

Expanding the Application of Cassava Value Chain Technologies Through UPoCA Project^A

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The lead author, **Braima Dama James**, is a Sierra Leonean working to develop the capacity of smallholder farmers to produce food in quantities and qualities suitable for markets. He has served Sierra Leone as a) Senior Academic staff at Fourah Bay College, University of Sierra Leone, (1975 to 1993) during which time he was b) UNDP/FAO National Expert, c) national biological control expert to advise Government on crop protection issues within food security needs, and d) Chief Examiner in Biology, West African Examination Council. In March 1993, he joined IITA where he works with a range of other scientists, international organizations and networks to identify and analyze actual and potential bottlenecks to agricultural productivity, and propose and assess technical resources and search for partnership and funding opportunities that hold promise to effect the desired change in Africa. At IITA, he coordinated a) the Africa component of the bi-continental UNDP funded Ecologically Sustainable Cassava Plant Protection Project (ESCaPP) in Africa and Latin America, b) the Global System-wide Programme on Integrated Pest Management (SP-IPM) of the Consultative Group on International Agricultural Research (CGIAR), c) the Rotary Foundation regional 3-H (Hunger, Health and Humanity) project on food quality, served as d) Director at the IITA Biological Control Centre for Africa based in Cotonou, Republic of Benin and is currently e) IITA Country representative in Sierra Leone. The common thread across his various Research-for-Development (R4D) activities is a focus to harness inter-institutional efforts to develop national capacities in ways that increase agricultural productivity and income of smallholder groups. Dr. James is a Fellow of the Royal Society of Entomology (FRES). His article reproduced here overviews recent strides and challenges across sub-Saharan Africa to put scientific technologies for smallholder groups needing to move cassava from subsistence to commercial level. It also demonstrates how smallholder groups can facilitate value-added processing of cassava. The article is based on experience gained by scientists at or affiliated with the International Institute of Tropical Agriculture (IITA) to implement the project “Unleashing the Power of Cassava in Africa” (UPoCA) funded by the United States Agency for International Development (USAID).

Cassava has long been recognized as a staple food crop with potentials as a raw material base for a wide range of processed products. Over the past three decades, cassava development research by IITA and its partners in Sub-Saharan Africa (SSA) has significantly enhanced these features in the crop. In the mid-1990s, IITA and partners focused on cassava crop improvement research for development activities within her component research programs and two sub-regional networks: EARRNET in East Africa and SARRNET in Southern Africa. Through a combination of conventional and new approaches, the partnership has developed improved cassava varieties which combine multiple pest/disease resistance with superior postharvest qualities, and improve the yield potential in many locations (Okechukwu and Dixon 2008). At least 165 improved varieties have been released in 26 countries (Dixon et al 2010). The availability of these elite cassava varieties with 50% more yielding potential reflects the vision of an expanded future role of cassava in food, feed, and industrial applications. However, the cassava sector in SSA has been and continues to be constrained by low on-farm productivity and marketing difficulties.

A vital step to increase on-farm yields/productivity is to promote value addition

targeting diverse markets in schemes to commercialize the crop enabling it to contribute significantly to poverty reduction strategies. Available research results suggest that generally a 1% increase in crop yield will reduce the number of people living under \$1 by 2 million in SSA (Thirtle et al 2003). In the cassava sub-sector, persisting challenges to the realization of the food and market potential of the crop relate largely to lack of sustainable mechanisms for area-wide scaling-out of proven research results. Problems with distributing planting material of elite varieties mean that farmers continue to grow local, low yielding varieties. Smallholder farmers in Africa also lack access to knowledge and equipment which could add value to their harvests, and skills to use it. Smallholders also lack access to diversified markets. To help address these productivity problems, IITA R4D partnerships have helped to enhance cassava yield stability and productivity through an Africa-wide biological control program which halted and reversed devastating losses caused by alien invasive pest species (Neuenschwander, 2001; Yaninek et al 1993; Neuenschwander et al 2003).

In recent years, the challenges have been addressed by multi-country projects which facilitate shifts from traditional processing techniques associated with low value and poor quality products towards beneficiary linkages for value added processing (Mahungu et al 2010; Sanni et al 2010). A number of such initiatives are triggered mainly by recent global food price crises, and focus on using previously developed best-bet production, processing and marketing approaches and innovations to ensure sustainable cassava value chains and markets. For example, in 2008, USAID famine trust project “Unleashing the Power of Cassava in Response to Food Price Crisis” (UPoCA) was initiated as a 2-year transitional multi-country set of activities for cassava sub-sectors to realize its potential in rural economies. USAID and IITA selected cassava as a commodity that can contribute decisively to on-going efforts to promote rural economic growth with spill-over benefits to urban populations. The UPoCA project, implemented by IITA through inter-institutional partnerships in DR Congo, Ghana, Malawi, Mozambique, Nigeria, Sierra Leone, and Tanzania, draws on prior research results to increase on-farm cassava productivity and value adding processing for markets.

The purpose of the 2-year (2009 and 2010) UPoCA project is to provide adequate supply of cassava products at economically affordable prices through availability of improved varieties, production and processing. To work towards achieving this purpose, UPoCA proposed to rapidly mass propagate improved and high yielding cassava varieties; promote farm gate and value adding processing of cassava for food and markets; and train farmers in improved cassava production techniques. The expected impact from achievement of these objectives will be cassava yield increased by at least 30% more than baseline figures, reduced fluctuations in food availability and price through increased cassava productivity triggered by value-adding and utilization at levels. This would lead to: a) enhanced household and national food security, b) increased income, and c) improved wellbeing and nutrition for beneficiary populations.

This paper presents an overview of progress of the UPoCA project towards its purpose and is based on implementation experiences in the seven project countries. The evolving UPoCA achievements elaborated in this overview show that a longer-term cassava research for development partnership platform of this nature will enable cassava sub-sectors to contribute significantly to rural economic growth in Africa. The paper concludes by indicating emerging R4D areas needing attention to more effectively move success towards full achievement of the project’s purpose.

Materials and methods

UPoCA project implementation strategy draws on prior cassava research results and experiences to promote end-users' access to technical innovations developed elsewhere and increase the range and applicability of cassava technologies and practices. Based on these experiences, project implementation uses a programmatic approach in which activities are anchored firmly at community levels with direct action by key cassava value chain actors to impact on the communities

At project inception, IITA initiated consultative discussions with key partners in each of the seven countries with the view to organize and hold national and regional project implementation planning workshops. At national consultative workshops IITA link scientists introduced the project to a wider range of stakeholder groups, participants discussed elements of the project and harmonized views on needs and drafted national work plans and budgets. By the end of the series of national workshops, IITA identified potential National Coordinators for recruitment, noted project implementation partners in the country and established the project management team.

The set of national consultative workshops culminated in a regional project planning workshop 19–21 January 2009, at IITA-Ibadan, Nigeria for joint implementation planning by 26 participants from IITA and various partner institutions in the seven project countries. The specific workshop objectives were to enhance communication, understanding and commitment among project leaders in the search for common ground and harmonized views on problem and opportunity analysis; and define more precisely project targets and performance indicators and related targets by which to measure project achievement; streamline national project work plans to reflect a common understanding of regional focus in project implementation. Workshop presentations and general deliberations took place in plenary sessions whilst details were fleshed out in smaller break-out working groups. The views of beneficiary groups as captured at national consultative activities were provided in country reports presented at the regional workshop. Through a process of brainstorming, ranking of constraints and discussions, the workshop specified priority issues and secured consensus on the three Immediate Results areas in the USAID/IEHA Results framework for the project.

In order to assure effective scaling out for greater impact within available resources, the project reviewed proposed plans on operational sites and use of households as the unit to track technology spread. In view of the discussions, the project reduced the number of administrative regions for field activities according to felt needs, e.g., from 10 to 6 States in Nigeria, 12 to 6 Districts in Sierra Leone, 8 to 4 districts in Malawi, and 13 districts in 2 regions in Ghana. Also, in recognition that households differ in composition and size even within the same locality, participants agreed that it will be most practical to track technology spread by individual farmers and processors. On vulnerability indices, participants agreed that the target beneficiaries to be listed would generally be poor smallholders and at least 35% of them would by default fall in one or more vulnerability classes.

Workshop participants identified the following scaling out approaches to strengthen community capacity and trigger positive changes in agricultural performance:

- Selecting operation sites based on a combination of criteria including a) prior cassava R4D; b) participation in the projects baseline surveys; c) partnership opportunities with other on-going funded activities by agricultural development agencies; d) probability of

synergies in efforts with other agencies; e) beneficiary interest in cassava production and processing; f) existing cassava processing activities.

- Building end-user ownership of processes through beneficiary listing of direct beneficiary groups and individuals associated with partner stakeholders group with on-going investment in community outreach activities.
- Building cadres of national ToT expertise comprising change agents with primary responsibility to facilitate experiential/hands-on learning of technologies by beneficiaries mostly associated with project's partner organizations.
- Area-wide dissemination of technologies with allied information resources for increased cassava productivity and value-added cassava processing.
- Facilitating experiential/hands-on learning to increase informed decision making in cassava production and value added processing by direct beneficiaries.
- Promoting interconnectivity between value chain actors, especially between producers and processors, in attempts to encourage the development of cassava enterprises.
- Mass media communications to increase national and global visibility of cassava utilization pathways, the nature of constraints and “best-bet” available interventions.

Results

Project inception: Consultative planning workshops identified nine major areas of constraints undermining cassava profitability in the countries. Participants proposed and agreed on interventions deserving project investment to address these problems (Table 1) and develop a detailed plan of operations to guide operations. The plan specified activities, performance indicators and related targets, resource allocation, timelines in implementations, and responsibilities of experts/agencies to be involved in the project implementation. Key actors on location-specific implementation activities included producer groups with emphasis on women, the youth and other vulnerable groups, agro-processors/private sector, government and NGO agencies. Project management teams introduced the project to USAID missions and formally launched in the countries. In Ghana and Sierra Leone the launching ceremonies were hosted and chaired by representatives of the United States Embassies in the countries. Table 2 summarizes the achievements based on agreed target by indicators. By end of September 2010, the project scored well on 16 (72.7%) out of 22 indicator targets agreed upon during regional implementation workshop. The following results expand on achievements made in key activities.

Expanded on-farm productivity: To boost on-farm productivity, 58 elite varieties were planted by smallholder farmers associated with 55 partner organizations and 11 agricultural related firms. The partners established 380 community cassava stem multiplication fields on 643ha and planted 11,540ha cassava farms. GIS projections, based on passive spread at 5km per year from each of the introduction sites, indicate that these varieties will spread to populations within buffer zones of 79,500 km² and 107,500 km² in 2010 and 2011, respectively.

Following training on competitive cassava production techniques in Sierra Leone, the resource persons and participants used the training experience to develop a user-friendly yield assessment methodology for use by project partners to measure yield in their farms. In addition to measuring root yields, the methodology allows for estimation of plant population (for use in advising farmers on appropriate plant spacing required for higher yields) and root rot incidence (to advice on researchable areas to promote sustainability of yields. The UPoCA yield data collection protocol is being used to estimate root yields by the project trained field agents and farmers. By end 2010:

- UPoCA-DRC collected yield parameters on 150 farms in seven territories and five provinces: Maluku (Kinshasa province), Bulungu and Idiofa (Bandundu), and Mbanza Ngungu and Seke Banza (Bas Congo province), Kisangani hinterland (Orientale province), and Ngandajika (Kasai Oriental province). One hundred and thirty fields were investigated. The average age of the cassava farms were 12.1 months and 13.1 months for farms planted with improved varieties and landraces respectively. The average number of tuberous root per plant in field totally planted with improved varieties was 4.4 roots/plant compared to 2.7 roots/plant in field planted totally with landraces (2.70 roots/plant). Average root yields were estimated at 18.9 t/ha planted with improved varieties only and 9.4 t/ha planted with landraces only. Root yields tended to be higher in the rain forest of Orientale, and Bas-Congo provinces.
- In Ghana, average yields for 5 varieties were 24.06 t/ha; 4.44 to 35.88 t/ha; 9.37 to 31.68t/ha; 3.07 to 57.5t/ha; and 6.5 to 33.25t/ha for varieties *Abasafitaa*, *Afisiafi*, *Bankyehemaa*, *Esambankye* and *Tekbankye* respectively.
- In Sierra Leone, yield data was collected from 240 farmers' fields in 12 districts. Farm age at harvest averaged 12months (range: 9 to 24 months); farm size averaged 1.2ha (range 0.1ha to 18.2ha); plant population averaged 13,157 stands per ha (range: 2,800 to 35, 60 plants). Root yield averaged 13.5 kg/ha and varied widely between 1kg to 36.6 kg/ ha. Root rot incidence also varied widely from none to 25.4% roots lost to the disease. Highest root yields (>15 tons/ha) were forested districts.

Capacity devolution: UPoCA project introduced smallholder beneficiaries to the economic potential of the crop and to cassava crop management practices through training. The training curriculum covered five integrated short-term courses. The courses were a) principles and applications of Global Positioning Systems; b) techniques for profitable cassava production; c) processing cassava into food and industrial products; d) packaging and labelling cassava products for markets; e) planning and managing a small cassava processing enterprise. Forty (40) hands-on courses were delivered in the seven project countries. Through these courses, 915 men and 782 women learnt improved techniques and skills of cassava production, pest management, processing, products' development, quality compliance, packaging and labelling of products and business planning. Box 1 profiles an example of one of the courses delivered. Through these courses, the project introduced to rural communities one biopesticide for control of the variegated grasshopper *Zonocerus grasshoppers*, five different low-cost cassava processing equipment (motorized graters, hydraulic press, hammer mill, mechanical sieves, gari roasting bays), one improved sun-drying shed and one steam dryer for drying cassava flours. This activity involved equipment upgrades, especially with

stainless steel to replace mild steel in the cutting and grinding edges of graters and hammer mills.

Across the seven countries, beneficiary groups learnt how to produce a wide range of primary cassava products and their derivatives the majority of which were hitherto either known but crudely prepared or unknown in the target communities. These products included odorless fufu flour, High Quality Cassava Flour (HQCF), gari, soya fortified gari, starch, tapioca granules, 10% to 20% HQCF composite bread, diverse cassava snacks (e.g., chin-chin, cassava meat ball, cassava root fritters, cassava croquettes, cassava cocktail tidbits, doughnuts, cassava egg rolls, cassava cookies, cassava queen cakes, cassava strips and cassava meat pie).

To strengthen capacity of trained participants the project sourced and disseminated at least five (5) technical and training support materials. Additionally, the project collaborated with other cassava initiatives at IITA (e.g., CFC cassava project in Tanzania, USAID cassava projects in Nigeria) to co-produce and/or draft the following new learning materials to help improve skills of end-users:

- A cassava variety handbook, *Improved cassava variety handbook*, describing 59 improved cassava varieties being grown by farmers in Nigeria and some UPoCA countries
- A cassava processor's guide book on quality management in the production of High Quality Cassava Flour
- Swahili translation of the IITA cassava recipe book. This will increase sub-regional visibility and effectiveness and impact of IITA.
- A manual for agribusiness training in Ghana
- A manual on managing a small business by cassava processors in Nigeria.

Box 1: Profile of ToT course delivery

Country: Sierra Leone

Course title: Cassava Processing and product development and utilization

Duration: The training was conducted from June 9 to 12, 2009.

Pre-course evaluation: About 15% of the participants had background in food related processing activities or certification. Most of them were unaware of new cassava products and approaches to add value to the existing traditional products, quality requirements from cassava products and processing machines, cassava products fortification for nutritive quality, and essential factors to be considered in product development.

Participants' expectations: Most participants expected to have skill gap analysis of the problems they encountered in producing quality cassava products, the methods they should introduce to their beneficiaries to add value to cassava, the new types of equipment required, equipment operation and maintenance practices, product development skills, and how to produce high quality cassava products and infant foods.

Objectives: The course was conducted to enable UPoCA partner organizations (GOs and NGOs) in Sierra Leone to train, coach, and guide on post-harvest processing, product development and machine specifications.

Synopsis: Resource persons were drawn from IITA- Nigeria, the University of Agriculture, Abeokuta, Nigeria and Njala University, Sierra Leone. The course covered cassava post-harvest (general remarks, storage losses, key constraints, storage methods and management issues); cassava processing (uses of cassava, processing purpose, equipment, adding value and processing methods); cassava value chains (characteristics, benefits, marketing challenges); new products (market research, new food products, food preservation, grades and standards); cassava for nutrition (fortified products, quality assurance, food legislation); hands on practical (group level); interactions (group discussions, plenary discussions, experience sharing and course evaluation).

Learning methods: Resource persons employed participatory approaches for information sharing, video show, power point display, group interactions, practical demonstrations and observations during the workshop.

Achievements: Twenty-nine (29) participants trained in trouble shooting & using five processing equipment to produce cassava products. Motorized cassava grater, screw press, motorized hammer mill, sieves, product drying platforms; processing of High Quality Cassava Flour (HQCF), starch, soya fortified gari and fermented fufu flour to ensure income generation, industrial applications and process improvement. During the 4-day training, participants were able to produce four primary products from cassava storage roots: High Quality Cassava Flour (HQCF); Soya- fortified gari; Fermented cassava flour (for instant fufu); High Quality Cassava Starch (participants made Tapioca, a roasted wet cassava starch, from the high quality starch). Additionally, participants used IITA cassava recipes booklet to produce seven secondary products by fortifying HQCF with a range of locally available animal and plant protein sources. The food products developed from HQCF were Croquette (christened “CAFICO” by the participants); cocktail tidbits (christened “teeth-bites”); doughnuts; chin-Chin; complementary food (baby food); cassava fritters; cassava egg roll. No imported wheat flour was used in any of the products. The cassava food products stand to impact positively on household and national food security.

Post-course evaluation: Participants were able to produce HQCF, fufu, starch and their derivatives. They also produced nutrient based cassava-soy products deriving joy in adding value to by-products from cassava and soybean. In all, the groups performed excellently and have sense of fulfilment.

Support to enterprises: To support the institutional base of emerging cassava enterprises requesting advice for value added cassava processing, the project provided technical assistance and support to a number enterprises, projects and agencies in the countries.

Linking farmers to processors: Farmers were linked to markets to assure sustainable raw material supplies for processing in a number of cases. In Nigeria, for example, cassava growers in Niger State were linked by the project to a buyer, Ekha Agro Company. The agreement was brokered with the aim to ease the negative effect of cyclical glut and price fluctuations in

cassava production chain. The MoU provides that the Niger State Cassava Growers Association will cultivate 5,000 hectares of cassava in 2009/2010 season using improved cassava planting varieties under technical supervision of UPoCA project in Nigeria. Ekha Agro guaranteed a purchase order for 200 tons of fresh cassava roots per day for one year at the agreed farm gate price. In Sierra Leone, the Pujehun Growth Centre (Pujehun District) and Kpandebu Growth Centre (Kenema District) were linked to an initial set of GIS verified 72.3ha and 94.6ha farms (including UPoCA farmers), respectively, within 20km radius of the factories to assure sustainable raw material supply. The Pujehun growth centre was also linked to Union Trust Bank which provided a one year loan equivalent of \$10,000 for the purchase of raw materials and packaging materials, and to “Home Food and Drinks Ltd” company as a primary market outlet for the cassava products on sale in the capital city Freetown. Also in Sierra Leone, UPoCA project-linked Quifel Natural Resources (international agri-business firms initiating agri-business in the country) was assisted to analyze soil samples collected at sites the firm has leased to grow cassava on a commercial scale. The soils were very acidic with pH of 3.8 to 4.3 and natural fertility status at the site was very low with organic carbon content under 104%. Mineral fertilizer application at N: 125kg; P₂O₅: 30 kg; K₂O: 150 kg per ha was recommended for the cassava farms. It was also recommended to use a Calcium Phosphate fertilizer to reduce soil acidity.

Linking fabricators to processors: A total of 12 equipment fabricators were linked to cassava processors in the seven countries. In DR Congo, the project linked selected processors to ACOMMERCONGO, AGRIMAC and BENIBOOD/FABRICATION, the three most important processing equipment fabricators in the country. In Nigeria, Memis Construction Ltd. and Fataroy Steel Industry Ltd. were linked to processors in Oyo State, producer of gari. In Tanzania, Entremech Engineering linked with the project to manufacture quality cassava processing machines, with technical backup from IITA Tanzania. Similarly in Sierra Leone, Ken Metal Works was trained jointly by the UPoCA and CFC projects in the country and linked to development agencies and processors for manufacture of quality graters, hydraulic presses and hammer mills.

Technical advice on management and technical issues: Technical advice was provided on management and technical issues in cassava processing. In Malawi, the assistance involving equipment upgrades and flour/starch-drying facilities is assisting four processing centres: Masimbe Investments (produces cassava starch), Mbwandimbwandi Gardens (produces HQCF), Kasiya Maliro Investments (for HQCF) and Chisi Investments (for HQCF). In Sierra Leone, for example, the project advised a World Bank supported Rural and Private Sector Development Project of the Ministry of Agriculture, Forestry and Food Security/Ministry of Trade and Industry on management and technical issues in cassava processing by FBOs at 32 processing sites that were being established. The technical advice covered a) type and capacity of equipment for the intended processing systems (e.g., root peelers, chippers, graters, presses, sieves, gari roasters, packaging materials and transport issues); b) standardized equipment list for processing cassava into various products such as gari, starch and flour (this focused on functional linkages in equipment assembly for cassava product production; and c) appropriate designs for civil works structures housing facilities for cassava processing (this involved re-tooling existing buildings, appropriate factory design to house a multi-purpose cassava factory, factory hygiene and crop-livestock integration).

Quality management and compliance status: Quality management and compliance status were undertaken in Ghana, Mozambique and Tanzania to assess the quality and safety problems encountered in the countries. In Ghana, the project worked with Caltech Ventures Ltd. to improve quality management and compliance in cassava processing. In Tanzania and Mozambique, six and five rural-based smallholder processing enterprises were assessed respectively. The quality and safety challenges encountered at these sites were largely indicative of the general quality-related problems of cassava processing in Ghana. The principal problems related more to the adherence of good manufacturing and hygienic practices than to process control. The lapses in adherence to good manufacturing practices/GMP included the lack of adequate drainage systems and other facilities for handling waste; free flow of liquid waste into the bush; non-availability of hand washing facilities specifically designated for the purpose; absence of changing rooms for the production staff; staff not being compliant with the non-wearing of jewellery during processing operations; staff not wearing recommended protective clothing during processing; absence of hygiene rules for visitors; absence of adequate tools for cleaning and sanitation of the facilities; absence of written standard operating systems; absence of a specific responsible officer to be in charge of sanitation and hygiene or quality issues; and inadequate cleanliness of net screens, ceilings, and overhead fixtures in the processing halls. A major constraint to processing identified in Mozambique was lack of the processing machines in the local market for making high-grade products. As a result, the processors used manual processing methods which result in low production capacity and low quality of products, especially gari and flour. Related to quality management was assistance to national standards bureaus, e.g., the project worked with Sierra Leone Standards Bureau (SLSB) to draft standards for the four products (gari, HQCF, starch, and cassava chips) for consideration by the appropriate technical committee of SLSB.

Sale of cassava products: Market studies were limited to perception surveys on opportunities and constraints faced by cassava value chains actors namely, traders, consumers and agro processors for producing and marketing cassava in Mozambique and Sierra Leone. The preliminary data showed that concerted efforts to commercialize the products are rare in the countries. Market data collection guidelines developed by the project were yet to be effectively implemented in a way that would verify data in any of the seven countries.

Project visibility: Global visibility of the project was promoted through at least 39 web news (Box 2) backed by print articles, radio, TV broadcast, field days and dignitary activity site visits covering project activities across the countries. Initially, a 6-page illustrated flyer was developed to introduce the project to diverse audiences. The flyer titled “Combating the food crisis through science” traced the causes of food price crisis; introduced the response of USAID/IITA partnership on cassava; explained the UPoCA implementation strategy; outlined the special benefits to be derived from the project; featured a cassava entrepreneur who typifies a range of capacity building challenges facing the development of cassava value chains at rural levels.

In Ghana, information on the rapid multiplication of cassava and product development and standard compliance were broadcasted on six radio stations and information centers in the project’s implementing districts/municipalities. The radio stations and information centers were NKWA FM, Assin North Municipality, Aboaso Information Center, Bekwai Municipality;

Edwenase Information Center, Bekwai Municipality; Onyame Akwan Dooso Information Center, Adansi North District; Asomdwoe Information Center, Adansi North District; and Oheneba Information Center, Obuasi Municipality. In Sierra Leone, project beneficiaries and a few partners engaged in community radio broadcast on cassava through daily 15-30 minute “Farmers’ Tok” program of Cotton Tree News (CTN); <http://www.cottontreenews.org> is funded by the European Union, Ireland and Germany and produced and broadcast by Fondation Hirondelle, Media for Peace and Dignity, in partnership with Fourah Bay College at the University of Sierra Leone and the United Nations Integrated Peace building Office in Sierra Leone (UNIPSIL). CTN links with Star Radio in neighboring Liberia.

In the last two quarters of the project UPoCA partners collaborated with IITA Regional Communications Office to initiate a series of “UPoCA People” stories in flyer forms highlighting success, opportunities and challenges faced by project beneficiaries in the countries. Project visibility was further increased through at least 11 field days and dignitary site visits e.g. Regional Farmers’ Day exhibition in Ghana, WFP/FAO World Food Day Commemoration in Sierra Leone; cassava open days organized by the project beneficiary groups in DR Congo (e.g., GROPAM, FDM, CARITAS-Matadi, CRAFOD and PRODI), Nigeria (Ido LGA council of Oyo State), in Malawi (Press Agriculture’s Estate 87; activity site visit to UPoCA Nigeria by Congresswoman Sheila Jackson Lee, member of the United States House of Representatives, 18th District, Texas with officials from other USAID sponsored projects in the country; and by a joint team of JICA/Japan and Cameroon scientists planning for cassava commercialization and food security in Cameroon.

Discussion and conclusion

The historical view of cassava as “a poor man’s crop” in SSA limits efforts to fully exploit the crop’s commercial potential as a raw material in food, feed and industrial products. This view exists because poorer households are marginalized and often live in marginalized areas, the same areas where cassava can perform well within farmers’ food security coping strategies. This affiliation suggests that development of market opportunities for cassava can improve food security and contribute substantially to poverty alleviation especially among resource-constrained households. Ensuring food security and sustained productivity requires adequate technical and manpower resources on the ground to effectively trigger positive changes in the performance of agricultural sub-sectors. International networking and collaboration enable national programs to have ready access to such resources.

UPoCA project achievements provide evidence that the project is stimulating the emergence of many rural enterprises for value-added processing of cassava and cassava products development for wealth creation. This paper summarizes project achievements for the period January 2009 to September 2010. During that period, project activities did not deviate from addressing the key constraints identified at implementation planning workshops. Whilst the project scored excellently on 72.7% of the planned 22 indicator targets, it should be noted that the % delivery data on yield indicator is from sites from the Democratic Republic of Congo, Ghana and Sierra Leone only.

Reliability in supply of raw material at competitive cost will largely determine the viability of processing operations. The numerous seed and root production farms will continue to serve as sources of rapid horizontal spread of new and improved varieties. This will enable individual and producer groups to assure self supply of healthy planting materials of the varieties. The reduction in dependency on external suppliers of planting material would reduce unit

costs and timeliness of delivery. This could be an essential trigger to boost rural entrepreneurship in cassava. Another essential trigger is higher yields for raw material supplies, and the data from DR Congo, Ghana and Sierra Leone indicate average root yield from farms with improved varieties were above the 2007 national average yields of 5-8t/ha in the respective countries. While in some cases productivity has been increased through the use of improved varieties, intensive agronomic mentoring will improve the observed plant population and reduce yield variations, thus enabling farmers to further increase on-farm productivity of the varieties.

To strengthen their viability as partners to agribusinesses, the farmers and farmers groups would need to acquire the organizational and managerial skills required to manage large input supply and crop marketing activities. Efforts to organize cassava supply lines for processing need would have to consider the effects of a number of factors on steady and predictable flow of the materials, e.g., ease of access to fresh marketing channels; ease of access to other processing outlets; influence of variations in farmer and consumer preferences on uptake of new varieties, supply variations including transportation and harvesting difficulties, seasonal effects on drying operations and the overall seasonality of agricultural production processes.

Through experiential learning, a core team of resource persons from IITA and national organizations has not only increased scientific literacy of a large number of men and women change agents, it has also provided a foundation to reduce disconnects between availability/discovery and end-user access and application of cassava research results. This enables participants to later on empower colleague producer groups, agro-processors and entrepreneurs with technical knowledge and skills required to embark on profitable cassava business. Concerted efforts to commercialize cassava are however rare in the countries, except in Nigeria. To tap into the high food and income generating potential of the crop, project beneficiaries need to be aware of identifiable sectors with potential to pull industrialization of cassava. These include feed industries, wheat substitution in bread, pastries and snacks and starch (and its derivatives) industry in the domestic and regional markets. Industrial pull for cassava is however still limited in the countries. Mechanisms to ensure guaranteed regular supply of good quality cassava will involve organized and facilitated linkages enabling cassava value chain actors to ensure the safety and quality of cassava products.

New challenges will be presented in consolidating a shift towards market-oriented production systems. This is particularly so in an atmosphere of urgent demand by a wide range of UPoCA stakeholder groups to enable cassava producers and related food industry to diversify their income sources. The kinds of new challenges emerging from the implementation experience of the UPoCA project include:

- Generation and promotion of economically productive varieties with profitable functional, nutritional and quality characteristics for different end-uses and markets: Cassava is practically all carbohydrate. In recent years, however, IITA breeding programs have developed “yellow-fleshed” cassava varieties containing pro-Vitamin A. This nutritional quality is lacking in many existing improved cassava varieties. The varieties need to be adapted to, multiplied and disseminated in localities of FBO beneficiaries and other government-supported interventions.
- Employing improved techniques to produce cassava for viable markets: This process will involve greater reliance on input and output delivery systems and integration with other sectors of the domestic, regional and international economies in order to maximize returns

on investments. Along with this will be experiential learning by the FBOs to boost national average yields toward the proven on-farm potentials of at least 25t/ha. At such yield levels, FBOs will be in a good position to easily justify requests for automated cassava processing equipments.

- Overcoming the interlocking problems of poverty, low productivity and resource degradation: Addressing these features of the cassava sub-sector will help reduce unit production cost and lower the real cost of food for consumers whilst still preserving the natural resource base.
- Institutionalising standards: Standards for cassava processing and cassava products quality management will pave the way for food safety compliance in health and trade.
- Cassava crop-livestock integration to further expand utilization of the crop.
- Addressing these kinds of challenges requires a longer-term research for development engagement with stakeholders and beneficiary groups. This will enable the partnerships to fully embed cassava sub-sectors within the framework of national expectations of an expanded future role for cassava in food, feed and industrial applications in the countries.

Project UPoCA, a transition activity by its nature, has laid a solid foundation that needs to be built upon in order to meet these expectations. The evolving achievements of UPoCA indicate that a longer-term R4D partnership of that nature will enable cassava value chain actors to contribute significantly to national economic growth in Africa.

Table 1: Priority constraints and proposed interventions

Key constraints	Proposed interventions	
	Action	Implementing partners
<i>Production issues</i>		
1. Poor & declining soil fertility leading to low productivity	Training on nature of the problem, corrective measures, sources of information, technical and material inputs; weed management	<ul style="list-style-type: none"> - National research institutes - Agrochemical dealers - Ministries and development agencies/ MDAs; agricultural development projects
2. Inadequate supply of clean planting materials of improved varieties	Establish private and community seed farms; training in rapid multiplication and quality control of stems	<ul style="list-style-type: none"> - Nat research institutes - MDAs and agricultural development projects - Private sector (firms and individuals) - Farmers groups
3. Biotic threats	Training in pest management, stem and plant health; biological control applications; Mass Information Education and Communication (IEC)	<ul style="list-style-type: none"> - Crop protection services - MDAs and agricultural development projects - Community radio networks - Farmers groups
<i>Post-harvest issues</i>		
4. Poor quality metals in processing machines	Upgrade existing machines; replace mild steel with stainless steel in cutting edges; training in equipment fabrication, repair and maintenance	<ul style="list-style-type: none"> - National research institutes - Private sector/national machine fabricators - Agro-dealers - Food processors
5. Poor storage quality of fresh roots and processed products	Training in value-added processing techniques; introduce improved packaging facilities	<ul style="list-style-type: none"> - National research institutes - MDAs and agricultural development projects - Private sector in packaging - Food processors
6. Poor drying of cassava products	Introduce processors to improved dryers; fabricate new rural friendly dryers	<ul style="list-style-type: none"> - National research institutes - Private sector/national machine fabricators - Agro-dealers - Food processors
<i>Market issues</i>		
7. Lack of cassava market information	Assess market potential of cassava products; establish strategy to link producers to markets' IEC	<ul style="list-style-type: none"> - National research institutes - MDAs and agricultural development projects - Community radio networks
8. Lack/ low of awareness of grades and standards for cassava products	Agro-enterprise training; IEC value-added; processing and quality needs; field day demonstrations of cassava products and recipes	<ul style="list-style-type: none"> - National research institutes - National standards bureaus - Equipment fabricators - Agro-dealers

- Farmer groups and food processors
- Community radio networks

Table 2: Summary of UPoCA achievement by end September 2010

Common indicators	Overall target	Overall achieved by end Sept 2010	% delivery on overall project
SO 1.1: Number of rural households benefiting directly from interventions			
IR 1: Access to improved production technologies and practices increased			
IR 1.1: No. of rural farmers & processors benefiting directly from interventions	395000	350,018	88.6
IR 1.2: No. of vulnerable households benefiting directly from interventions	184925	28,263	15.3
IR 1.3.1a: Male attendance at short term training	620	979	>100
IR 1.3.1b: Female attendance at short term training	305	833	>100
IR 1.3.2: Type of Training	5	24	>100
IR 1.3.3: No. of Trainings	42	44	>100
IR 1.3.4: Other trainings	900	428	47.6
IR 1.4: No. of Seed Farms Established	26	390	>100
IR 1.5: Area of Seed Farms Established (ha)	176	710.2	>365.6
SO 1.2: Gross margin per hectare for targeted (cassava) commodities			
IR 2: Increased agricultural productivity			
IR 2.1: Gross margin per hectare for targeted commodities (\$)			
IR 2.2: No. of technologies made available for transfer	6	16.0	>100
IR 2.3: Crop productivity (t/ha)	20	24.2	>100
IR 2.4: Area (ha) under improved cassava varieties	27000	12,566.2	46.5
IR 3: Improved agric marketing & commercial viability of micro/SME			
IR 3.1: No. agriculture-related firms benefiting directly from interventions	35	58	>100
IR 3.2: No. of partner organizations & active institutional members of those partner org.	36	71.0	>100
IR 3.3: No. of producers' organizations, trade & business associations, & CBOs assisted	13	239	>100
IR 3.4: Number of public-private partnerships formed	19	2.0	10.5
IR 3.5: No. of jobs	27000	26,956	99.8
IR 3.6: Sales (\$) of agricultural commodities/products/services	1732000	70,579.2	0.4
IR 3.7: No. of fabricators linked	12	21.0	>100
IR 3.8: No. of products introduced and improved	5	24.0	>100
IR 3.9: No. of Information resources developed	5	13.0	>100

Notes

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