

2020 Conference Note 1

Enhancing Nutritional Value and Marketability of Beans through Research and Strengthening Key Value-Chain Stakeholders in Uganda

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This note provides more information about the case study described in the 2020 conference paper and brief *Value Chains for Nutrition* by Corinna Hawkes and Marie T. Ruel.

Background and Approach

Agricultural development throughout the global south is taking place in the context of rapid urbanization and market integration. Production practices and livelihoods of small farmers are being increasingly influenced by the demands of market intermediaries, food industries, and urban consumers. Yet agriculture in East Africa is characterized predominantly by women and men working in small-scale, rainfed farms that average one to two hectares per household. Farmers face problems with soil fertility, seed quality, pests, diseases, and erratic bimodal rainfall patterns. They have limited technical skills and limited access to inputs, new technologies, financial resources, and extension and training for improved agronomic practices. These factors restrict farmers' ability to expand the scale of their operations and invest in technologies that increase efficiency and add value to primary production, thereby increasing incomes. Small-scale farmers lack basic knowledge of the marketing system, current information on prices and market conditions, and real bargaining power. The limited market surplus of individual small-scale farmers makes per-unit costs of assembly, handling, and transportation relatively expensive. Most private traders operate on a small scale with limited investment capability. Awareness of the nutritional value of many crops and of new ways of preparing foods is limited, especially among rural households. The availability and use of processed products is very modest.

As a result of low production levels, poverty, hunger, and nutritional problems are widespread. Using a *sustainable rural livelihoods* approach, the Center for

Sustainable Rural Livelihoods at Iowa State University (ISU) in the United States and its Ugandan partners have been working to improve agricultural production, nutrition, health, and incomes among 1,000 small-scale farming households in Uganda's Kamuli district since 2004. From the start, ISU's partners have included Volunteer Efforts for Development Concerns (VEDCO), a local nongovernmental organization, and Makerere University (MU). The partners were joined in their efforts by Uganda's National Crops Resources Research Institute (NaCRRI) in 2008. Between 2004 and 2007, food security and market readiness increased from approximately 9 percent to 77 percent among participating households.

The sustainable livelihoods (SL) approach, developed and refined to reflect improved understanding of poverty dynamics, has been used in numerous countries. Reversing conventional top-down problem solving, the SL approach operates from the perspective of poor households and views them as the center of development processes. The SL approach identifies the diverse assets or "capitals" (human, social, cultural, natural, built, financial, and political), capabilities, and activities that enable these households to actively pursue their livelihood goals: food and nutrition security; the basic needs of shelter, health, and education; diverse income sources and increased income levels; and access to public goods and services. Livelihoods are sustainable when people and communities maintain or enhance their assets and capabilities, can cope with or adapt to various stresses, and do not undermine the natural resource base.

In order to achieve sustainability of viable livelihoods for poor people in countries such as Uganda, a clear understanding of the root causes of poverty and barriers to improvement is essential. In Kamuli, a participatory situation analysis was conducted at the onset

of the program, articulating locally meaningful indicators of wealth versus poverty, food security versus insecurity, and good versus poor nutritional status while identifying perceived proximate and underlying causal factors. Insights generated during this process have guided program development, implementation, ongoing monitoring, and annual evaluation. Participatory research and development methods can generate knowledge that people are able to apply to improve their individual and collective well-being. Underlying the SL approach is the recognition that “wealth” consists not merely of material artifacts that have a recognized monetary value but also of indigenous knowledge and skills, individual and group resourcefulness and social support systems, and the creative strategies that people use to cope with challenges. This ensures a focus on strengths rather than problems and increases the likelihood that any modifications to existing behaviors generated by externally funded project interventions will indeed be locally accepted and sustained after a project’s external support is phased out.

In the Kamuli program, farmer-to-farmer training and outreach—involving volunteer “rural development extensionists” and “community nutrition and health workers”—cover agricultural production, food utilization, nutrition, health, and marketing. The main crops in the locality are maize, beans, cassava, sweet potatoes, bananas, rice, coffee, and grain amaranth. Diversification of livelihood opportunities and activities is crucial to sustainability. Elements recently incorporated into program activities include community-based seed production, anaerobic storage, and innovative food combinations and diverse processing methods to reduce cooking time, increase product stability, and enhance nutrient bioavailability.

While a value-chain approach to agricultural production and commercialization can be employed independently of a sustainable livelihoods approach, experience suggests that tremendous benefits can be derived—particularly concerning nutrition and health—from basing rural development assistance in SL principles before value-chain analysis and development activities are initiated. Three key elements of the SL approach underlie this preliminary conclusion:

- First, the value of diversification is promoted and realized in relation to both production and diet, thereby enhancing food security and nutrition.
- Second, helping farmers to explicitly articulate their interrelated livelihood goals and strategies in a broader context reinforces the likelihood of avoiding the temptation to sell all of one’s crop harvest when prices seem particularly attractive.

- Third, participatory methods in the SL approach enhance the degree of local ownership and genuine empowerment, thereby increasing prospects for sustainable implementation of any changes initiated and adopted.

The value-chain approach is of equal importance for achieving SL goals because rural households have real needs for cash income throughout the year to pay for healthcare, education, and so forth. Successful participation in the value chain means that farmers are able to earn higher prices for whatever quantity of produce they sell locally or in distant markets. Higher prices can enable them to effectively meet their income needs while retaining sufficient food stocks to ensure food security and nutrition throughout the year.

Rationale for Bean Value-Chain Research and Development

Under the framework of the USAID-funded Dry Grain Pulse Collaborative Research Support Program (CRSP), Iowa State University and its Ugandan partners (VEDCO, MU, and NaCRRRI) are now working to improve the bean value chain in the Kamuli district. The project is running between 2008 and 2012. While the project focuses on beans, some project teams are addressing the value chains for sweet potatoes high in beta carotene, maize, and grain amaranth.

Beans are a major food and cash crop in Uganda, accounting for 7 percent of the national agricultural gross domestic product. Most farming households produce one or more bean varieties, but few (20 percent) sell any. When sold, beans do earn higher prices relative to other crops. The smallholders who produce beans remain food insecure and poor owing to common problems that limit yields to less than half the genetic potential. Beans are among the crops for which the in-home stock typically is finished before the next harvest. The majority of farmers involved in the production, harvesting, and marketing of beans in Kamuli are women (77 percent). Because of their central roles in food preparation and caring for children’s health and education, there is great potential to enhance food security, improve household members’ nutritional status, and increase incomes through bean value-chain research and development.

Beans are rich in protein and essential micronutrients that will benefit populations of all ages. To date, the potential nutritional benefits of beans consumed locally or sold in the marketplace have been compromised by inadequate pre- and postharvest handling techniques; late harvest that exposes beans to fungus, damage, and breakage during threshing; and high levels of insect infestation among beans stored in farmers’ homes for consumption and sold on the market.

There are also few value-added bean products with relatively short preparation times, making bean preparation laborious with high fuel requirements. Consumers also tire of monotonous flavor. Among urban residents, an increasing number of people are reducing or abandoning consumption of beans despite their documented high nutrient content and health benefits. Little information is available to date regarding the prospects for increasing demand among consumers for beans and agroprocessed products.

Project Objectives and Approach

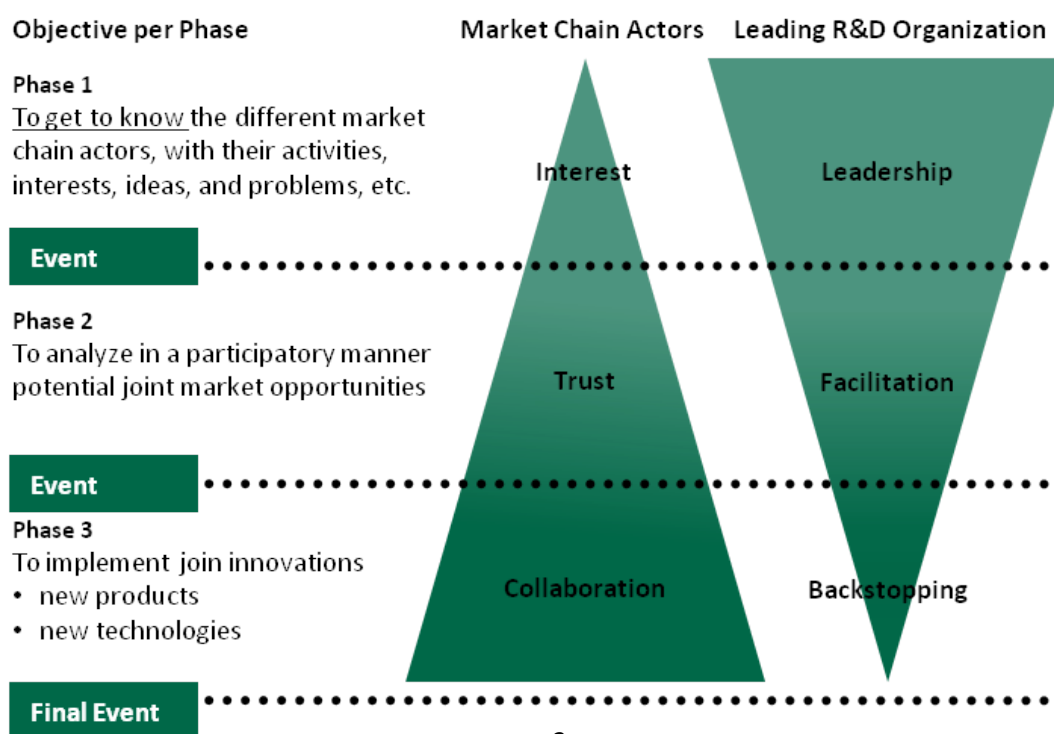
Given the interrelated nature of problems that extend along the value chain—from production to postharvest handling, processing, and marketing—the leaders of the project adopted a value-chain approach to identify and test solutions. The ultimate goal is to improve sustainable livelihoods in rural communities where a collaborative development support program has been in operation since 2004. Ongoing program monitoring and annual learning-oriented evaluation indicated that, in addition to crop-specific production and storage-management practices and technologies, there is a pressing need to enhance dietary nutritional quality and to help producers earn more through their efforts to sell to existing and emerging markets. Thus, the CRSP research and development project objectives are to (1) improve harvested bean quality and yields, (2) enhance the nutritional value and appeal of beans through appropriate handling and processing practices and technologies, and (3) identify solutions for constraints to increased market access and consumption.

The approach involves addressing all of these challenges in a coordinated manner to increase the economic value earned by producers and the value gained by rural and urban consumers in nutritional terms.

Participatory Market Chain Analysis and Development

A participatory market chain approach (PMCA) for analysis and development engages small farmers, market agents, and agricultural service providers in a reflective collective-action process of progressive problem solving to foster pro-poor market chain innovation. It involves identifying business opportunities in value chains that are important to small farmers, then carrying out action research activities to successfully realize those opportunities. Typically, a multi-institutional research and development (R&D) team initiates the PMCA process by selecting the priority value chain(s) on which to work, identifying potential R&D partners, and carrying out exploratory, diagnostic research. Key goals of Phase 1 are to become familiar with value chains and their actors, and to motivate these actors to participate in the PMCA process in multistakeholder innovation platforms. In Phase 2, the R&D team facilitates meetings that have two objectives: (1) foster mutual trust and knowledge sharing among participants, thereby developing valuable capacities for innovation, and (2) carry out joint analysis of potential business opportunities and barriers. In Phase 3, the value-chain actors collaborate in practical, market-driven innovation processes with support from R&D organizations (see Figure 1).

Figure 1—Phases and objectives of participatory market chain analysis and development



Sources: Horton (2008); and Bernet et al. (2006).

Project Activities through the Value Chain

Reflecting the PMCA approach, the first phase of the project involved meetings and focus group discussions with farmers and other stakeholders to identify specific problems during (1) **production**, (2) **postharvest**, and (3) **market access**, including understanding **consumer demand**. Following these stakeholder meetings, many different actions were taken to begin to achieve the stated goals, involving research on management practices and technologies, development of extension materials, and farmer-to-farmer training and outreach.

To address limitations in **production**, a set of field trials using new bean varieties developed by NaCRRRI in Uganda is being implemented side by side with farmers' locally preferred varieties. The trials involve soil and terrain analysis, organic and inorganic treatments to enhance soil fertility, and various planting methods. Data from experiments for three cropping seasons have been quantified and analyzed. Recent assessments include new early-maturing (60–65 days), drought-tolerant, and anthracnose-resistant bean lines. Farmer trainings to support the trials are conducted by NaCRRRI and VEDCO. A farmer-led field day was held to demonstrate and explain practices and technologies and share with other farmers the knowledge gained to date through project activities.

The **postharvest** phase involves three types of actions. First, trainings regarding management practices and technologies were initiated to reduce losses due to insect damage, which is farmers' primary concern. Second, to improve nutrient quality, scientific analysis was conducted on bean varieties to determine their profiles and the effects of different postharvest drying and storage techniques on nutrient content. Third, analyses identified best practices (for example, optimal sequencing and duration of processing methods such as soaking, dehulling, and sprouting) to maximize the retention and bioavailability of nutrients such as protein, iron, and zinc and to reduce or eliminate antinutrients, such as tannins and phytic acid, which inhibit iron and zinc absorption. Additional objectives of these analyses were to reduce cooking time (and, therefore, fuel requirements) and enhance consumer acceptability of bean products. A quick-cooking bean flour protocol was also developed at MU's Department of Food Science & Technology (DFST) to add value by making bean-based composite flours. These flours are being assessed for sensory properties and consumer acceptability. A partnership is being developed by DFST's Technology Business Incubation Centre with a private-sector company (Nutreal Ltd.) to refine, brand, and market bean-based

composite flours suitable for use in both porridge and sauces.

A series of different activities was used to achieve the objective of improving **market access**. First, a series of analyses of components of the value chain was undertaken. Three separate analyses were conducted to identify the following components:

- **Main market channels:** It was found that most (80 percent) of the beans marketed were sold at the farm gate, 58 percent of which were sold to intermediaries. Of the 20 percent that were sold in local village markets, 54 percent were purchased by local retailers.
- **Drivers of the marketing decisions:** Smaller household size, higher level of household resources, higher price of beans, greater size of harvest, and better conditions for the road to the market have a positive effect on the amount sold by households.
- **Presence of nutrient-enhanced foods in Kampala:** A very limited range of such products was observed, implying a good potential to increase the range.

Second, after the analyses were conducted, training sessions were held to improve farmers' business skills—such as keeping records of inputs and output—and to enhance their ability to increase the acceptability of the beans in the marketplace (sorting of beans by condition and appearance, packaging and labeling beans in smaller quantities rather than selling in bulk, and so forth).

Third, price information was improved through weekly updating of public market price boards and dissemination of market prices for crops via cell phone messages to farmers. Fourth and finally, VEDCO brought together diverse stakeholders from across the value chain (farmer marketing groups and associations, government agencies, nongovernmental organizations, private sector traders, transporters, distributors, and processors) to share information and best practices and develop new approaches to improving market access. The participants in the first workshop, held in September 2010, committed to establish a forum for stakeholders to meet regularly and share information, strengthen the role of business principles and profit orientation in producer organizations, develop an accessible and effective market information system, and increase the expertise and capacity of all stakeholders in the value chain. Thus, the approach has involved working with farmers and a diverse set of stakeholders to understand and increase their initial levels of interest and to facilitate increased trust and collaboration among themselves. The project will continue to engage them in activities that build their capabilities to adopt, adapt, and innovate.

To better understand **consumer demand** and preferences, a consumer survey was conducted. Among VEDCO-assisted rural producer households, beans are regarded as a very important food for their nutrient and dietary benefits and are consumed by all household members, starting as early as six months of age, on average four days per week. However, processing of bean products is minimal and done only by a small proportion of households in Kamuli. To increase awareness of new ways of preparing beans and to stimulate demand for value-added products, MU and VEDCO conducted cooking trainings for rural households using recipes developed by NaCRRRI. A “bean cook day” was also organized for family members and included demonstration of the use of bean flour. Members of the community, from different backgrounds and age groups, tasted and evaluated the prepared foods for their overall acceptance as well as key attributes (texture, flavor, and appearance). The project team inquired about participating farmers’ and farmer groups’ knowledge of the nutritional benefits of beans, ways of combining beans with other foods to improve diet quality, the importance of hygiene in food preparation, and the appropriateness of different bean dishes for different age groups and individuals.

The next stage of the project is a planned survey by MU, in partnership with Nutreal Ltd., to understand urban consumers’ awareness of the nutritional and health benefits of beans, their consumption of nutrient-enhanced products (porridges, weaning foods, ready-to-eat snacks and foods, and bread), and their values and preferences regarding purchase of existing value-added products and the specific types of those products under development.

Value-Chain Advantages and Challenges

This project aimed to understand barriers to participation and develop solutions for producers and consumers in different parts of the bean value chain, through participatory research involving improved management practices and technologies, development of training materials, peer extension and outreach, and monitoring and evaluation. By developing solutions for key points of the value chain, coordinating these activities so that they reinforce each other, and including diverse partners and sectors, the project reflects core value-chain concepts and theories and has good prospects for effectively promoting sustainable change and development. Notably, a focus of the project is “adding value”

through postharvest handling of staple products and product differentiation for consumers as a means of increasing income for rural producers.

The challenges of team building are continuous in a five-year research and development project that spans the value chain, involves multiple research institutions and diverse disciplines to work with practitioners in a development organization, and forms direct linkages with private-sector traders and processors. Project leaders address these challenges by highlighting the benefits derived by all participants through the diverse perspectives that partners bring, based on their real-world experiences to understanding problems, identifying promising solutions for testing, and evaluating results at all project stages. Key challenges for any successful research and development effort include balanced collaboration of people from different types of organizations and communities, broad participation, genuine empowerment, and long-term sustainability. Better nutrition is being achieved by increasing both supply and demand; focusing on the nutritional value of beans for consumers as well as the economic value to producers; and integrating activities, actors, and sectors engaged in production and consumption. Value-chain approaches may become increasingly successful through explicit attention to the nutritional value of crops and value-added products derived from them. Future research could usefully measure nutritional outcomes as rural and urban consumers increase consumption of beans through new value-added products. Future action research should also pay attention to potential economic and nutritional trade-offs between marketing beans and retaining them in the home for household consumption. The ultimate goal is to contribute to the knowledge base of the global scientific community and to the set of management practices and technologies that are scalable on a national or regional basis to transform rural livelihoods and the well-being of consumers. In combination with SL and value-chain approaches, training, inputs, improved technologies, organizational leadership and development, and changes in government policies can have significant positive local and regional impacts. These approaches have proven instrumental in making progress toward achievement of the Millennium Development Goals established by the United Nations and broader international development community.

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