of Verification	Assumptions
	<ul style="list-style-type: none"> • 30% of male and female pilot farmers adopting at least one pre-storage technique in their own field (not pilot fields) • At least 10 additional farmers/traders (among those not involved in the trial and supported by the project) constructing ambient stores or paying a fee for storage services <p>Sweetpotato:</p> <ul style="list-style-type: none"> • At least 50 additional male and female farmers within a 5km radius from the demonstration centres feeding pigs with sweet potato silage • At least one farmer/entrepreneur not directly supported by the project in each location (Kamuli and Masaka) starting a silage making business <p>Cassava:</p> <ul style="list-style-type: none"> • At least one private entrepreneur or farmers/traders association with a business plan to establish a packing house and/or a packing house with a business plan to develop/expand outgrower schemes 		
Increased participation of women in higher and more profitable levels of the value chain and more equitable distribution of benefits between pilot men and women	<ul style="list-style-type: none"> • At least 20% of women involved in the pilots are involved in more profitable nodes of the RTB chain • At least 30% of women involved in the pilots perceive greater control over RTB crop income 	<ul style="list-style-type: none"> • M&E • Case studies • Project final report 	<ul style="list-style-type: none"> • Local and national partners agree about project's positive selection mechanisms for ensuring women participation in the pilots. • Local social-cultural context allowing women's participation in higher nodes of the chain and better control over income
Strengthened capacity of NARS, development organization and private sector players to innovate	<ul style="list-style-type: none"> • At least 50% of NARS, development organizations and private sector players involved in the project implementation perceive that their capacities have been strengthened in each of the following areas: 	<ul style="list-style-type: none"> • Initial capacity need assessment • Final capacity need assessment 	<ul style="list-style-type: none"> • Stable partners committed to capacity development

	Objectively Verifiable Indicators	Means of Verification	Assumptions
through development of knowledge, attitude, skills and social capital	I. proposed technical innovations II. understanding and responding to market opportunities and constraints III. establishing and/or strengthening linkages among value chain actors IV. conducting research in partnership V. integrating gender in research activities	<ul style="list-style-type: none"> • M&E • Project final report 	
Outputs			
1.1 Current main RTB postharvest challenges and priorities for improvement identified with key RTB production communities (women and men) and value chain actors	<ul style="list-style-type: none"> • Main postharvest constraints and causes of PHL identified • Relevant PHL estimated according to specific criteria for all crops • Marketing opportunity and constraints understood 	<ul style="list-style-type: none"> • Project inception report • Business cases for funding • M&E plan • PMCA training workshop report 	<ul style="list-style-type: none"> • Partners willing to share their knowledge and conduct scoping activities • Respondents willing to contribute
1.2 RTB technologies and their application for reducing PHL and expanding utilization prioritized and gaps for research identified	At least 2 technologies for each crop group inventoried and product development/pilot experiences reviewed, including via online sources and literature review, and gaps identified	<ul style="list-style-type: none"> • Business cases for funding 	<ul style="list-style-type: none"> • Partners willing to share their knowledge, conduct scoping activities and prepare business cases for funding • Respondents willing to contribute
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, marketing and storage environments	At least 10 RTB varieties tested and validated for improved postharvest characteristics, including where relevant nutritional factors, with stakeholder platforms	<ul style="list-style-type: none"> • Project progress and final reports • Website 	<ul style="list-style-type: none"> • Project partners conducting collaborative research • Target farmers, traders, processors and consumers willing to be actively involved in the research • Accessibility of the research sites
1.4 RTB on-farm storage and processing systems tested and validated	At least 4 on-farm storing and processing technologies tested and validated with stakeholder platforms	<ul style="list-style-type: none"> • Project progress and final reports • Website 	<ul style="list-style-type: none"> • Project partners conducting collaborative research • Target farmers, traders, processors and consumers willing to be

	Objectively Verifiable Indicators	Means of Verification	Assumptions
			actively involved in the research <ul style="list-style-type: none"> • Accessibility of the research sites
1.5 Other RTB technologies to reduce PHL and expand utilization tested and validated	At least 6 other RTB technologies to reduce losses tested and validated with stakeholder platforms	<ul style="list-style-type: none"> • Project progress and final reports • Website 	<ul style="list-style-type: none"> • Project partners conducting collaborative research • Target farmers, traders, processors and consumers willing to be actively involved in the research • Accessibility of the research sites
2.1. Current RTB value chains analysed and priorities for improvement and enhanced gender equity identified with key chain actors/stakeholders	Priorities for improvement shared and agreed with stakeholders in 4 value chains	<ul style="list-style-type: none"> • Project inception report • Business cases for funding • Website 	<ul style="list-style-type: none"> • Partners willing to share their knowledge and conduct scoping activities • Respondents willing to contribute
2.2. New market opportunities to expand use of RTB assessed and prioritized with stakeholder participation	1 new market opportunity identified per RTB crop	<ul style="list-style-type: none"> • Project progress and final reports • Business cases for funding 	<ul style="list-style-type: none"> • Partners willing to share their knowledge and conduct scoping activities • Respondents willing to contribute
2.3. RTB producers, traders and processors strengthened for equitable participation and innovation in value chains	At least 20 producers, traders and processors strengthened per crop	<ul style="list-style-type: none"> • Project inception report • PMCA training workshop report • Training events reports • Project progress and final reports 	<ul style="list-style-type: none"> • Project partners willing to provide training • Target farmers, traders, processors willing to participate in the training • Accessibility of the research sites
2.4. Sustainable multistakeholder platforms for further RTB value chain innovation created or strengthened (when already	4 platforms fully operational (one per crop)	<ul style="list-style-type: none"> • Project progress and final reports • Minutes of the platforms' meetings 	<ul style="list-style-type: none"> • Platform participants willing and able to attend the meetings

	Objectively Verifiable Indicators	Means of Verification	Assumptions
existing) with public/private sector and NGO and CBO participation			<ul style="list-style-type: none"> • Conducive environment to hold regular meetings
3.1. Project's website containing documented methods, technologies, and knowledge products suited to target audiences (researchers, extension services, communities, NGOs, etc.)	<ul style="list-style-type: none"> • 1 functional project's website • Series of project publications (e.g., scientific articles, manuals, guidelines, MSc theses, technical reports and protocols) available online 	<ul style="list-style-type: none"> • No. of website hits • Series of project publications accessible from the website • No. of downloads of project publications 	<ul style="list-style-type: none"> • Members of the research teams willing to produce publications • MSc students concluding their studies • Journals' T&C not preventing on-line dissemination of published papers
3.2. Capacity built in key national partners for reducing PHL and increasing use of RTB	<ul style="list-style-type: none"> • At least 3 training events held per RTB crop • Researchers from the National Agricultural Research Organization (NARO) involved in the design and implementation of the research for all crops • At least 5 MSc students supported and supervised 	<ul style="list-style-type: none"> • Project inception report • PMCA training workshop report • Meeting-cum-training workshop report • Business cases for funding • Project progress and final reports • MSc theses 	Stable partners committed to capacity development
3.3 Outputs of research disseminated throughout agricultural knowledge and information systems	<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 • At least 5 project publications (e.g., manuals, guidelines, MSc theses, technical reports and protocols) produced and disseminated for each crop 	<ul style="list-style-type: none"> • Project communication and visibility plan • Article's proofs and websites of peer-reviewed journals • Programs, reports and proceedings of fora and symposia • Articles in traditional, on-line and social media • Project progress and final reports • Website 	<ul style="list-style-type: none"> • Members of the research teams willing to publish and present the project's results • MSc students concluding their studies

	Objectively Verifiable Indicators	Means of Verification	Assumptions
Activities			
Preparatory phase (2014)			
Hold a project inception workshop to: i) analyse RTB value chains and main postharvest challenges; ii) identify priorities for improved postharvest management and enhanced gender equity with key value chain actors; and iii) establish multi-agency research teams for each RTB crop (banana, sweetpotato, cassava and Irish potato),	1 inception workshop	<ul style="list-style-type: none"> • Project inception report • Project progress and final reports 	
Provide training and build capacity on PMCA methodology and gender mainstreaming in collaborative research design and implementation	<ul style="list-style-type: none"> • 2 training sessions on gender mainstreaming in the inception workshop • 1 4-day PMCA training workshop • 3 training sessions on PMCA in the meeting-cum-training workshop • 3 training sessions on gender mainstreaming in the meeting-cum-training workshop 	<ul style="list-style-type: none"> • Project inception report • PMCA training workshop report • Meeting-cum-training workshop report • Project progress and final reports 	<ul style="list-style-type: none"> • Project's partners willing to attend and actively contribute
Conduct scoping studies to validate hypotheses and assumptions about the preliminary identified priority innovations for improved postharvest management	Scoping studies conducted for 7 research options (2 for banana, 2 for sweetpotato, 2 for cassava and 1 for Irish potato), including literature review, key informant interviews and collection of primary data	7 draft business cases submitted for funding	<ul style="list-style-type: none"> • Respondents willing to contribute
Organize a poster session during the RTB Annual Review and Planning Meeting to present the draft business cases	<ul style="list-style-type: none"> • 1 poster session 	<ul style="list-style-type: none"> • Report of the RTB Annual Review and Planning Meeting 2014 	
Review (internally and externally) the submitted draft business cases and preliminary select the most promising for funding, based on agreed criteria	<ul style="list-style-type: none"> • Feedback from 2 external reviewers based on agreed criteria • Preliminary selection of 4 draft business cases for funding • 1 set of required amendments and recommendations for each preliminary selected draft business case 	<ul style="list-style-type: none"> • External reviewers' feedback • Minutes of the project's Process Committee • Communication about required 	

	Objectively Verifiable Indicators	Means of Verification	Assumptions
		amendments and recommendations	
Select best bet research options for improved postharvest management	4 revised business cases selected for funding	<ul style="list-style-type: none"> Project progress and final reports Communication about the outcome of selection process to research teams 	
Establish a project's Steering Committee	1 project's Steering Committee established (6 representatives of CRP-RTB and 3 representatives of national and regional agricultural R&D organizations)	<ul style="list-style-type: none"> Project progress and final reports Steering Committee membership 	<ul style="list-style-type: none"> Interest and availability of non-CG representatives
Organize an event for the official launch of the research implementation phase	1 Meeting-cum-training workshop	<ul style="list-style-type: none"> Meeting-cum-training workshop report Meeting-cum-training workshop concept note Project progress and final reports 	
Develop project's Gender Action Plan for research implementation	1 Gender Action Plan	<ul style="list-style-type: none"> Meeting-cum-training workshop report Project progress and final reports Gender Action Plan 	<ul style="list-style-type: none"> Active participation of research teams' members
Develop draft the M&E system for the research implementation phase	<ul style="list-style-type: none"> 1 Draft M&E plan 1 Performance Monitoring Matrix 	<ul style="list-style-type: none"> Meeting-cum-training workshop report Project progress and final reports Draft M&E plan Performance Monitoring Matrix 	<ul style="list-style-type: none"> Active participation of research teams' members
Research implementation phase (2015-2016)			
1. Crop specific activities			
Please see Gantt charts presented in the 4 business cases and revised workplans for year 2016 for details of activities carried out by each research team			

	Objectively Verifiable Indicators	Means of Verification	Assumptions
2. Overarching activities			
Develop and implement the project M&E system	<ul style="list-style-type: none"> • 1 M&E plan • 1 Performance Monitoring Matrix • M&E visits 	<ul style="list-style-type: none"> • M&E plan • Performance Monitoring Matrix • Reports of the visits of the M&E Specialist • Project progress and final reports 	
Develop and implement the project communication and visibility plan	<ul style="list-style-type: none"> • 1 Communication and visibility plan • 1 functional project's website • Project publications (e.g., scientific articles, manuals, guidelines, MSc theses, technical reports and protocols) available online • Preparation and submissions of papers and posters for presentations in fora and symposia • Articles in traditional, on-line and social media 	<ul style="list-style-type: none"> • Communication and visibility plan • Website • Media coverage • Project progress and final reports 	
Hold an annual project review meeting	1 project review meeting	<ul style="list-style-type: none"> • Project progress and final reports • Report of the project review meeting 	
Hold regular meetings with the members of the project's Steering Committee	Meetings with members of the Steering Committee held biannually	<ul style="list-style-type: none"> • Minutes of the project's Process Committee 	
Organize an end-of-project workshop	1 end-of-project workshop	<ul style="list-style-type: none"> • Report of the end-of-project workshop • Project final report 	

APPENDIX 2. PROGRESS TOWARDS PROJECT-WIDE OUTPUTS

No.	Output	Target	Current Status	Progress
1.1	Current main RTB postharvest challenges and priorities for improvement identified with key RTB production communities (women and men) and value chain actors	<ul style="list-style-type: none"> • Main postharvest constraints and causes of PHL identified • Relevant PHL estimated according to specific criteria for all crops • Marketing opportunity and constraints understood 	Completed	<p>An inception workshop was held in March 2014 and attended by 45 participants (29 men and 16 women) representing the various CG (CIP, IITA, CIAT, Bioversity and ILRI) and non-CG partners (CIRAD, NARO, Makerere University, NGOs, private sector, etc.) potentially interested in being involved in the implementation of the project. During the workshop, four crop-specific multi-agency teams were established to jointly identify the main RTB postharvest challenges, opportunities and priorities. Taking also into account the outcomes of the planning meeting held in mid-2012, seven preliminary business cases for research were developed by the teams. Scoping studies were conducted to validate initial hypotheses and assumptions as well as provide initial estimates of PHL. In order to properly equip the teams in adopting the PMCA approach and tools during the scoping studies and the development of the final business cases, a four-day PMCA training was held in June 2014 and attended by 19 participants (15 men and 4 women) from the different teams (see 3.2). Based on the findings of the scoping studies, scoping reports were produced and final business cases for research funding were submitted to the Project Management in September 2014. The reports of the inception meeting and PMCA training can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p>
1.2	RTB technologies and their application for reducing PHL and expanding utilization prioritized and gaps for research identified	At least 2 technologies for each crop group inventoried and product development/pilot experiences reviewed, including via online sources and literature review, and gaps identified	Completed	<p>The scoping studies conducted by the four teams entailed a review of relevant literature and collection of primary data through individual interviews and Focus Group Discussions. The seven business cases presented options for funding research around a number of technologies and other innovations such as:</p> <ul style="list-style-type: none"> -Banana: marketing of different presentation forms, cushioning, weight-based pricing mechanisms, sucker staggering, processing of banana into beer and juice, etc. -Sweetpotato: storage of fresh roots, silage making, business models for silage commercialization, etc. -Potato: traditional stores, ambient stores, pre-harvest practices for extended shelf-life, grading & sorting, etc. -Cassava: pruning, waxed cassava, high humidity storage, marketing model for dry chips, chipping technologies, etc. <p>Eventually, following the feedback received by lead experts during a specific poster session organized during the 2014 RTB Annual Review and Planning meeting as well as transparent internal and external reviews of the business cases, four were selected for funding in October 2014 (hereinafter referred to as sub-projects).</p> <p>All the seven business cases and relevant posters can be found in the section "Project Documents" of the project's website http://www.rtb.cgiar.org/endure/.</p>

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, marketing and storage environments	At least 10 RTB varieties tested and validated for improved postharvest characteristics, including where relevant nutritional factors, with stakeholder platforms	On-going	<p><u>Banana:</u> A list of banana varieties preferred by the market (Nakitembe, Musakala, and Mbwazirume) plus one known to have longer intrinsic shelf-life (Kibuzi) was confirmed in Q1 of the reporting period. Prior to dissemination, the list (including agronomic, culinary and other attributes) will be further reviewed with male and female farmers and after the shelf-life studies. In order to enhance farmers' access to planting material of these four varieties, 10 mother gardens have been established (5 in Rakai and 5 in Isingiro districts in western Uganda, 40% managed by women). The mother gardens were supplied with at least 100 tissue culture plantlets (a total of 1500 plantlets) that were previously multiplied and hardened at NARL-Kawanda. Host farmers have been trained on how to keep the material clean. Each garden serves 2-3 nearby farmers groups hosting macro-propagation chambers established by the project and expected to serve as source of clean planting material of the selected varieties as well as learning centres for multiplication techniques (decapitation, enhanced nutrition and macro propagation). Data collection for cost-benefit analysis of different multiplication techniques has started.</p> <p><u>Sweetpotato:</u> On-farm and on-station trials to evaluate the best dual purpose sweetpotato varieties are underway. The 1st round of on-station trials to evaluate four varieties (NASPOT 12 O, NASPOT 13 O, NASPOT 11 and a local variety) and different cutting regimes has been concluded at the Ugandan Martyrs University (UMU). The 2nd round for determining the role of NPK fertilization on vines and roots' yield is ongoing. The 1st season of on-farm trials in Masaka (central Uganda) and Kamuli (eastern Uganda) districts is underway. One MSc student has been enrolled for supporting this research component (see 3.2).</p> <p><u>Potato:</u> 8 CIP clones and 10 varieties commonly grown in Western Uganda (with potential to perform well in Eastern Uganda) possessing various traits (long dormancy for prolonged storage, short maturity for early markets, disease resistance for food security, and high dry matter/acceptable oil absorption for processing) are being evaluated on-station at NARO-BugiZARDI. The 1st season of trials has been completed and the 2nd season is underway. One MSc student has been enrolled for supporting this research component (see 3.2).</p> <p><u>Cassava:</u> 17 varieties have been collected from Masindi and Kyenjojo districts and analysed at NARL-Kawanda and NARO-NaCCRI (the Cassava Regional Center of Excellence) to determine varietal differences in postharvest physiological deterioration (PPD) and, in turns, how PPD affects biochemical composition and eating quality of the roots as well as suitability to the two proposed shelf-life extension technologies (see 1.4). Biochemical analysis, PPD scoring and sensory evaluation (sensory panel) are being done at day 0, 7, 14, 21, 28 and the best performing varieties will be selected for shelf-life extension treatments.</p>
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No.	Output	Target	Current Status	Progress
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	On-going	<p><u>Sweetpotato:</u></p> <p>In partnership with the Livestock CGIAR Research Programme, the sub-project is testing options for on-farm silage making for pig feed using sweetpotato vines and non-commercial roots. 16 pilot (5 male and 11 female) and 8 control (2 male and 6 female) farmers, equally distributed between Masaka and Kamuli districts, have been selected based on a set of criteria developed by the implementation partners. They have been profiled, sensitized and trained in biosecurity measures (with a focus on preventing outbreaks of African Swine Fever - ASF) and silage making (see 2.3). Protocols to assess the current pig feeding practices of pilot and control farmers have been designed by ILRI and data collection is underway (twice a week) to generate baseline information. Micro silos trials to evaluate options for sweetpotato silage and supplementation have been concluded at MUARIK (Makerere research station) with 5 treatments based on sweetpotato vines and locally available maize bran and cassava flour, each at two inclusion levels (2.5% and 5% of the wilted weight of the vines). Based on the results of organoleptic tests and chemical analyses, four treatments have been selected for the digestibility (at MUARIK) and on-station feeding (at NARO-MUZARDI) trials that are scheduled to begin in early 2016. The construction of the silos for the on-station feeding trials has been finalized, silage has been prepared in mid-December and awaiting maturity. One MSc student has been enrolled to conduct on-station research (see 3.2). Pilot farmers have also harvested their sweetpotato gardens and prepared silage for the on-farm feeding trials that will be run in parallel with the on-station ones.</p> <p><u>Potato:</u></p> <p>The sub-project is testing different ware potato on-farm storage options, i.e., collective ambient stores (capacity of 40-50 tonnes) and improved traditional individual stores (capacity of 4-8 tonnes). Despite a number of challenges, including bad weather and inconsistency in bales' density, the construction of three collective ambient stores hosted by the three potato farmers' associations in the project site was completed in September 2015. The stores were built at different altitudes in order to determine how external climatic conditions may affect the storability of the wares. During construction efforts were made to ensure skills and capacity transfer to local artisans in order to facilitate sustainability and scalability. MoUs have been signed with the associations hosting the stores and the 1st round of postharvest assessments of stored potatoes has commenced (using tubers harvested from the 1st season of variety evaluation). One MSc student has been enrolled and is contributing to this research (see 3.2). The design of the individual stores has been finalized and 12 farmers have been selected for hosting them. Their construction is scheduled to be finalized in January 2016. All stores are expected to be handed over to the hosting associations and pilot farmers by the end of January 2016 and samples of farmers' potato will be also collected and analyzed to assess the storability of different varieties and the potential for shelf-life extension.</p> <p><u>Cassava:</u></p> <p>The sub-project is testing two postharvest shelf-life extension technologies: root waxing technology and high relative humidity (RH) storage. On-station trials are being conducted at</p>

No.	Output	Target	Current Status	Progress
				<p>NARL-Kawanda where PPD scoring, biochemical analysis and sensory testing of the treated roots are being conducted at day 0, 7, 14, 21, 28 to assess the effectiveness of the two technologies. Samples of both pruned (see 1.5) and unpruned plants are being analyzed. Two MSc students are involved in the on-station research on root waxing and RH storage, respectively. Suitability for processing the roots on-farm will be assessed through setting up a pilot pack-house hosted by a farmers' group that has already been selected and trained in required agronomic practices (see 2.3) based on the capacities that have been built during the visit to Colombia (see 3.2). Construction of the pack-house is scheduled to be finalized in January 2016 and the best combination of technologies will be market tested to identify the most suitable technology for each market segment. Linkages with potential buyers (traders and supermarkets) of cassava roots with extended shelf-life have been initiated.</p>
1.5	Other RTB technologies to reduce PHL and expand utilization validated	At least 6 other RTB technologies to reduce losses tested and validated with stakeholder platforms	On-going	<p>Banana: 56 pilot farmers (23 female) have been selected for hosting demonstration sites for sucker staggering and data collection is on-going to assess the effectiveness of this technique in evening out supplies and reducing PHL.</p> <p>Trials to estimate the optimal harvest time for bananas to ensure both better postharvest properties and optimum eating qualities have commenced. This activity is led by CIRAD with participation of NARO. The methodology has been developed, the plants have been identified in farmers' fields and tagged at flowering and one MSc student has been recruited to conduct the field experiments (see 3.2).</p> <p>Convenient presentation forms of cooking bananas for reducing PHL are being piloted. Following visits to some open markets and supermarkets in Kampala, two wholesale traders and two supermarkets (Mega and Uchumi) agreed to participate in the pilot. Two farmers groups (one in Rakai and one in Isingiro districts) are involved in the pilot trials where different presentation forms (bunches, clusters, unpeeled and peeled fingers) of selected varieties are promoted coupled with better handling practices, cushioning and a weight-based pricing mechanism. In June 2015, the first 100 cushioned bunches were delivered to the Nakawa market but retailers were reluctant to pay a premium for protected bunches, which discouraged the wholesaler. New strategies are being devised to ensure that all parties benefit. By engaging with the Uganda Fruits and Vegetables Exporters and Producers Association (UFVEPA), the team is also targeting the small but potentially very lucrative export market. However, farmers are challenged by the stringent requirements for the export market, especially related to food safety and quality. Therefore an ad hoc training was conducted to address this capacity gap (see 2.3). One female farmer in Rakai district has moved from just production to wholesale trading of three presentation forms: protected bunches, protected clusters (sorted, graded by cultivar and packed in boxes) and fingers (that are graded by cultivar and packed in bags) for both the domestic and export markets. She is spearheading the Kg-system among producers and buyers with some initial success with the export market. Discussions are also ongoing with traders and retailers to have the Kg-system accepted in</p>

No.	Output	Target	Current Status	Progress
				<p>the local market too. Similarly, trials have been conducted with Mega and Uchumi supermarkets but some challenges are being faced, mainly due to the unfavorable terms of payment and the return of produce that gets damaged in the supermarket shelves to farmers. Furthermore, Uchumi has recently closed all branches in Uganda and attempts are underway to engage other supermarkets and groceries.</p> <p>Storage temperature experiments are underway to determine storage conditions that can extend shelf-life. The first of three rounds of experiments at different temperatures has been concluded at the Ssemwanga Center facility using 51 bunches of cooking banana (variety Kibuzi). The effectiveness of cold storage (T=10 °C) in extending the shelf-life is tested on 3 banana products: bunches, unpeeled fingers and peeled fingers. In the case of peeled fingers additional experiments have been set for assessing also the efficacy of preservatives (vinegar, sodium metabisulphites and citric acid) at different inclusion levels. The following parameters are measured at regular storage intervals (7 data points): pH, Total Soluble Solids (TSS), weight, peel colour and pulp colour. Additionally, the economic viability of storage is being evaluated.</p> <p>Sweetpotato:</p> <p>As in 1.4 but, in this case, options for silage making as a business (not necessarily on-farm) and for the provision of related services (e.g. mobile choppers) are also being explored. A stakeholder meeting was held in Kamuli to identify potential entrepreneurs and discuss proposed business models.</p> <p>Potato:</p> <p>The construction of one collective store hosted by the local potato trader association (Mbale Potato Dealers Association – MPODA) has been finalized and postharvest assessment of the stored potatoes is underway (see 1.4). Furthermore, the evaluation of the impact of improved pre-harvest practices (dehaulming) and harvesting methods on storability of the wares is ongoing. The initial plan to test the technical and economic viability to storing potatoes at controlled temperature (using coolbot technology) has been halted due to a number of challenges identified (e.g., cost of insulation material, durability of the cooling system, etc.) and further validated during a visit paid to a manufacturer of cold rooms in Kampala (Kazi Food Logistics Ltd) to discuss the feasibility to run potato storage trials in cold rooms.</p> <p>Cassava:</p> <p>As in 1.4 but, in this case, options for adopting shelf-life extension technologies at trader level (not necessarily on-farm) are being explored. A trader has been selected for hosting a second pilot pack-house and construction is scheduled to be finalized in February 2016. Furthermore, during the capacity building in Colombia (see 3.2), the research team has appreciated how the pruning of cassava plants six days before harvest can slow down PPD. On-station research is underway at NARL-Kawanda for assessing the effectiveness of pruning, pruning+waxing, and pruning+RH storage in reducing the extent of PPD of all 17 varieties (see</p>

No.	Output	Target	Current Status	Progress
				1.3). Initial trials have confirmed that pruning alone can extend the shelf-life of fresh cassava roots but preliminary results show that the combination of pruning and postharvest treatments can be even more effective.
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 4 value chains	On-going	<p>All sub-projects are expected to conduct <u>market and value chain studies</u> in order to i) map the value chain of which pilot farmers and traders are part of; ii) assess margins along the chain; iii) validate priorities for improving postharvest management; iv) further refine the estimation of the demand for the proposed innovations and end products; v) deepen the analyses of PHL and vi) collect baseline data for M&E. Based on the outcomes of a meeting held in March 2015 with the researchers expected to lead these studies, the Project Leader has developed guidelines and a template in order to harmonize the research design and outputs. Each team has then developed ad hoc tools for data collection.</p> <p><u>Banana:</u></p> <p>A market study has been completed. The study allowed to 1) identify and describe the key players in the banana value chain; 2) establish the current demand and future growth prospects of the different banana products targeted by the project (protected banana bunches, clusters, unpeeled fingers, peeled fingers, planting materials of cultivars with a high market demand and those with intrinsic longer shelf-life); 3) establish the extent of sorting and grading in the banana value chain; 4) establish the level of use of the weight-based pricing system; and 5) determine the extent and causes of PHL along the banana value chain. The report is accessible in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p> <p>A study to understand gender, natural, institutional and policy context of the value chain and how these can be harnessed to promote adoption of innovations and equitable benefits sharing has also been completed. The report is being drafted.</p> <p><u>Sweetpotato:</u></p> <p>A 2-phase study has been designed. Phase 1 aims at assessing 1) the current fodder's market structure and value chains in the projects' sites; and 2) the current perception and acceptability of sweetpotato silage as pig feed. Phase 2 aims at investigating 1) the potential demand and willingness-to-pay for sweetpotato silage as pig feed; and 2) the economic viability of using sweetpotato silage. Tools for Phase 1 have been developed and data collection was completed in December 2015. Preliminary results are expected in early 2016. The methodology for Phase 2 has also been developed. One MSc student has been enrolled for conducting research in this area.</p> <p><u>Potato:</u></p> <p>A study has been designed to map the ware potato marketing system in Eastern Uganda, and identify and analyse gender-based market constraints and opportunities along the potato value chain, with a focus on marketing and storing of potatoes in the Mt. Elgon region. In particular, the study aims at 1) assessing the current marketing and storage practices as well as PHL along the potato value chain; 2) identifying the main potential marketing channels for stored potatoes; 3)</p>

No.	Output	Target	Current Status	Progress
				<p>preliminary assessing the economic feasibility of ware potato storage; and 4) providing recommendation for collective storage management. A methodology and several survey tools have been developed and data collection has been completed. Data analysis and report writing is underway. One MSc student has been enrolled to support this research component and will also contribute to deepen the analysis of the economic viability of different storage options.</p> <p>Cassava:</p> <p>A market and value chain study has been designed to ascertain the marketing channels of fresh cassava roots along the two axes that during the scoping study had been identified as the most promising for supplying shelf-life extended roots to Kampala (Kabarole and Masindi axes). Among others, the study aims at assessing 1) the market segments of fresh roots; 2) the extent of PHL and current mitigation measures; and 3) the use of deteriorated roots. The methodology and survey tools have been developed, data collection completed and analysis is on-going. The draft report has been submitted and is being revised. Based on the findings of this study, the team has decided to focus on one axis only (Kabarole) because of the high productivity, low disease pressure and large number of varieties in the production area. One MSc student has been trained at the University of Pretoria and is working on assessing the willingness-to-pay for roots with extended shelf-life (see 3.2).</p> <p>A <u>Gender Action Plan</u> has been developed. The gender team adopted and/or adapted tools (including validation of recently developed PMCA engendered tools for which complementary funds have been obtained from the Policy, Institutions and Market CGIAR Research Programme) for conducting gender situational analyses for all sub-projects in order to identify strategies for ensuring gender equity. Field work for assessing gender-based constraints and opportunities in the potato and banana value chains has been completed and crop-specific gender strategies have been drafted. These two gender strategies have been presented, discussed and reviewed during a specific event held in December 2015 (see 3.2). Gender situational analyses, and therefore the development of specific gender strategies, for sweetpotato and cassava have been postponed to early 2016 due to delays of the cassava team in identifying the pilot farmers and traders to work with.</p>
2.2	New market opportunities to expand use of RTB assessed and prioritized with stakeholder participation	1 new market opportunity identified per RTB crop	Completed	During the preparatory phase (year 1) the different teams identified and analysed new market opportunities and the most promising innovations that culminated into the 4 sub-projects that are currently implemented.
2.3	RTB producer/processor groups	At least 20 producers, traders and processors	On-going	All sub-projects are expected to provide training and technical assistance in order to build the capacities of value chain actors in a number of domains, e.g., technological aspects (both pre- and postharvest), entrepreneurship, agribusiness, collective actions, etc. In some cases specific

No.	Output	Target	Current Status	Progress
	strengthened for equitable participation and innovation in value chains	strengthened per crop		<p>assessment of training needs have been carried out with project beneficiaries (e.g., potato sub-project). The capacity building events that have been held by the different team are reported below.</p> <p><u>Banana:</u></p> <p>As reported in 1.3, the 10 farmers hosting the banana mother gardens were trained in multiplication techniques with a focus on how to maintain the integrity of the planting material. 266 farmers (154 male and 112 female) were trained in sucker staggering as well as record keeping to enable tracking the uptake of the technology.</p> <p>104 farmers (56 male and 48 female) and one trader were trained in collective marketing, food safety, quality requirements and traceability for export in Rakai district. 118 farmers (92 male and 26 female) were also trained in Isingiro district.</p> <p>In June 2015, selected pilot farmers were trained by KAIKA and NARO on introduction of the weight-based pricing system.</p> <p><u>Sweetpotato:</u></p> <p>After completing the ToT in biosecurity measures, data collection and calibration of feeding equipment provided by ILRI (see 3.2), the implementing partners operating in the project's districts imparted the acquired knowledge to 69 farmers (27 male and 42 females), including the 16 pilot and 8 control farmers.</p> <p>In October 2015, 152 farmers in Masaka district (67 male and 85 female) and 125 farmers in Kamuli district (58 male and 67 female) were trained on sweetpotato silage making by some of the partners that have attended the ToT training on silage (see 3.2). The sweetpotato silage making manual and the brochure on improved tube silage making method developed by the project (both in Luganda, see 3.3) were used during the training. The two training reports are accessible in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/</p> <p><u>Potato:</u></p> <p>A business capacity need assessment of the four associations hosting the collective ambient stores was completed in September 2015. The identified gaps have been communicated to the members who validated the findings and prioritized the skillset areas for action. Based on this, a curriculum for management and business skills training was developed and validated by each of the four associations. The capacity need assessment's report and the training curriculum are accessible in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p> <p>In October 2015, 119 members of the farmers and traders associations (78 male and 41 female) hosting the collective stores were trained on farmers associations' organizational structure and governance as a foundation for business engagement. As a result, new functional committees (e.g., Finance Committee, Production and Quality Control Committee; Marketing Committee and Store</p>

No.	Output	Target	Current Status	Progress
				<p>Management Committee) have been established in each association and committees' members elected.</p> <p>In December 2015, they were also trained in: 1) Leadership & governance; 2) Enterprise analysis 3) Business planning: and 4) Store management and record keeping. The business plan training resulted into development of draft business plans by the four associations. The business plans are under review and will be finalized by February 2016. The store management training involved clarification of processes involved from harvesting or procurement to receipt of potatoes to the store. These include inspection, handling while in transit, sorting and pre-storage inspection, batch and lot name, stock allocation and tagging as well as record keeping. As a conditions for receiving the stores, the associations have been asked to develop store management plans defining how the association will manage the stores, including: i) how association-owned and member-owned potatoes are stored; ii) how preference is given to storage space; iii) whether a fixed fee or a percentage of the sale's revenue is charged by the association for storage space; iv) storage rules, e.g., frequency/quantity of potatoes entering and exiting the store; etc. Through careful facilitation and support, the store management plans have been drafted by the associations and are expected to be finalized by January 2016.</p> <p>A brief guide to ware potatoes storage has been produced (see 3.3) and will be used for the technical training on storage scheduled in January 2016.</p> <p><u>Cassava:</u></p> <p>The cassava team has carried out trainings for 25 farmers and 5 traders (12 male and 18 female) in October 2015, and sensitization activities for building the capacities of farmers, traders and extension staff (2) in Kabarole, around the area where the pilot pack-houses are to be set up. During the training received in Colombia (see 3.2), the research team appreciated that a number of agronomic practices affect PPD and can also contribute to increasing cassava yield and the proportion of roots suitable for the shelf-life extension technologies. Therefore, practical training has so far focused on pruning as well as ridging, planting techniques and improved harvesting methods that can minimize mechanical damages responsible for accelerating the PPD. About one acre of cassava has been allocated by the selected farmers' organization for piloting the new pre-harvest and harvesting practices.</p>

No.	Output	Target	Current Status	Progress
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)	On-going	<p>Simple landscape studies have been conducted by all sub-projects to map the current relevant multistakeholder platforms in Uganda and the on-going interventions for supporting their establishment and development. Banana and cassava are among the 10 prioritized crops under the current Uganda's Agricultural Sector Development Strategy & Investment Plan (DSIP). For these crops the DSIP emphasizes the importance of forming multistakeholder platforms as a way to foster the sector's growth and development. In some cases, project's partners are already members of existing platforms. It has been noted that most of these platforms are not functioning well and are mostly project-based, raising concerns about their long-term sustainability. Therefore, in most cases, it has deemed appropriate to work towards their strengthening rather than establishing new platforms from scratch which, due to the short duration of the project, are likely to collapse at the end of the intervention.</p> <p><u>Banana:</u></p> <p>Currently there are two operational regional platforms, for the western (established with the support of the NAADS Programme) and the northern region, respectively. Furthermore a national banana platform is under establishment. The project is linking up with the western region platform which is already owned and managed by banana stakeholders. The banana team has planned to partner with it for facilitating 1) alliance and partnerships building; 2) resource mobilisation; and 3) capacity building of Steering Committee's members. Two stakeholders meetings with key-persons of this platform have been organized to present the projects' interventions. The members have already been involved in training and various other activities. Furthermore, the banana team is part of the efforts for establishing the national banana platform.</p> <p><u>Sweetpotato:</u></p> <p>There are a number of operational pig platforms: one national and four regional (central, eastern, western and northern regional pig platforms). There is a national Steering Committee at national level that supervises the regional platforms (that are autonomous) and organizes periodic meetings with their representatives. No formally established sweetpotato platforms have been identified apart from the sweetpotato seed systems Community of Practice. The sweetpotato team has opted to use some of the existing pig platforms (national, central region and eastern region platforms) to further its work on sweetpotato silage for pig feeding since feeding is recognized as one of the priority areas addressed by the platforms. Representatives of the sweetpotato team have participated in two meetings of the regional platforms. In the first one (in Masaka) sweetpotato silage was extensively discussed; in the second one (in Kamuli) the platform members participated actively in developing the criteria and selecting entrepreneurs potentially interested in silage business. Until December 2015 the national and regional platforms have been facilitated by SNV with financial support from ILRI. However, ILRI funding has come to an end and this may undermine the sustainability of the platforms that are still in their infancy and will need support though not at the same level provided by ILRI up to now. The project is planning to facilitate the regional platforms' meetings for the year 2016.</p>

No.	Output	Target	Current Status	Progress
				<p><u>Potato:</u> The International Fertilizer Development Center (IFDC) has established a national Steering Committee for potato in Uganda focusing on seed distribution and new varieties for processing. CIP representatives regularly participate in the meetings. Apart from that, no other potato platforms have been identified. Therefore, it has been decided to establish an eastern region potato multistakeholder platform from scratch. The platform will build on the structure of the national Steering Committee but drawing from the Kenyan national potato platform. It will focus on developing innovative approaches for tackling challenges in the potato value chain, particularly on postharvest management and marketing. The project is funding the development of the platform and stakeholders from the major potato producing districts in the region are expected to join the platform's meetings and progressively identify alternative sources of funding (including a fee-based membership) for ensuring its sustainability. In the short run it is expected that basic funds may be also provided by the Government of Uganda through NARO as part of the ATAAS project. Potential members were introduced to the idea of establishing a potato platform during a meeting in December 2014 and general expectations were discussed. A follow up meeting was then held in October 2015 with key participants from IFDC, District Agricultural officers, CIP-Uganda/Nairobi, NARO-KaZARDI and NARO-BugiZARDI. Members discussed the geographical scope, stakeholder involvement and facilitation and an action plan was drafted. Participants agreed that the development of the platform should be facilitated by NARO-BugiZARDI, at least in the first phase. The first platform meeting is scheduled for early-March 2016 where objectives, mandate, membership, roles and responsibilities will be discussed.</p> <p><u>Cassava:</u> Following the DSIP recommendations, a national cassava multistakeholder platform was established with a private sector-led approach. The Chair is from the private sector while the Secretariat is hosted at MAAIF. Some representatives of the project's implementing partners (e.g., NaCRRI) are among its members. Furthermore, local platforms were formed in the main cassava producing districts and regions, mostly facilitated by the NAADS Programme. In the cassava sub-project's implementation area, district level platforms exist in both Kabarole and Kyenjonjo. In addition, a regional platform has been set up for the Rwenzori region. Most local platforms have lost momentum and are weak (for example, they do not meet regularly and members' roles and responsibilities are not clearly defined) as confirmed by project's collaborators that have already joined these platforms (e.g., district agricultural officers and private sector players). While the project plans to work closely with and build on the national platform, the main focus will be on revamping and strengthening the local platforms by providing limited support, mainly for facilitation of meetings. The project is working towards establishing Secretariats at the District Agricultural Offices and joining the Steering Committees. While the district level platforms currently include farmers only, the project will work towards broadening the memberships to include other stakeholders.</p>

No.	Output	Target	Current Status	Progress
3.1	Project's website containing documented methods, technologies, and knowledge products suited to target audiences (researchers, extension services, communities, NGOs, etc.)	<ul style="list-style-type: none"> • 1 functional project's website • Series of project publications (e.g., scientific articles, manuals, guidelines, MSc theses, technical reports and protocols) available online 	On-going	<p>A functional project website has been developed and is currently up and running. It can be found at this link: http://www.rtb.cgiar.org/endure/.</p> <p>As specified in the other sections a number of project documents and publications have already been made available on line and the website's content is being regularly updated as the project progresses.</p>
3.2	Capacity built in key national partners for reducing PHL and increasing use of RTB	<ul style="list-style-type: none"> • At least 3 training events held per RTB crop • Researchers from the National Agricultural Research Organization (NARO) involved in the design and implementation of the research for all crops • At least 5 MSc students supported and supervised 	On-going	<p><u>Training and capacity building events:</u></p> <p>A four-day training on PMCA approach and tools was held in June 2014 and attended by 19 participants (15 men and 4 women) in order to build the capacities of the 4 commodity teams in market research and gender mainstreaming required for the preparation of the final business cases.</p> <p>A three-day Meeting-cum-Training event has been held in December 2014. The training sessions strengthened the capacities of the 60 participants (42 male and 18 female from all 4 research teams) to adopt the PMCA, mainstream gender in research activities as well as to design and implement a M&E system. The event has also improved networking and learning across the teams. During the event an initial assessment of the capacities of the national partners in a number of key areas has been undertaken. The report is available in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p> <p>The banana team organized a five-day inception and PMCA training workshop in February 2015 (18 participants: 14 men and 4 women). Three days were fully devoted to strengthening participants' capacity to adopt the PMCA approach and use Phase 2 tools during their research activities. The workshop report can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p> <p>In the sweetpotato sub-project, project partners have been trained in using relevant PMCA tools during the two-day 1st Technical meeting that was held in February 2015 and whose report can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/. Furthermore, in July 2015, key implementing partners (NARO-MUZARDI, VEDCO and CHAIN Uganda) attended a two-day ToT in biosecurity measures to prevent outbreak of ASF, data collection and calibration of feeding equipment organized by ILRI. These partners, as well as other selected participants, such as extension and NaLiRRI staff, also benefitted from a two-day ToT training held a MUARIK in August 2015. The training aimed at strengthening the technical capacities of 31 participants (6 female) that are expected to continue</p>

No.	Output	Target	Current Status	Progress
				<p>training farmers in silage making after the closure of the project. The sweetpotato silage making manuals (in English) developed by the project was used during the training (see 3.3). The ToT report can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p> <p>In July 2015, six members of the cassava sub-project (2 NARL-Kawanda, 1 NARO-NaCRRRI, 2 IITA and 1 IIRR) travelled to Colombia to participate in a nine-day training organized by CIAT to strengthen their capacities in PPD assessment and shelf-life extension technologies. Despite the cost, the training was deemed necessary since these technologies are completely new in Uganda and the researchers had to gain knowledge and hands-on experience on how to adopt and adapt them to the Ugandan context. Colombia was selected not only because of the presence of CIAT but also because these technologies are already in use under commercial setting. The capacities of the cassava team were strengthened in the following areas: 1) varietal selection for waxing and RH storage; 2) PPD evaluation; 3) methods for root waxing and RH storage; 4) pre- and postharvest factors that promote the effectiveness of shelf-life extension technologies; and 5) options for developing marketing channels and business models. The training report can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/.</p> <p>In October 2015, the potato sub-project officially launched the stores in Mbale. 65 participants (48 male and 17 female) attended the two-day event. On the first day (science day), the potato research team and other players in the potato research arena (FAO, IFDC, NARO-KaZARDI) presented the on-going and past postharvest work for improving the performance of the potato value chain in Uganda. On the second day, the participants visited two collective ambient stores to gain a better understanding of how they function. This presented an opportunity for the research and development community to increase the awareness and understanding of the interventions, successes and challenges of other organizations working on Irish potato. Furthermore, a number of key representatives of the other sub-projects attended and appreciated the work done by other colleagues in the RTB arena. This set the stage for facilitating the establishment of a Community of Practices in the postharvest area of RTB crops in Uganda.</p> <p>In December 2015, the gender team organized a four-day training for the banana and potato teams to: 1) strengthen gender awareness among partners and beneficiaries (lead farmers and traders); 2) impart skills and tools for identifying, analyzing and devising strategies for mitigating gender-based constraints in exploiting selected market opportunities; 3) build capacities in gender-responsive business planning; and 4) review and customize the crop-specific gender strategies that had been drafted by the gender team. The workshop report can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/. Similar training is scheduled to be delivered to the sweetpotato and cassava teams as soon as gender baseline studies are concluded and gender strategies drafted (in Q1 2016).</p> <p><u>NARO involvement:</u></p>

No.	Output	Target	Current Status	Progress																																			
				<p>Researchers from the National Agricultural Research Organization (NARO) have been involved in the research design and implementation for all crops. In particular, staff of the following NARO institutes are conducting research under this project: National Agricultural research Laboratories-NARL (banana and cassava sub-projects), Mukono Zonal Agricultural Research Institute-MuZARDI (sweetpotato), National Livestock Resources Research Institute-NaLiRRI (sweetpotato), Buginyanya Agricultural Research and Development Institute-BugiZARDI (potato), National Crops Resources Research Institute-NaCRRRI (cassava).</p> <p><u>Postgraduate students:</u></p> <p>Ten postgraduate students (Master's level) have been identified and granted fellowships for undertaking studies to complement project research activities. Together with the students' supervisors, project partners have provided the students with guidance and support for developing full research proposals for award of degrees and are coaching them to conduct their research. The details of the students and the research topics are reported below:</p>																																			
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3.3	Outputs of research disseminated throughout agricultural knowledge and information systems	<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 At least 5 project publications (e.g., manuals, guidelines, MSc theses, technical reports and protocols) 	On-going	<p><u>Communication and Visibility Plan:</u></p> <p>The project's Communications and Visibility Plan was initially drafted by the CIP-SSA Communication Specialist. During a two-day workshop in March 2015, the Communication and Visibility Plan was discussed and reviewed by the implementing partners, facilitated by the Communication Specialist. The workshop report and the finalized version of the plan are accessible from the project's website http://www.rtb.cgiar.org/endure/, in the section "Reports and Publications" and "Project Documents", respectively. Based on this, each sub-project team has then developed and finalized its own Communication and Visibility sub-plan that is currently being implemented.</p> <p><u>Articles:</u></p> <ul style="list-style-type: none"> Dione M.M., Pezo D., Kyalo G., Mayega L., Nadiope G. & Lukuyu B. (2015). Perception and practices of farmers on the utilization of sweetpotato, and other root tubers, and banana for pig feeding in smallholder crop-livestock systems in Uganda. <i>Livestock Research for Rural Development</i>, Vol. 27, Article 226. It can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/ and at http://www.lrrd.org/lrrd27/11/dion27226.html <p><u>Presentations at fora and symposia:</u></p> <ul style="list-style-type: none"> A presentation entitled "The use of sweetpotato residues as feed in rural and peri-urban smallholder pig systems in Uganda" has been given by D. Pezo at a Conference of the CoP on Sweetpotato Marketing, Processing and Utilization (Nairobi, May 2015). The Ppt can be found in the section "Reports and Publications" of the project's website http://www.rtb.cgiar.org/endure/ A leaflet outlining the objectives and progress of the sweetpotato silage research has been produced and distributed to the participants to 6th Annual Technical and Steering Committee Meeting of the Sweetpotato for Profit and Health Initiative (SPHI) held in Kigali in September 																				

No.	Output	Target	Current Status	Progress
		produced and disseminated for each crop		<p>2015. The leaflet can be found in the section “Reports and Publications” of the project’s website http://www.rtb.cgiar.org/endure/ and at https://cgspace.cgiar.org/handle/10568/69142?show=full</p> <ul style="list-style-type: none"> • In December 2015, S. Mayanja has given a presentation entitled ‘Experiences of using the WEAI tool in Uganda’ at a seminar organized by IFPRI/CIAT Uganda. • The following contributions presenting findings of the project have been accepted for presentation at the 1st World Congress of Root and Tuber Crops (WCRTC) held in Nanning, China, on 18-22 January 2016 (http://www.gcp21.org/wcrtc/): <ul style="list-style-type: none"> ○ Muyinza et al.: Effectiveness of cassava stem pruning for inducing delay in postharvest physiological deterioration (PPD) of fresh roots – Oral presentation. ○ Wanda et al.: The impact of PPD in the fresh cassava roots value chain and current mitigation measures in Uganda. Perspectives and actions of value chain actors – Oral presentation. ○ Wanda et al.: Extending the shelf-life of fresh cassava roots for increased incomes and postharvest loss reduction in Uganda: Current business case – Poster session. ○ Nyamutoka et al.: Postharvest physiological deterioration effects and gender dynamics in the retail marketing of fresh cassava roots; a case study in Uganda – Poster session. ○ Mayanja et al.: Understanding gender dynamics and their contribution to designing ‘winning’ sweetpotato postharvest interventions – Poster session. <p>Project publications:</p> <ul style="list-style-type: none"> • Sweetpotato silage making manuals have been developed in both English and the most spoken local language (Luganda) for training purposes (see 2.3). They can be found in the section “Reports and Publications” of the project’s website http://www.rtb.cgiar.org/endure/ • A brochure originally developed by the SASHA project in Kenya describing an improved tube silage making method has been translated in Luganda and distributed during the training sessions (see 2.3). It can be found in the section “Reports and Publications” of the project’s website http://www.rtb.cgiar.org/endure/ • A brief guide to ware potatoes storage has been developed for training purposes and is available in the section “Reports and Publications” of the project’s website http://www.rtb.cgiar.org/endure/ <p>Additional scientific articles, presentations at fora and symposia and other publications are expected when the project progresses.</p>

APPENDIX 3. WORKPLAN 2016

Banana

Research outputs	Activities	Q1	Q2	Q3	Q4
1. Increased access of farmers to cooking banana varieties with preferred quality attributes and long intrinsic shelf-life	1.1. Establish 3 more macro-propagation chambers per site				
	1.2. Train male and female farmers in business planning, entrepreneurial skills, gender, agronomy and postharvest management				
	1.3. Carry out exchange visits for extension workers for capacity building and training/coaching on the implementation of the gender strategy				
	1.4. Develop gender responsive dissemination models				
	1.5. Train male and female farmers and test three seed multiplication techniques (macro-propagation, enhanced nutrition & decapitation)				
	1.6. Collect and analyse data on costs and benefits of the three seed multiplication techniques				
2. Convenient presentation forms of cooking bananas reducing postharvest losses and acceptable to different market segments promoted	2.1. Conduct experiments to establish optimal harvest age for cooking banana, Kibuzi variety				
	2.2. Train actors in business plan development				
	2.3. Link farmers to export markets				
	2.4. Coordinate and implement the weight based pricing system along the cooking banana value chain				
	2.5. Evaluate preservatives and packaging forms for peeled banana				
	2.6. Conduct experiments to establish optimal storage temperature for the different banana presentation forms				
	2.7. Data collection, monitoring and reporting on the weight based pricing system pilot among cooking banana VC actors				
	2.8. Market trials for differentiated cooking banana products and continuous linking farmers to local markets				
	2.9. Collect data on the costs and benefits of weight-based pricing system, different presentation forms and different preservation forms				
3. Sucker staggering for evening our banana production across seasons practiced by producers to obtain premium prices	3.1. Train male and female farmers hosting sucker staggering trials				
	3.2. Conduct follow up activities (record taking on sucker emergence & selection)				
	3.3. Conduct exchange visits by farmers hosting trials				
	3.4. Data collection, analysis and reporting				
4. Technologies, market information and regulations for increased market access and fair pricing mechanisms promoted	4.1. Develop and disseminate promotional materials on TIMPs that enhance market access				
	4.2. Promote market enhancing TIMPS through print and electronic media				
	4.3. Hold PMCA Phase II final event				
5. Improved practices, (dis)enabling environments, norms and culture to foster mutual understanding along the VC	5.1. Conduct a policy situational analysis				
	5.2. Document the policies and develop policy recommendations				
	5.3. Document best practices for cooking banana value chain upgrading				

Sweetpotato

Research outputs	Activities	Q1	Q2	Q3	Q4
1. Knowledge on pig feed resources (quantity, quality and seasonality) in Masaka and Kamuli districts in Uganda documented	1.1. Data analysis				
	1.2. Feedback session for the participating farmers				
2. At least 2 methods for SP silage preparation validated and piloted in the targeted districts	a. On-station trials				
	2.1. Collect data from digestibility trials				
	2.2. Conduct feeding trials at MUZARDI				
	2.3. Data analysis				
	b. On- farm trials				
	2.4. Conduct on farm feeding trials and data collection				
	2.5. Data analysis				
	2.6. Preparation of guidelines for stack silo sweetpotato silage preparation				
3. Dual purposes SP varieties and their cutting management identified and promoted	2.7. Revise the training manual 1.0 for version 2.0				
	2.8. Train farmers on validated sweetpotato silage technologies				
	3.1. Data collection from on-station and on-farm trials				
	3.2. Set up second fertilizer trial				
4. Capacity for uptake of silage making as a business for the youth, women and men strengthened	3.3. Data collection and analysis				
	4.1. Develop criteria for selection of host Silage Business Support centres				
	4.2. Pre-assess hosts of Silage Business Support centres				
	4.3. Refine criteria for selecting 16 entrepreneurs for business plans				
	4.4. Hold stakeholders meeting to select business models and potential entrepreneurs				
	4.5. Select entrepreneurs for business plans development				
	4.6. Develop business plan template before the training				
	4.7. Assess capacity needs of the 16 business plans' proponents				
	4.8. First training for 16 entrepreneurs on key information required for business plans				
	4.9. Proponents collect the required information for the business plans				
	4.10. Develop and finalize 16 business plans				
	4.11. Held one open day for each centre				
	4.12. Train business plans' proponents on business and entrepreneurial skills				
5. Economic viability and social acceptability of SP pig systems validated and documented	4.13. Data collection and analysis for gender situational analysis and strategy for gender equity				
	5.1. Data analysis of market structure and fodder value chain				
	5.2. Data collection for willingness to pay				
6. At least 2 business models for silage production and marketing tested and best models identified and promoted for scaling up	5.3. Data entry and analysis				
	6.1. Select 2 business plans for support in implementation				
	6.2. Implement selected business plans				

Potato

Research outputs	Activities	Q1	Q2	Q3	Q4
1. Current status and ware potato marketing system in Eastern Uganda mapped and gender based market constraints and opportunities identified, analysed along the potato value chain	1.1. Finalize data analysis for preparation of journal article and MSc thesis				
2. Pre-harvest and storage methods tested and validated by potato variety under different ambient conditions taking into account technical, economic and social aspects as well as consumer acceptability	2.1. Design and construct 12 traditional/wooden ware potato stores at individual level in pilot sites				
	2.2. Conduct two season assessment of quality variations of CIP clones and Uganda varieties in collective stores and on farm individual wooden stores				
	2.3. Conduct one season evaluations of CIP clones and South West Uganda varieties on station and on farm				
	2.4. Seasonal multiplication and maintenance of experimental material and structures on station at Buginyanya				
	2.5. Preparation for the study on economic viability and consumer acceptability of stored potato and related field work (collecting data on prices, storage costs/returns, and consumer acceptability of stored potato product)				
	2.6. Data analysis				
	2.7. Adapt and fabricate animal and/or tractor drawn potato harvesters to be used on station and on farm with associations for scaling up				
3. Capacity in ware potato pre harvest and storage methods for producers, traders, researchers and extension agents strengthened	3.1. Three in field trainings in pre-storage management that ensures good quality of ware potato				
	3.2. Coordinate and facilitate 3 potato platform meetings in eastern Uganda				
	3.3. Hold meetings and workshops for to increase awareness of relevant agencies in the zone				
4. Skills in entrepreneurship, agribusiness and collective action developed for selected actors in specialized ware potato market	4.1. Develop and finalize business plans for the 4 associations				
	4.2. Train the 4 associations in Marketing and Market research				
	4.3. Train the 4 associations in Savings and Resource mobilisation				
	4.4. Train the 4 associations in Basic Financial Literacy				
	4.5. Organise and conduct exposure visits of committee members from the 4 associations				
	4.6. Monitor and mentor the 4 associations in potato business management				
	4.7. Develop guidelines for development and management of associations for potato business				
5. Recommendation for extending shelf-life, increased utilization and reduction of post-harvest losses along ware potato value chain disseminated	5.1. Field work to collect data from individual farmers hosting stores to assess their business approach				
	5.2. Data analysis				

Cassava

Research outputs	Activities	Q1	Q2	Q3	Q4
1. Knowledge on market segments for fresh cassava and use of deteriorated cassava roots generated and disseminated	1.1. Finalize data analysis for market and value chain study				
	1.2. Data collection and analysis for gender situational analysis and strategy for gender equity				
2. Technology and innovations on extending shelf-life of fresh cassava evaluated on-station	2.1. Finalize protocol for sensory evaluation				
	2.2. Finalize screening of currently selected varieties (biochemical and PPD analysis and sensory evaluation)				
	2.3. Collect and assess at least 6 more varieties for shelf-life extension in Kabarole (biochemical and PPD analysis and sensory evaluation)				
	2.4. Test, evaluate and optimize technologies for shelf-life extension				
3. Improved capacity to utilize technologies and innovation through documentation and knowledge sharing	3.1. Design material (manual and user guide) to set up and handle a pack-house for waxing and relative humidity storage				
	3.2. Design training materials & methodology for training farmers & traders				
	3.3. Finalize construction of 2 functional pack-houses				
	3.4. Train farmers and traders directly by project partners and also facilitating trainings by collaborating organizations				
	3.5. Develop and finalize 2 business plans for the established pack-houses				
	3.6. Hold a PMCA Phase II final event				
4. Assessment of adaptability and profitability of the technologies in Uganda conducted	4.1. Identify market actors for market testing				
	4.2. Market testing of shelf-life extended fresh cassava roots				
	4.3. Collect and analyse data for assessing the profitability of waxing and relative humidity storage technologies for fresh cassava in Uganda				
	4.4. Analyse data on best marketing practices for the two models (i.e., farmer and trader-led models)				

Annex 1. Project sites and contribution of the sub-projects towards project's objectives

The project is implemented in a number of different locations spanning across Eastern, Central and Western Uganda. The following figure shows where on the ground project activities are implemented and where on-station research is conducted.

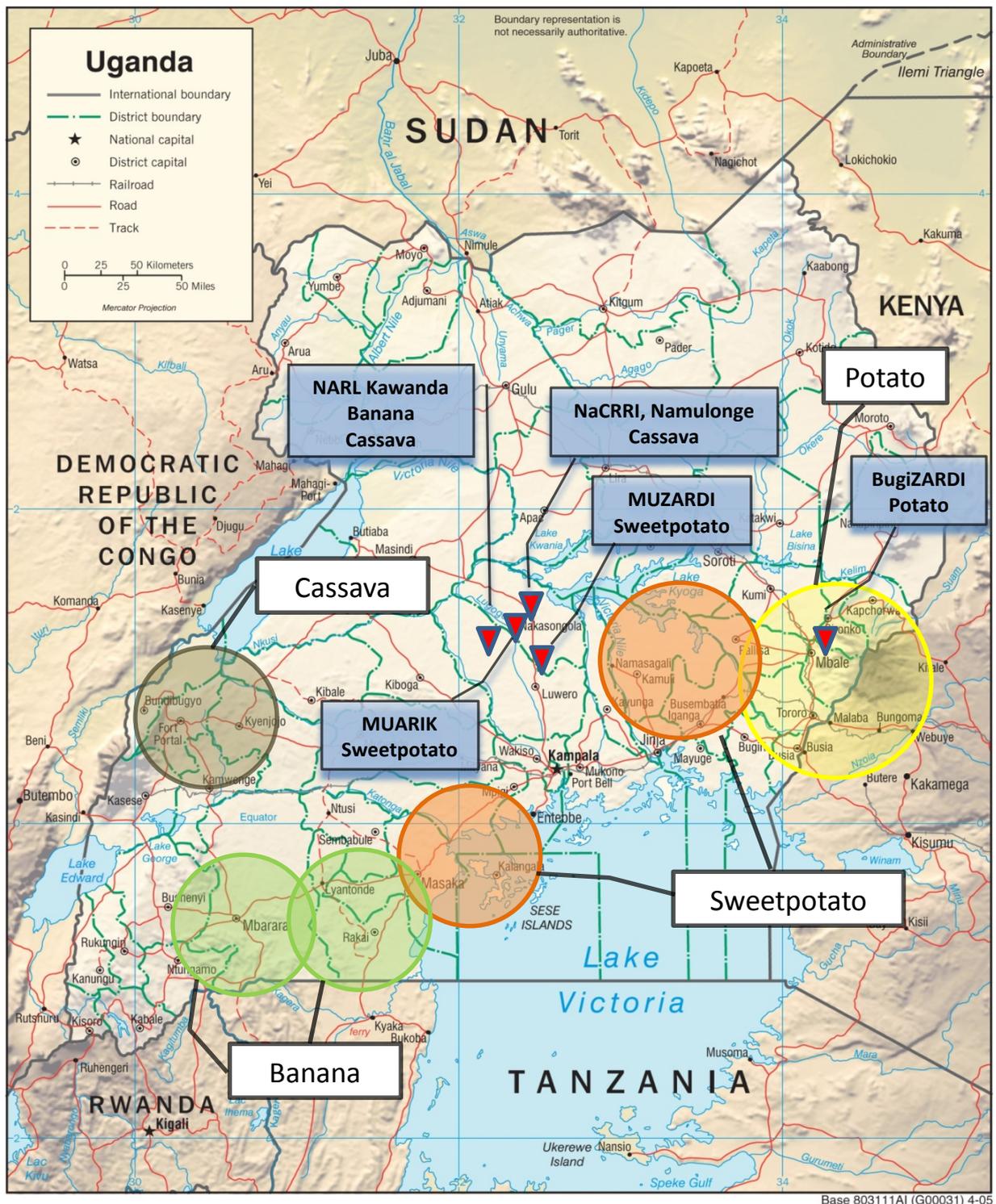


Figure 2: Main project sites

The four sub-projects are quite different in nature. Nevertheless they all contribute to the overall project’s objectives. The following figure provides a graphical representation of how each sub-project contributes towards the project’s broader objectives.

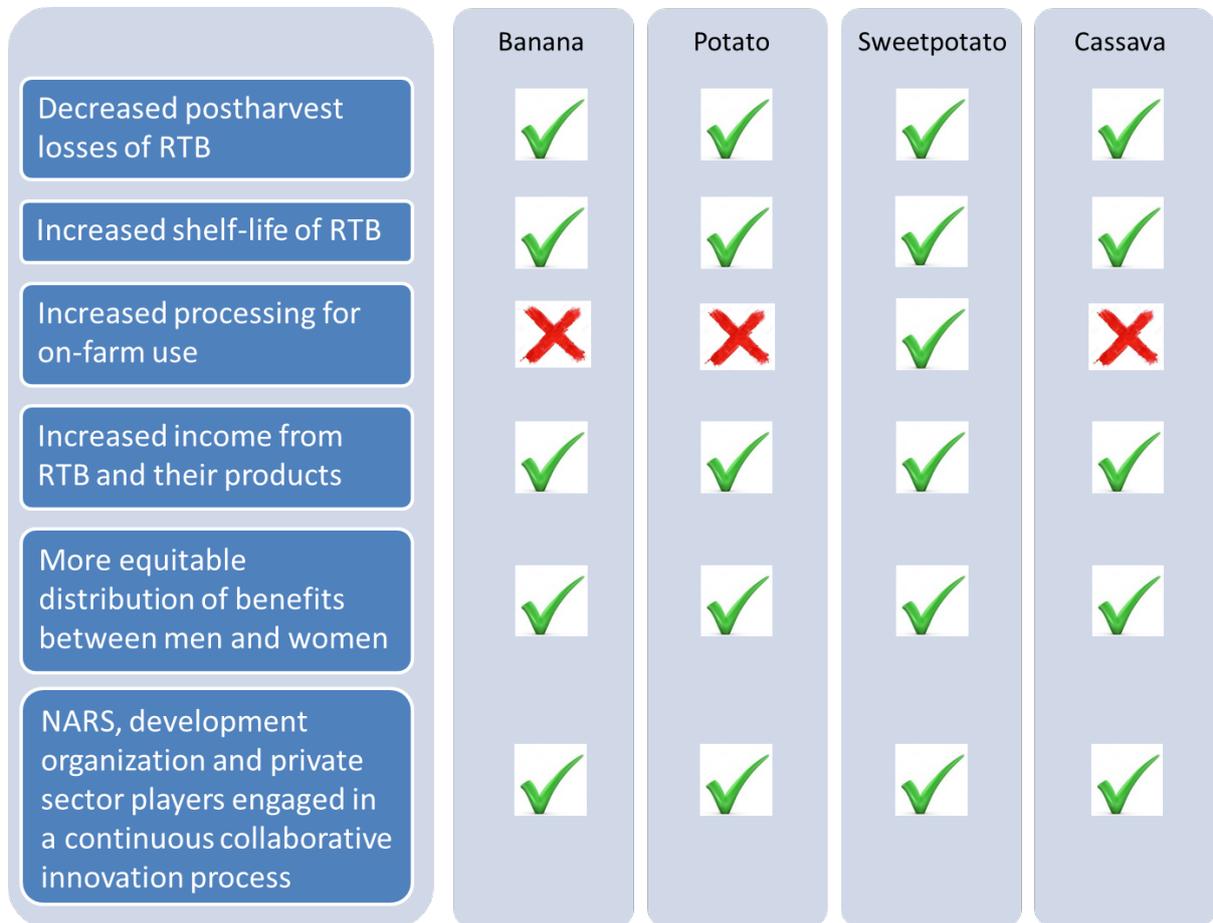


Figure 3: Contribution of each sub-project towards project’s objectives

Annex 2. International Public Goods

Articles

[Livestock Research for Rural Development 27 \(11\) 2015](#)

Perception and practices of farmers on the utilization of sweetpotato, and other root tubers, and banana for pig feeding in smallholder crop-livestock systems in Uganda

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Abstract

Limited access to quality feeds and reliable feed supply are amongst the priority constraints of smallholder pig production in Uganda. Among the feeds given to pigs, sweetpotato (SP), banana and other root tubers residues are common. However, information on farmers' perceptions and practices on the proper use of these residues for pig feeding is limited. Therefore, this study aimed at assessing those aspects, as well as to identify opportunities for better use of these residues in the pig-SP systems. A qualitative survey was undertaken in Masaka and Kamuli, two districts of Uganda with high pig population and SP production. Focus Group Discussions (FGD) and Key Informant Interviews (KII) were undertaken with 80 small scale pig and SP producers and 24 key informants.

Results from this study revealed that the majority of pig farmers in those districts use SP and other RTB crop residues as animal feed. During the rainy season, farmers scored high the utilization of SP crop residues, with the latter being the leading contributor to the pig diet especially in the rural area. SP crop residues are usually fed to pigs fresh without processing. Among the residues, fresh raw vines represent the largest part fed to pig (70%), as compared to roots and peels. The way these residues are offered vary, for example in peri-urban areas with easier access to commercial feeds, farmers feed the crop residues mixed with concentrates; whereas in rural areas with limited access to commercial feeds, crop residues tend to be given without supplementation. However, the full potential of SP and other RTB crop residues for pig feeding is not yet fully exploited as farmers accept that a large amount is wasted (37% in Masaka and 40% in Kamuli). In Masaka, the proportion of SP crop residues utilized at household level mostly for pig feeding was 40%, while in Kamuli was 52%. This study demonstrated that there is potential for better use of SP and other RTB crop residues as pig feed in the smallholder pig farming systems in Uganda, but the major constraint as pointed out by farmers is the poor access to technologies for preserving these resources. Therefore, there is a need for further exploration of strategies for conserving SP and other RTB crop residues during the harvesting period for use in pig feeding during times of feed scarcity.

Presentations at fora and symposia

1) Presentation at the Conference of the CoP on Sweetpotato Marketing, Processing and Utilization (Nairobi, May 2015).

The use of sweet potato residues as feed in rural and peri-urban smallholder pig systems in Uganda

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Abstract

In the last 30 years, Uganda has had a massive growth in pig population, from 190,000 in the late 90's to 3.2 million pigs in 2008, and currently has the highest per capita consumption of pork in East Africa (3.4 kg/year). The majority of pig farmers are smallholders (1.2 million households raise pigs), practicing low input/ low output systems. On the other hand, Uganda has the highest production of sweet potatoes in Africa, and is the second largest producer of sweet potatoes in the world. FGDs conducted in 35 Ugandan villages (covering Kamuli, Masaka and Mukono districts) showed that in rural and urban settings smallholder pig farming is practiced in crop-livestock systems, with high dependence on crop residues and sweet potato vines being the most preferred crop residue by smallholder farmers as pig feed. However, the relative contribution of sweet potato residues to pig diets, as well as other crop residues and forages, is strongly affected by rainfall seasonality that influences crop patterns.

More than 95% of the crop residues used for feeding pigs is produced on farm. Trading of crop residues is minimal (comprises <2%). Women and children are mostly responsible for pig feeding and management, as well as for collecting crop residues for pigs (86 and 79% of farms in rural and peri-urban settings, respectively). Other feeds used are kitchen leftovers, including banana peelings, which provide 18-20% of the total ration; whereas forages and "weeds" represent 20-28%, and compounded feeds (commercial and home-mixed) 25-27%, with maize bran as the main ingredient.

The main feeding constraints identified by farmers in FGDs are: dry season fodder shortages (60%); risk of parasite infestation through forages (26%). In the case of concentrates, constraints include high cost of commercial feeds (80%), and poor quality of purchased feeds (46%). There is need for enhancing knowledge on feeding strategies and fodder conservation among farmers in order to overcome the feed availability fluctuations, but also on proper feed formulation for both farmers and feed stockists. In addition, quality control of feeds available in the market is urgently needed.

An alternative to overcome seasonality in the use of sweet potato residues is silage making. Simple technologies have been tested in South East Asia, China, and more recently in Kenya and Uganda. A study conducted in Masaka district, Uganda showed that crossbred and local pigs eating complete diets made of 30-40% sweet potato silage (70% vines: 30% tubers) plus other local feeds (i.e., fruit, forages, and others) gained 470 and 390 g/day, respectively; whereas the daily gains for pigs fed on concentrates were 660 and 530 g/day, respectively. Studies in Sichuan (China) showed that pigs fed on sweet potato silage supplemented with a protein rich concentrate could gain up to 620g/day, with an increase in the economic benefit of 33.5%. In conclusion, the use of sweet potato silage as pig feed results in significant increases in live weight gain and a reduction in feeding costs by partial replacement of commercial concentrates.

2) Presentations at the 1st World Congress of Root and Tuber Crops (WCRTC)

In 2015 the following abstracts have been submitted and accepted either for oral (first 2) or poster (last 3) sessions at WCRTC to be held in Nanning, China, on 18-22 January 2016 (<http://www.gcp21.org/wcrtc/>).

The impact of PPD in the fresh cassava roots value chain and current mitigation measures in Uganda. Perspectives and actions of value chain actors

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Abstract

Cassava is a tuber crop that originated in South America. It is grown in tropical and subtropical areas throughout the world. Uganda is the sixth largest producer in the world with output estimated over 5 million tons. Importance of cassava in Uganda has increased over the years. It is a prioritized crop in Uganda's Agricultural Strategy and Development Plan. Apart from being a major staple and food security crop, it is a major contributor to household incomes and employment for both men and women. Drivers of this change include urbanization, consumer demand, and affirmative action that have empowered women to engage in economic activities.

The cassava fresh roots value chain is of significant proportions in terms of marketing, utilization, and gender-balanced income generation. Women constitute over 90% of the retailers. Fresh cassava roots consumption was estimated at 1.32 million tons, out of which 309, 528 is monetary demand. Estimates indicate demand to increase by an average of 60% per year, reaching a total of 841,917 million tons in 2018 (RTB Market Study 2015).

The major constraint facing the large-scale production and marketing of fresh cassava (*Manihot esculenta*) roots in Uganda is the rapid postharvest physiological deterioration (PPD), which occurs within 2 – 3 days of harvest. Biochemical changes occur in stored roots and in the functional properties of their starches, thereby adversely affecting the flavour, texture and general eating quality of cassava roots. The Roots, Tubers and Banana (RTB) research problem is currently implementing a cassava sub-project in Uganda targeting to reduce PPD via testing and adopting/adapting technologies that increase the shelf-life of cassava.

Roots perishability implies short marketing period, low trading volumes, leading to high discounting and sometimes losses of above 50% of the initial value. To reduce loss in quality and quantity, sellers charge very high retail prices, which in turn reduces utilization. Both physical and economic losses occur, mostly at retailing where the majority of women operate.

The market study found innovative mitigating actions against PPD being practiced by actors along the entire value chain. However, their effectiveness is limited and hence a need for introducing more effective technologies. The current RTB research programme is piloting two technologies that include waxing and relative humidity storage with preliminary positive results.

Effectiveness of cassava stem pruning for inducing delay in postharvest physiological deterioration (PPD) of fresh roots

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Abstract

Losses of cassava roots after harvest are estimated at between 25% to 45% in Sub-Saharan Africa. These are mainly due to physiological deterioration resulting from enzymatic activity and scopoletin production in the cassava root tissues. The deterioration, in form of black streaking, off flavour and taste, occurs within 48 hours. Thus a study was undertaken to screen 10 Ugandan varieties (Nyamigyera, Tim Tim, Nase14, Mercury, BAO, Hoima Local, Tongoro, TME200, TME14 and Nyaraboke) for PPD of roots from pruned and un-pruned cassava plants. Pruning was conducted by removing leaves from the plants 7 days prior to harvesting in the laboratory for PPD. Preliminary results show that delay in PPD was induced in pruned plants compared to roots of un-pruned plants. Roots from un-pruned plants were significantly ($p < 0.05$) more affected by PPD than roots of pruned plants of the same varieties, showing that pruning could significantly reduce postharvest losses in cassava at small holder level in Uganda. This supports previous findings from studies in Latin America.

Understanding gender dynamics and their contribution to designing 'winning' sweetpotato postharvest interventions

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Abstract

A scoping study was done in Kamuli, Kumi, Mbale and Kampala districts in Uganda to assess gender specific constraints and opportunities which male and female farmers and traders could harness to address sweetpotato post-harvest losses. Data were collected from 65 respondents in single sex focus groups and from key informants. The gender sensitive mapping tool was used to discern nodes where male and female actors were concentrated, roles and responsibilities, constraints faced and market opportunities. Female actors were highly concentrated in subsistence production and retailing nodes, accounting for 92%. Men actors dominated commercial sweetpotato production, wholesale and other chain support functions like brokerage and transportation. Male farmers reported up to 60% higher productivity per acre compared to female farmers, and 33% more acreage devoted to sweetpotato. Women and youth provided all the labour for food plots but also worked in the commercial plots alongside men and hired labourers. Female farmers had limited access to market information, alternate markets and post-harvest technologies and were more hit by consequences of glut while men faced more challenges in periods of scarcity. While constraints were similar across the sexes, female farmers advocated for simple storage technologies like pit stores while men preferred clamp stores with a much higher storage capacity. Traders preferred varieties that keep for long, and used simple storage methods which would preserve the roots for 3-7 days. To avoid losses, female traders procured only what they were sure of disposing off within three days, while male traders preferred procuring what could be sold in a day. The study offered better understanding of the gender dynamics in the chain and enabled design of gender responsive strategies for proposed research on sweetpotato post-harvest management.

Extending the shelf life of fresh cassava roots for increased incomes and postharvest loss reduction in Uganda

Wanda K.¹, Abass A.¹, Bamidele A.¹, Muyinza H.², Matovu M.², Achieng S.², Menya G.², Nuwamanya E.³, Nyamutoka P.⁴, Kaliisa R.⁴, Waigumba P.⁴ and Dufour D.^{5,6}

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Abstract

The major constraint facing large-scale production, marketing and utilization of fresh cassava (*Manihot esculenta*) roots is the rapid postharvest physiological deterioration (PPD). Biochemical changes occur in stored roots and in the functional properties of their starches, thereby adversely affecting the flavour, texture and general eating quality of cassava roots.

Roots perishability implies short marketing period, low trading volumes, leading to high discounting and sometimes losses of above 50% of the initial value. To reduce loss in quality and quantity, sellers charge very high retail prices, which in turn reduces utilization. Both physical and economic losses occur, mostly at retailing where the majority of women operate.

Storage in cool and humid environments show promise in reducing postharvest losses of fresh roots. Other technologies such as waxing also extend the shelf life and they are in commercial use elsewhere. Although waxing requires new innovations in terms of agronomic practices, pre-harvesting and harvesting practices, current fresh cassava prices are high, at about Uganda shillings 1000 per kg (about 0.30 USD per kg).

Women retailers dominate the fresh roots value chain. In Uganda, fresh roots total consumption is estimated at 1.32 million tons, out of which 309,528 is monetary demand. More people are relying on markets for incomes and food. Estimates indicate demand to increase by an average of 60% per year, reaching a total of 841,917 tons in 2018 (RTB Market study 2015).

The Root Tuber and Banana (RTB) research programme is piloting a business case for two shelf-life extension technologies ie waxing and relative humidity storage. It is a research activity testing technical, market and institutional innovations following capacity building in Colombia. It is using PMCA and involves technical and economic feasibility analysis. It is analyzing current value chains to determine opportunities and constraints to adoption/adaptation of the new technologies. It has a strong gender perspective and South to South collaboration.

Research outputs include increased incomes to growers and marketers, especially women traders; better functioning gender sensitive value chains and improved marketing.

Postharvest physiological deterioration effects and gender dynamics in the retail marketing of fresh cassava roots: A case study in Uganda

Nyamutoka P.¹, Waigumba P.¹ and Kaliisa R.¹

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Abstract

Cassava is currently the second most important staple and food security crop after banana in Uganda (Kleih et al., 2012), with Uganda being the sixth largest producing country in Africa (FAOSTAT; 2013).

The major constraint faced by large-scale production and marketing of fresh cassava roots is the rapid postharvest physiological deterioration (PPD) that occurs two days after harvesting the roots. This reduces the eating quality, transportation range, and financial value of fresh cassava (Booth, 1976; Buschmann et al., 2000; Westby, 2002; Lyer et al., 2010), consequently reducing on returns to investment in fresh cassava businesses.

A fresh cassava value chain analysis was conducted in Aug/2015 in mid-western & central Uganda, on a random sample of 60 farmers, 17 Wholesaler, 115 retailers & 65 consumers. 63% of the farmers were female, 88% of the wholesalers were males, and 59% of the retailers were female, revealing that females were mostly located at the end nodes (farmer/producer & retailers) of the value chain, where returns to investment were very low. Males were found predominantly situated at the wholesale level (88%), where they received higher returns compared to other actors. The study also revealed that retailers suffered most of the challenges attributed with PPD, being that they stayed with the fresh roots for longer periods (up to four days) than any other actor in the value chain. Most farmers do not harvest until the buyer comes (the latter does the harvesting); the buyer who is also the wholesaler transports the cassava roots to the market within 12 hours of harvesting. Retailers then purchase the roots and display them for retail sale in open markets for over two days hence suffering economic & physical losses of up to 40%, due to PPD. Marginal analysis showed that farmers received 5% of gross margin, wholesalers 29% and retailers 13%. This small margin coupled with PPD associated losses, have become a disincentive to increased participation in retail marketing of highly demanded fresh cassava roots yet most of the cassava produced (60%) by farmers is sold in fresh form to the market.

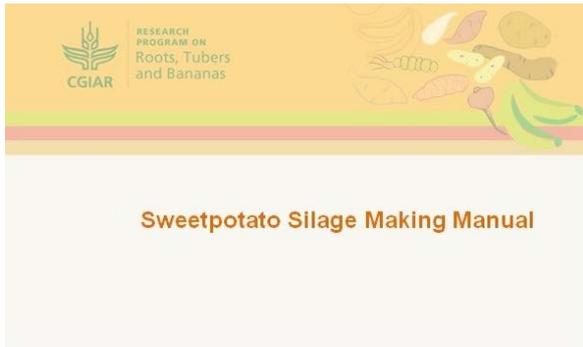
Fresh cassava is widely eaten across the country and postharvest deterioration is a big problem to traders, so any technology that will address this problem will benefit a large number of farmers and traders, most of whom are women as revealed by the current study.

Research is being carried out in Uganda, to establish the effectiveness of two shelf-life extension technologies on fresh cassava roots i.e. waxing and high relative humidity storage methods, in increasing demand, and retail marketing participation, while retaining the desired quality traits for fresh cassava roots.

Project Publications (some examples)



Brochures for improved tube silage method: original from SASHA (left) and translated in Luganda (right)



Expanding Utilization of Roots, Tubers and Bananas and Reducing Their Postharvest Losses

September 2015



Prepared by:

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Expanding Utilization of Roots, Tubers and Bananas and Reducing Their Postharvest Losses

September 2015



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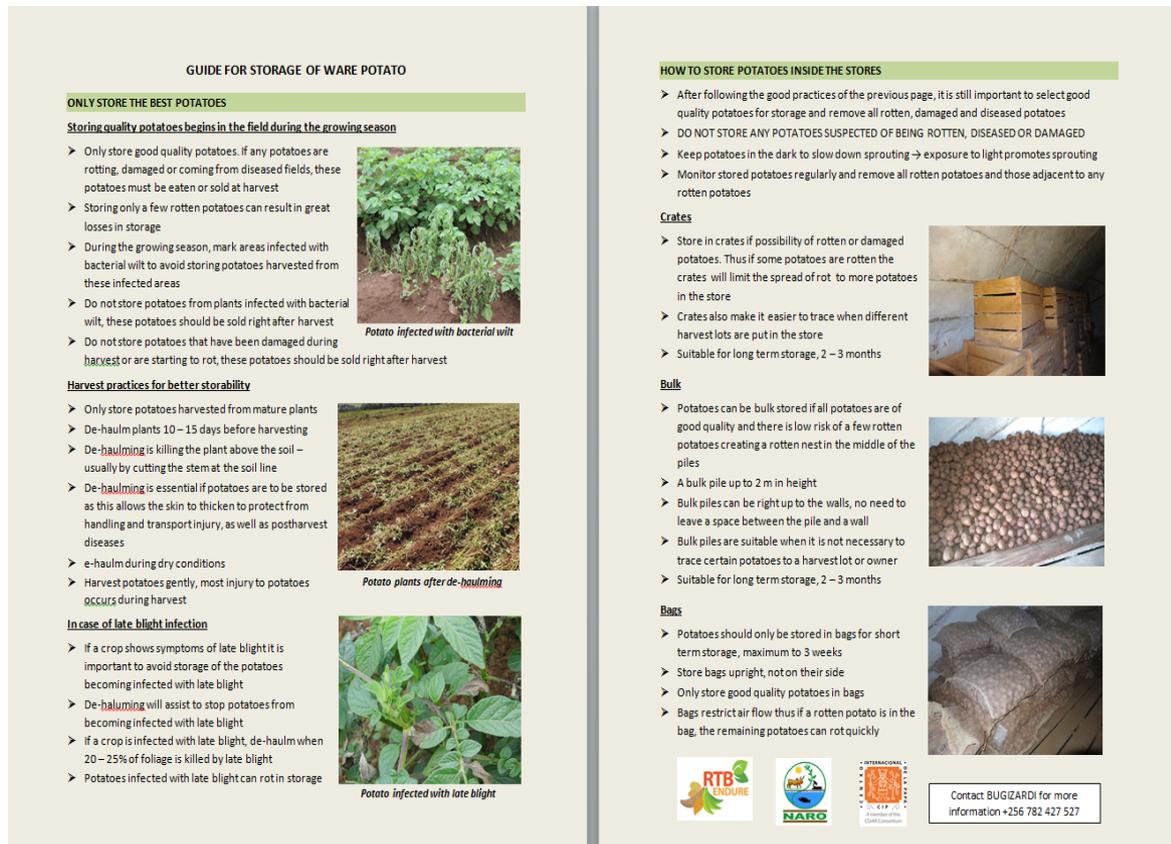
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Sweetpotato silage making manual in English (left) and Luganda (right)



Brief guide for storage of ware potato

Annex 3. Full list of expected deliverables and their status

Banana

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
1.	Increased access of farmers to cooking-banana varieties with preferred quality attributes and intrinsic long shelf-life traits	Nov	2016	On track			
	a) 1 workshop report: Inception and PMCA training workshop	Nov	2015	Completed			Accessible at the project website
	b) 10 mother gardens of the market demanded varieties established	Sep	2015	Completed			Mother gardens were established for the four selected cultivars
	c) 10 macro-propagation chambers of the market demanded varieties established	Mar	2016	On track			Four chambers have been established (remaining six to be built by March 2016)
	d) 1 leaflet of the market demanded varieties (including agronomic and culinary attributes, synonyms & other social characteristics)	Oct	2015	Delayed	Mar	2016	Information for compiling the leaflet is available
	e) 1 technical report: Comparing different seed multiplication techniques and seed distribution models	Nov	2016	On track			Experiments to compare the different multiplication techniques (macro-propagation, decapitation and enhanced nutrition) will commence in March 2016. Meetings are being conducted to discuss distribution models.
2.	Convenient presentation forms of cooking bananas reducing postharvest losses and acceptable to different market segments promoted	Nov	2016	On track			
	1 technical report: Structure of the Cooking Banana Value Chain in Uganda and Opportunities for Value Addition and Postharvest Losses Reduction	Dec	2015	Completed			Accessible at the project website

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	b) Case stories/experiences/lessons on marketing of different presentation forms of cooking banana	Mar	2016	On track			One case story has been captured and it is under compilation (Banana marketing story)
	c) 1 scientific article submitted: Postharvest losses along the cooking banana value chain	May	2016	On track			The article has been drafted
	d) 1 scientific article submitted: Perceptions towards weight-based pricing system for cooking banana	Aug	2016	On track			Required information has been collected
	e) 1 baseline report: Gender dynamics & value chain context in the cooking banana value chain	Feb	2016	On track			A draft report is under review by different team members
	f) 1 scientific article submitted: Depicting gender and value chain context in the cooking banana value chain	Apr	2016	On track			The article has been drafted
	g) 1 technical report: Gender situational analysis of cooking banana value chain and strategies for gender equity in postharvest innovations	Mar	2016	On track			The report has been drafted and an activity plan has been prepared to guide gender mainstreaming
	h) 1 protocol: Requirements for cooking banana export	Apr	2016	On track			Information is available and compilation is starting in February 2016
	i) 1 business plan: seed system	Apr	2016	On track			The business plan has been drafted
	j) 1 business plan: product differentiation	Jun	2016	On track			Not yet started
	k) 1 technical report: Shelf-life and storage temperatures of the different banana presentation forms	Jul	2016	On track			1 st set of experiments have been conducted. 2 nd set of experiments is ongoing
	l) 1 technical report: Optimal harvest age (combining physical, chemical & sensory attributes) of cooking bananas	Jul	2016	On track			Experiments started in December 2015

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	m) 1 scientific article submitted: Effects of optimal harvest age, storage temperature and packaging on the shelf-life of green cooking banana	Aug	2016	On track			Experiments started in December 2015
	n) 1 MSc thesis submitted: Determining the optimal harvest age of East African highland cooking bananas	Nov	2016	On track			Proposal and experimental protocol have been developed
	o) 1 technical report: Cost and benefit analysis of the different presentation forms and seed multiplication techniques	Oct	2016	On track			Not yet started
3.	Sucker staggering for evening-out banana production across seasons practiced by producers to obtain premium prices	Nov	2016	On track			
	a) 1 technical report: Effect of sucker staggering on production of cooking banana	Nov	2016	On track			Experiments are ongoing
4.	Technologies, market information and regulations for increased market access and fair pricing mechanisms promoted	Oct	2016	On track			
	a) 1 gender sensitive cooking banana value chain map	May	2016	On track			Required information has been collected
	b) 1 workshop report: PMCA Phase II final event	Oct	2016	On track			The PMCA Phase II final event is scheduled for July 2016
	c) Flyers, posters, and leaflets developed from the output results.	Oct	2016	On track			
5.	Improved practices, (dis)enabling environments, norms and culture to foster mutual understanding along the value chain	Nov	2016	On track			Not yet started
	a) Best-practices protocol	Oct	2016	On track			Not yet started
	b) Gender-responsive policy recommendations	Nov	2016	On track			Not yet started

Sweetpotato

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
1.	Knowledge on pig feed resources (quantity, quality and seasonality) in Masaka and Kamuli districts in Uganda documented	Sep	2016	On track			
	a) 1 scientific article submitted: Perception and practices of farmers on the utilization of sweetpotato, and other root tubers, and banana for pig feeding in smallholder crop-livestock systems in Uganda	Oct	2015	Completed			Article presenting main findings of the scoping study published in <i>Livestock Research for Rural Development</i> . 2015, Vol. 27. Accessible at the project website and at http://www.lrrd.org/lrrd27/11/dion27226.html
	b) 1 technical report: Pig feeding practices in smallholder crop-livestock systems in Uganda	Jun	2016	Delayed	Sep	2016	Bi-weekly data collection of feeding practices of pilot and control farmers is underway
2.	At least 2 methods for SP silage preparation validated and piloted	Nov	2016	On track			
	a) 1 brochure: Improved tube silage making method (in Luganda)	Sep	2015	Completed			The brochure has been widely distributed during ToT and farmers training sessions. It is accessible at the project website
	b) 1 manual: Sweetpotato silage making (in English)	Oct	2015	Completed			The manual has been widely distributed during the ToT session. It is accessible at the project website
	c) 1 manual: Sweetpotato silage making (in Luganda)	Oct	2015	Completed			The manual has been widely distributed during farmers training sessions. It is accessible at the project website
	d) 1 manual: Sweetpotato silage making 2.0 (in English)	Aug	2016	On track			The manual already produced will be updated based on the results of the sweetpotato and feeding trials
	e) 1 manual: Sweetpotato silage making 2.0 (in Luganda)	Aug	2016	On track			The manual already produced will be updated based on the results of the sweetpotato and feeding trials

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	f) 1 training report: ToT on sweetpotato silage making	Sep	2015	Completed			Accessible at the project website
	g) 2 training reports: Farmer training on sweetpotato silage making (in Masaka and Kamuli districts)	Oct	2015	Completed			Accessible at the project website
	h) 1 guideline: Stack silo sweetpotato silage preparation	May	2016	On track			Not yet started
	i) 1 technical report: Best combinations of sweetpotato silage based on local feed resources	May	2016	On track			Micro silos trials to evaluate options for sweetpotato silage and supplementation concluded.
	j) 1 technical report: Effect of sweetpotato based diet on pig growth performance	Jul	2016	On track			The construction of the silos for the on-station feeding trials has been finalized. On station and on-farm feeding trials will commence in March 2016
	k) 1 brochure: Supplementation of sweetpotato silage for pig feeding	Sep	2016	On track			Not yet started
	l) 1 scientific article submitted: Sweetpotato silage as a basal diet for growing pigs	Nov	2016	On track			Not yet started. To be extracted from the technical report
	m) 1 MSc thesis submitted: Sweetpotato silage as a basal diet for growing pigs	Nov	2016	On track			Proposal has been developed and is currently under review
	n) 2 training reports: Promotion of validated sweetpotato technologies (in Masaka and Kamuli districts)	Nov	2016	On track			Not yet started
3.	Dual purpose sweetpotato varieties and their cutting management identified and promoted	Nov	2016	On track			

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	a) 1 technical report: Performance of dual purpose sweetpotato varieties and effect of cutting regimes	Jun	2016	Delayed	Oct	2016	On-farm and on-station trials to evaluate the best dual purpose sweetpotato varieties are underway. The 1 st round of on-station trials to evaluate four varieties and different cutting regimes has been concluded. The 2 nd round for determining the role of NPK fertilization on vines and roots' yield is ongoing. The 1 st season of on-farm trials is underway
	b) 1 scientific article submitted: Performance of dual purpose sweetpotato varieties and effect of cutting regimes	Nov	2016	On track			Not yet started. To be extracted from the technical report
	c) 1 MSc thesis submitted: Evaluation of sweetpotato varieties for suitability as dual purpose varieties and their cutting management	Nov	2016	On track			Proposal has been developed and successfully defended
4.	Capacity for uptake of silage making as a business for the youth, women and men strengthened	Jul	2016	On track			
	a) 16 business plans for potential sweetpotato silage producers, traders and service providers	Apr	2016	On track			Selection criteria have been defined and some of the potential silage producers, traders and service providers have been identified
	b) 4 Silage Business Support Centres established	Apr	2016	On track			Roles and responsibilities have been defined and the hosts of the centres have been identified
	c) 1 technical report: Capacity needs assessment of potential sweetpotato silage producers, traders and service providers	Apr	2016	On track			Selection criteria have been defined and some of the potential silage producers, traders and service providers have been identified
	d) 1 training report: Capacity strengthening of potential sweetpotato silage producers, traders and service providers	Jun	2016	On track			Not yet started

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	e) 1 technical report: Gender situational analysis of sweetpotato and pig value chains and strategies for gender equity in postharvest innovations	Jul	2016	On track			Not yet started
5. Economic viability and social acceptability of sweetpotato-pig systems validated and documented		Nov	2016	On track			
	a) 1 technical report: Economic viability and social acceptability of sweetpotato silage production and marketing	Nov	2016	On track			Research underway to collect data
	b) 1 scientific article submitted: Structure of sweetpotato fodder markets in Masaka and Kamuli districts	Sep	2016	On track			Not yet started. To be extracted from the technical report
	c) 1 scientific article submitted: Demand and willingness to pay for sweetpotato silage for pig feed in smallholder systems in Kamuli and Masaka districts of Uganda	Nov	2016	On track			Not yet started. To be extracted from the technical report
	d) 1 MSc thesis submitted: Demand and acceptability of sweetpotato silage as pig feed by smallholder pig farmers in Uganda: A case of Kamuli and Masaka districts	Nov	2016	On track			Proposal has been developed and successfully defended
6. At least 2 business models for silage production and marketing tested and best models identified and promoted for scaling up		Oct	2016	On track			
	a) 1 technical report: Best practices and models for production and marketing of sweetpotato silage	Oct	2016	On track			Not yet started

Potato

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
1.	Current status and ware potato marketing system in Eastern Uganda mapped and gender based market constraints and opportunities identified, analyzed along the potato value	Aug	2016	On track			
	a) 1 technical report: Market and value chain analysis: A Case of ware potato from East Uganda	Jun	2015	Delayed	Feb	2016	Data analysis and collection has been finalized and the report is being drafted
	b) 1 scientific article submitted: Postharvest management practices and market performance in Uganda: A case of ware potato value chains	Aug	2016	On track			Not yet started. To be extracted from the market and value chain analysis report
	c) 1 MSc thesis submitted: Postharvest management practices and market performance in Eastern Uganda: A case of ware potato value chains	Nov	2016	On track			Proposal has been developed and successfully defended
	d) 1 technical report: Gender situational analysis of ware potato value chain in eastern Uganda and strategies for gender equity in postharvest innovations	Jun	2015	Delayed	Feb	2016	A draft report is under review by different team members
2.	Pre-harvest and storage methods tested and validated by potato variety under different ambient conditions taking into account technical, economic and social aspects as well as consumer acceptability	Nov	2016	On track			
	a) 1 scientific article submitted: Potential impact of postharvest technologies on women and households in Uganda	Jul	2016	On track			Required information has been collected
	b) 4 collective ambient stores constructed	Sep	2015	Completed			Stores have been built at MIFA, KACOFA and WASWAPA potato farmers associations and at MDOPA potato traders association

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	c) 12 improved traditional stores constructed	Sep	2015	Delayed	Feb	2016	Host farmers have been identified and procurement of material is underway
	d) 1 technical report: Postharvest quality of potato by variety and storage conditions	Aug	2016	On track			Research underway to collect data
	e) 1 scientific article submitted: Postharvest quality of potato by variety and storage conditions	Oct	2016	On track			Not yet started. To be extracted from the technical report
	f) 1 MSc thesis submitted: Biological analysis for potato postharvest storage: Evaluating different potato varieties under differing postharvest storage conditions	Nov	2016	On track			Proposal has been developed and successfully defended
	g) 1 technical report: Economic viability and consumer acceptability of stored potato	Dec	2015	Delayed	Aug	2016	Still pending entry of some costs for construction of ambient stores. Some aspects will be extracted from 2a
	h) 1 scientific article submitted: Economic viability and consumer acceptability of stored potato	Oct	2016	On track			Not yet started. To be extracted from the technical report
	i) 1 technical report: Results of potato variety evaluations	Sep	2016	On track			Research underway to collect data
	j) 1 MSc thesis submitted: Evaluation of suitability of potato varieties and staggered planting in Eastern Uganda	Nov	2016	On track			Proposal and experimental protocol have been developed
	k) 1 technical report: Adapted harvesting techniques	Sep	2016	On track			Not yet started. Procurement of harvesting equipment is underway
3.	Capacity in ware potato pre harvest and storage methods for producers, traders, researchers and extension agents strengthened	Jul	2016	On track			
	a) 1 brochure: Guide to store ware potato	Nov	2015	Completed			Accessible at the project website
	b) 1 guidelines: Ware potato postharvest and storage techniques	Jun	2016	On track			Research underway to collect data

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	c) 1 training report: Better pre-harvest and appropriate storage management techniques	Jul	2016	On track			First training scheduled in Jan 2016
4. Skills in entrepreneurship, agribusiness and collective action developed for selected actors in specialized ware potato market		Jun	2016	On track			
	a) 1 technical report: Potato associations capacity needs assessment and action planning	Nov	2015	Completed			Accessible at the project website
	b) 1 training curriculum: Entrepreneurial skills for potato associations	Nov	2015	Completed			Accessible at the project website
	d) 1 training report: Entrepreneurial skills for ware potato production, postharvest handling and marketing	Jun	2016	On track			Training in process, four of seven modules completed
	e) 4 business plans (one for each potato association)	Apr	2016	On track			Training underway to enable completion
	f) 1 guidelines: Association/ group development for ware potato agri-business	Jun	2016	On track			Not yet started
5. Recommendation for extending shelf-life, increased utilization and reduction of post-harvest losses along ware potato value chain disseminated		Oct	2016	On track			
	c) 1 technical report: Business models to profitably engage in storage and improved postharvest management of ware potato for improved integration into potato value chains	Oct	2016	On track			Not yet started

Cassava

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
1.	Knowledge on market segments for fresh cassava and use of deteriorated cassava roots generated and disseminated	Jul	2016	On track			
	a) 1 technical report: Market and value chain analysis of fresh cassava roots in Uganda	Jul	2015	Delayed	Feb	2016	Draft report and data sets shared for input from partners, comments awaited for further data analysis and reporting
	b) 1 technical report: Gender situational analysis of fresh cassava value chain and strategies for gender equity in postharvest innovations	Jul	2016	On track			Not yet started
2.	Technology and innovations on extending shelf-life of fresh cassava evaluated on-station	Nov	2016	On track			
	a) 1 technical report: PPD tolerance of selected Ugandan cassava varieties	May	2016	On track			17 varieties, both pruned and unpruned, are being analyzed and sensory evaluations is underway
	b) 1 technical report: Efficacy of pruning, waxing and relative humidity storage in extending shelf-life of fresh cassava roots	Jul	2016	On track			On-station trials are on-going on selected varieties and their shelf-life assessed
	c) 1 scientific article submitted: The effect of pruning on shelf-life and eating quality of selected cassava varieties in Uganda	Sep	2016	On track			Not yet started. To be extracted from the technical report
	d) 1 scientific article submitted: The effectiveness of waxing and relative humidity storage technologies in extending the shelf-life of selected cassava varieties in Uganda	Sep	2016	On track			Not yet started. To be extracted from the technical report
	e) 1 MSc thesis submitted: Effectiveness of relative humidity storage as a method of extending the shelf-life of fresh cassava roots	Nov	2016	On track			Proposal has been developed and successfully defended

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	f) 1 MSc thesis submitted: Improving cassava shelf-life and reducing its postharvest deterioration through the waxing technology	Nov	2016	On track			Proposal and experimental protocol have been developed
3. Improved capacity to utilize technologies and innovation through documentation and knowledge sharing		Sep	2016	On track			
	a) 1 training report: South-South collaboration for strengthening capacities in assessing the postharvest physiological deterioration (PPD) of fresh cassava roots and technologies for shelf-life extension	Oct	2015	Completed			Accessible at the project website
	b) 1 manual: How to set up a pack-house for cassava shelf-life extension	Jan	2016	Delayed	Mar	2016	The manual is being finalized
	c) 1 user guide: Cassava handling for waxing and relative humidity storage	Jan	2016	Delayed	Mar	2016	Not yet started
	d) 2 pack-houses established and operationalized	Apr	2016	On track			Ongoing discussion on most suitable locations, total investment needs (capital and operational costs), distribution and responsibilities of stakeholders/partners
	e) 1 training report: Capacity building in entrepreneurial and business skills	Jun	2016	On track			Preliminary information is being collected on partners capacities in entrepreneurship and business management
	f) 1 training report: Capacity building in agronomic practices and waxing/relative humidity storage technologies for shelf-life extension of fresh cassava roots	Jul	2016	On track			First draft of Initial capacity building activities on ridging, harvesting and pruning is being edited
	g) 2 business plans for the established pack-houses	Sep	2016	On track			Preliminary data on market opportunities being compiled with stakeholders
4. Assessment of adaptability and profitability of the technologies in Uganda conducted		Nov	2016	On track			

Output	Deliverable	Due date		Current status	If delayed, indicate revised date		Comments regarding progress
		Mon	Year		Mon	Year	
	a) 1 technical report: Profitability of waxing and relative humidity storage technologies for shelf-life extension of fresh cassava roots in Uganda	Oct	2016	On-track			Preliminary data on costs being compiled from on-station trials
	b) 1 scientific article submitted: Best practices and models for marketing of extended shelf-life fresh cassava roots in Uganda	Oct	2016	On track			Not yet started but preliminary identification of market opportunities and linkages with potential buyers initiated
	c) 1 scientific article submitted: Determinants of acceptability and willingness to pay for fresh cassava with extended shelf-life in Uganda	Nov	2016	On track			Not yet started
	d) 1 MSc thesis submitted: Acceptance and willingness to pay for fresh cassava with extended shelf-life	Nov	2016	On track			Proposal has been developed and is currently under review

Annex 4. Project highlights on media in 2015

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News



Project seeks to add value to roots, tubers and bananas

Image credit: Flickr/ Trust for Africa's Orphans

19/01/15

Esther Nakkazi

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Trial to assess vaginal ring for curbing HIV 'on track'

Researchers say that by June 2016, they hope to complete a trial that aims to use a vaginal gel to prevent HIV.

HIV/AIDS | Health | R&D

News: 23/01/15

Beans project launched to

Speed read

- The project is using research to help reduce the crops' postharvest losses
- It will test tech that could help store cassava roots for more than seven days
- It also aims to assess post-harvest innovations and gender-sensitive approaches

115

[KAMPALA] Researchers are implementing a new project to explore increased use of roots, tubers and bananas (RTBs) and technologies to reduce their postharvest losses in Uganda.

Source: <http://www.scidev.net/sub-saharan-africa/agriculture/news/adding-value-to-rtbs.html>



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Project to limit post-harvest losses in Uganda

Thursday, 29 January 2015 11:59



CIP indicated that they would test existing technologies to prolong the shelf life of fresh cassava roots using high relative humidity storage. (Image source: CGIAR)

Uganda has launched a new project to explore increased use of roots, tubers and bananas (RTBs) and agricultural technologies to reduce post-harvest losses in the country

Diego Naziri, a post harvest specialist at the International Potato Center (CIP) in Uganda, said, "This project is supported by the EU and the International Fund for Agricultural Development (IFAD). The project will improve food security for RTBs and the

demand of post-harvest and processing technologies as well as value chain and capacity development in Uganda."

Naziri added that unlike in Asia, the full potential of RTBs has not been realised in Africa despite their benefits. He noted that Africa lacks technologies for storing RTBs, resulting in an underdeveloped potential for value addition.

Enoch Kikulwe, an associate scientist at Biodiversity International of Uganda, said that research on cooking bananas is expected to reduce post-harvest losses by promoting varieties with a longer shelf life and better post-harvest handling properties.

The project would pilot a new weight-based pricing system and promote different

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16 April:
Commercial and emerging commercial farmers focus day

17 - 18 April:
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Source: <http://www.africanfarming.net/crops/agriculture/project-to-add-value-to-ugandan-agricultural-produce>



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He turned to growing rice to earn more money



Lawyer invests in coffee, livestock and forestry



Uganda selected as focus for project on root crops



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FARMING

Uganda selected as focus for project on root crops, bananas

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Bananas are one of the widely grown crops and a main source of income in Uganda. A regional project is developing technologies to enable farmers who grow such crops to enjoy the benefits of value addition such as better markets and higher incomes.

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Source: <http://www.monitor.co.ug/Magazines/Farming/Uganda-selected-as-focus-for-project-on-root-crops--bananas/-/689860/2611266/-/743lcs/-/index.html>



Tuesday, January 27, 2015

New technologies for storing use of roots, tubers and bananas

 **Consiglia** Consiglia questo elemento prima di tutti i tuoi amici.

1-3 December 2014. Ntinda, Uganda. [A new project is to explore increased use of roots, tubers and bananas \(RTBs\)](#) and technologies to rt Uganda.

The European Union is [funding](#) the US\$4 million, **three-year project**. A workshop to highlight the research activities to be undertaken was

Four RTBs — cassava, sweet potatoes, cooking bananas and Irish potatoes — were selected last year, according to [Diego Naziri](#), a postharv Potato Center (CIP) in Uganda and the leader of the project.

"This project will contribute to improved food security for RTBs and will contribute to the demand of postharvest and processing technologies as well as value chain and capacity development," Naziri says.

He adds that unlike in Asia, the full potential of RTBs has not been realised in Africa despite their benefits. Naziri explains that Africa **lacks technologies for storing RTBs**, resulting in an underdeveloped potential for value addition. The researchers indicated that they would test:

1. existing technologies to **prolong the shelf life of fresh cassava roots** for more than seven days using high relative humidity storage, whereby healthy cassava roots are dipped in a household bleach, packed in polyethylene bags and maintained at high humidity in a cool environment.
2. **research on cooking bananas** will reduce postharvest losses by promoting varieties with a longer shelf life and better postharvest handling properties. The project will pilot a new weight-based pricing system and promote different consumer products, including peeled and preserved bananas.
3. develop simple and affordable **silage making technologies for conserving sweet potato** roots and vines unknown to most pig producers in Uganda

at [Tuesday, January 27, 2015](#) 

Labels: [postharvest](#), [Uganda](#), [waste](#)

Source: <http://paepard.blogspot.com/2015/01/new-technologies-for-storing-use-of.html>



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Agribusiness

Farmers trained in silage production

Publish Date: Sep 04, 2015



A trainee farmer tried forage chopping at Kabanyolo. (Credit: Christopher Bendana)

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newvision

By Christopher Bendana

Some 28 agriculture officials and famers have been trained in silage production for pigs at Makerere University Agricultural Research Institute, Kabanyolo.

The training, sweet potato production, management and utilization workshop for training of trainers was organised by the International Potato Center (CIP) and the International Livestock Research Institute (ILRI).

The officials and farmers were chosen from Masaka and Kamuli districts.

Dr. Peter Mubiru, an official from the ILRI, said that trained officials from Masaka became the...

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Source: <http://www.newvision.co.ug/news/673028-farmers-trained-in-silage-production.html>



A man inspects Irish potatoes stored in an ambient store in Kapchorwa District. PHOTO BY DAVID MAFABI

Farmers get stores for Irish potatoes

BY DAVID MAFABI
editorial@ug.nationmedia.com

KAPCHORWA. Makerere University Roots, Tubers and Banana's (RTB) project with financial assistance from European Union and International Fund for Agricultural Development have constructed Irish potato ambient ware stores in Kapchorwa District to improve the quality of the crop.

According to Ms Joyce Banan, the vice chairperson of Kapchorwa Commercial Farmers Association, the stores are a big step in adding value to the crop.

"We could not keep it [potato] for long, so we sold it

add the shelf life of the potato and keep it until the price is high," Ms Banan said last week.

She said Irish potatoes are highly perishable and yet there is excess supply during the months of June, July and October, November.

Ms Banan said the stores have also been constructed at Wanale for Wanale Seed and Ware Potato Association, Bugwere market in Mbale for Mbale Potato Dealers Association and Benet in Kween District for local farmers.

The project leader, Mr Diego Naziri, said the project is also aimed at improving marketing, expanding utilisation of RTB through research

SUITABLE FACILITY

Ms Maria Burnet, a senior researcher at RTB, said the ambient stores bring an ideal cool place with temperatures above 40°F in a location that has high humidity. She said the stores are built with grass, mud, stones, poles, cow dung and the outside is cemented to make the storage room dark to prevent greening of the tubers. "The ideal storage conditions to promote curing of Irish potatoes are 60° to 65° F and 85 per cent relative humidity for the first 10 days. Then drop the temperature to 40° to 50° F, and raise the humidity for final holding," Ms Burnet said.



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30/12/15

Bernard Appiah



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News: 05/01/16

Science organisations sign open data access accord

Four global science organisations have developed and signed an accord for championing open data and its practice.

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Speed read



- Many of our top stories discussed increased yields of staple crops
- Others highlighted the ways to deal with climate change
- The impact of ICT and tech on agriculture and health also became prominent

A **story on roots, tubers and bananas** indicated that a three-year project in Uganda aimed at adding value to the crops had begun. A postharvest specialist at the International Potato Center in Uganda, who is the leader of the project, says use of postharvest and processing technologies could help prevent losses of bananas, roots and tubers, and improve food security on the continent. Another expert indicated that cassava roots have a very short marketing period of 48 hours, thus leading to economic losses of up to 90 per cent of the initial value if smallholders lack storage technologies.

Source: <http://www.scidev.net/sub-saharan-africa/agriculture/feature/africa-science-stories-2015.html>



New potato storage facilities help Ugandan farmers increase incomes

Potato is a critical source of income and food security in Uganda. However due to constraints, including the high perishability of the crop and limited storage facilities, farmers are faced with a short marketing window that impacts their income.

This is particularly important in Eastern Uganda where there are two potato cropping seasons that result in a highly seasonal market with periods of excess and scarcity, causing prices to fluctuate.

To help farmers extend the shelf-life of their produce for sale in the off-season when the prices are higher – providing them with a more stable income and evening out market supplies – the “Postharvest innovations for better access to specialized ware potato markets” sub-project of the RTB-ENDURE project supported the construction of four ware potato ambient stores in Mbale, Kapchorwa and Kween districts.

These storage facilities were launched at a colorful event on October 23, 2015 which was preceded by a science day on October 22, 2015 at the Mbale Resort Hotel, Mbale in Eastern Uganda.



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Source: <http://www.rtb.cgiar.org/new-potato-storage-facilities-help-ugandan-farmers-increase-incomes/>

Roots, tubers and banana plants: Next-generation pig feeds for Uganda

Posted on 20 Nov 2015 by SUSAN MACMILLAN

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Pigs (photo credit: N Palmer/CIAT).

The demand for animal source foods in Uganda is rising as the country's population continues to grow alongside improved income and urbanization.

Pork in particular has become an increasingly important food in the diets of Ugandans, reflected in the significant growth in consumption rates from the 1960s, when it accounted for only 1–2% of the per capita consumption of meat, to today's level of at least 30% of the 10 kg consumed per capita/year.

Despite its growing popularity among both farmers and consumers, smallholder pig production in Uganda is faced by key constraints including limited access of farmers to a reliable supply of quality pig feed and



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Source: <http://news.ilri.org/2015/11/20/roots-tubers-and-banana-plants-next-generation-pig-feeds-for-uganda/>

Six steps forward for root and tuber crops

Graham Thiele, Program Director, CGIAR Research Program on Roots, Tubers and Bananas (RTB) shares his top six highlights from the first [World Congress on Root and Tuber Crops](#), January 18 – 22, Nanning, China.

With root and tuber crops providing food for than 2.2 billion million people around the globe, it is no surprise that our efforts to improve these crops are so broad and geographically dispersed. The first World Congress on Root and Tuber Crops, which has just wrapped up in Nanning, China, brought together hundreds of experts working on various areas in the value chain and is a special forum to share advances across all our crops.

This is one of the reasons why RTB is so pleased to support the [International Society for Tropical Root Crops](#) (ISTRC) and [Global Cassava Partnership for the 21st Century](#) (GCP21) as co-organizers. For me, it was also great to see so many friends and colleagues in the roots and tubers community and catch up on progress. There is so much to report back, but I do have a few highlights from the week which particularly struck me to share.

Omics and beyond

It's astonishing the progress made with understanding the genetic makeup of root and tuber crops and the different pathways from genes to trait expression which the new science of 'omics' has made possible. It was impressive to see the progress made by our Chinese colleagues, including a lively presentation from Songbi Chen of the [Tropical Crops Genetic Resources Institute](#) of the Chinese Academy of Tropical Agricultural Sciences (CATAS) on the application of

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RTB Tweets

Pruning buys time for cassava

Cassava roots deteriorate quickly after harvest, posing a significant challenge for farmers and processors. Harriet Muyinza of NARO took part in an exchange visit to the [International Center for Tropical Agriculture](#) (CIAT) in Colombia sponsored by the [RTB-ENDURE](#) project, during which she applied a cassava pruning technique that she learned during the exchange in field trials in Uganda. The results are very promising, showing that with one of the varieties called *Tim Tim*, pruning reduced post-harvest deterioration to below 20%, compared to 70% without pruning. This suggests that pruning could be effective for farmers to reduce storage loss and have more time to transport their crop to market.

Source: <http://www.rtb.cgiar.org/six-steps-forward-for-root-and-tuber-crops/>