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The U.S. Government's Global Hunger & Food Security Initiative



Fresh tomatoes at Mile 12 Market, Lagos, Nigeria. Photo by Roberta Lauretti-Bernhard.

FEED THE FUTURE BUSINESS DRIVERS FOR FOOD SAFETY

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BUSINESS OPPORTUNITIES FOR HORTICULTURAL CROPS IN ETHIOPIA, RWANDA, SENEGAL, AND NEPAL

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Introduction

Horticulture crops such as fruit and vegetables play a significant role in income generation and help to ensure nutritional security via small business activities for many countries in Africa and Asia (Demmler 2020). In the case of Ethiopia, Rwanda, Senegal, and Nepal, focal countries for Feed the Future Business Drivers for Food Safety (BD4FS)¹, the majority of the population is directly or indirectly involved in agriculture. A Commodity System Assessment Methodology (CSAM) was undertaken in these countries, initiated by BD4FS and conducted by MarGEn, in recognition of the immediate necessity for interventions to reduce food losses and ensure food safety. For each country, two important horticulture crops were selected considering consumption status, nutritional aspects, degree of postharvest loss, food safety issues, and scope for business opportunities.

Selected crops included:

- Ethiopia - tomato and mango
- Rwanda - tomato and banana
- Senegal - tomato and mango
- Nepal - tomato and apple

A series of key informant interviews and field studies were conducted from October to December 2020 to complete the assessment of these crops. This report focuses on the portion of the study that identified potential business opportunities for micro, small, and medium enterprises (MSMEs).

Scope of Business Opportunities

The detailed commodity assessment identified several important business opportunities in the areas of production, cold chain management, packing, and processing to create value-added products. Additionally, there is a need for training services in all of these areas to provide businesses the technical knowledge and skills to utilize new tools and technologies.

Production of high quality and disease-free planting material

Tomato - The tomato crop was found to be important for all focus countries. Rwanda imports most of its hybrid tomato seeds from Uganda and Kenya, which are sold through agro-dealer shops. This practice makes it more expensive to cultivate high quality tomatoes. Similarly, in Ethiopia, due to inadequate supply of good quality seeds, the productivity of the tomato crop is very low. Improved tomato seed production and commercialization are not yet developed into a structured system, resulting in shortcomings in seed availability and timeliness of delivery. If the hybrid seeds can be produced at the local level by trained MSMEs, it would not only encourage quality production in the nation but would also contribute to sustainability of tomato production. The cultivars of tomato can be developed to suit different purposes, such as fresh consumption and for processing.

The ill-effects of various soil-borne diseases on the tomato crop can be avoided by vegetable grafting. Though this technology is not yet accessible to farmers, grafting could be a good business opportunity for vegetable nurseries if they are provided sufficient training.

Apple - In Nepal, there is good demand for high-yielding apple varieties and quality grafts tolerant to different biotic and abiotic stress conditions. There is a scope for the development of high-quality hybrid varieties, cultivars suitable for processing, as well as the development of nurseries to produce good quality grafts. There is also a need for proper training in cultivation practices to improve quality yield from the existing orchards.

Banana - In Rwanda, there is a huge demand for virus-free banana planting materials, and only a few organizations are commercially producing tissue culture plantlets. There is scope to train and involve the medium scale entrepreneurs in the production of disease-free planting material using tissue culture methods.

Mango - In Ethiopia and Senegal, the majority of the mango orchards are of local varieties. Due to lack of proper pruning practices, the trees are very tall, making it difficult for crop management practices and harvesting.

Cold chain infrastructure and management

The unavailability of sufficient cold chain infrastructure renders farmers, wholesalers, and retailers unable to safely handle and store their produce. This situation is responsible for both qualitative and quantitative postharvest losses in all four countries. The cold chain is still in the nascent stage and is being practiced mostly by the processing and export industries. There is a good scope for development of community-based cold storage as well as other low-cost cold infrastructures. A

¹ BD4FS is a multi-country Feed the Future project funded by USAID and implemented by Food Enterprise Solutions (FES).

temperature-managed packhouse including machines for weighing, grading, sorting, washing, air drying, and packing can be developed by the local small and medium scale entrepreneurs and pay-per-use services can be offered to different supply chain stakeholders. Availability of continuous electricity could be a critical factor for functioning and cost effectiveness of the majority of needed infrastructure. There are different options available for off-grid low-cost tools and technologies for cold chain management and food safety. Many of these technologies are well known (Kitinoja and Kader 2015; Teutsch and Kitinoja 2019). Moreover, there is a need for training programs to educate the stakeholders on the advantages of cold chain management in maintaining quality and the economic potential in investing in cold chain management for reducing postharvest losses of perishables.

Manufacturing packaging materials

The appropriate packaging material plays a major role in protecting the produce from damage, thereby protecting quality and reducing postharvest losses throughout the supply chain. There are different materials available for packaging to suit to specific needs of the produce handled. Some reports elucidate that covering the banana bunches and mango fruits with plastic bags at the early maturing stage on the plant would decrease the pest and disease incidence and thereby reduce the need for chemical sprays. Many containers and packaging materials are well known and utilized for fruits and vegetables (Kitinoja and Kader 2015; Teutsch and Kitinoja 2019). In the countries studied, reusable plastic crates (RPCs) as a packaging material are in high demand as this simple technology has potential to reduce the losses from 30% to less than 10% and increase the earnings of the farmer or trader. Only 10 uses can fully pay the investment made on the plastic crates, subsequent uses will generate additional revenue up to \$325 per load of 1000kg of mangoes in Ethiopia (Table 1). Despite huge demand and a relatively simple manufacturing process, most RPCs are being imported from other countries. Rwanda imports RPCs from Kenya and Uganda, while Senegal imports them from China and Dubai.

Encouraging local manufacturing of packaging materials is a niche to consider, and it would reduce the cost of the materials and make them more available to stakeholders. These units can be designed not only to manufacture packaging materials but also to produce a range of products such as harvesting implements, storage bags and containers of different sizes and thickness, containers for processed products, covers, tarps and more. Using recycled plastic to manufacture would provide a win-win situation where plastic pollution is also reduced.

Value addition

Processing fruits and vegetables into value-added products is a potential strategy for reducing postharvest losses while also increasing the availability of the products and promoting their consumption. When processed properly, following all the food safety standards, the value-added products earn good prices at both regional and international markets. Therefore, it has gained the attention of several planners and policymakers as value-added products can contribute to the economic development of rural populations.

Tomato is a popular crop in all the countries studied with high consumer demand for both fresh and processed forms. The tomato crop can be processed into a range of products including dried/dehydrated fruit, ketchup, paste, juice, puree and canned fruits. The processing units for manufacturing these products possess immense economic potential with diverse market opportunities and are available to fit any scale of business.

In Senegal and Ethiopia, mango is mainly processed into different products like juices, nectars, jams, powder, pickles, vinegar and leather. Drying of mango fruit is the most suitable method in the semi-arid environment of Senegal. The local demand for mango products is weak but most of the locally processed mango is intended for export to the EU. Though women's associations in Senegal are involved in preparing different mango products, they fail to meet the EU standards. In Ethiopia, mango growers are not growing cultivars suitable for agro-processing, and therefore, there is no continuous supply of raw material for the existing processing factories. Extracting and preserving the pulp from the mango fruit during harvesting season can be a possible way to continuously provide raw materials of the processing factories.

In Rwanda, local manufacture of cooking banana flour (with flavors and in dried vegetable mixes) and diversifying nutritious and healthier banana food products for human consumption has great scope. The new products can also be manufactured from banana plant parts and banana fruit wastes for both human consumption and livestock feeding. In the hill districts of Nepal, the apple fruit is processed to produce cider. There is also scope for producing other products, such as dried apple slices, jams, and juice with the main target market of hospitality industries.

There is a huge scope for establishing processing units and developing value-added products in all the countries studied. The processing units prove to be a sustainable business, if essential training programs can be organized to enhance the skills for product development, to maintain international food quality and safety standards, and for market promotion.

Postharvest training and services centers

The countries studied had no or limited access to adequate training and technical guidance on new technologies and business practices. The local access to tools and supplies needed to utilize the new technical knowledge or improved postharvest handling practices was also very limited. A one-stop center to provide postharvest training and service is a potential solution for this situation. The model of such postharvest training and service center (PTSC) was described in detail by Kitinoja and Barrett (2015). The PTSC operates with five key components: (i) training of postharvest trainers, (ii) postharvest training demonstrations for local clientele, (iii) adaptive research applicable to the local area, (iv) postharvest services, and (v) retail sales of tools and postharvest supplies such as RPCs and packaging. PTSCs can also include any other locally needed services, such as sale of improved planting materials or business development training.

PTSCs can provide services with a small fee such as cold storage for a few days before marketing, packaging in improved containers, leasing of a small and insulated transport vehicle, and use of processing equipment such as solar dryers to produce dried fruits or vegetable snacks. The retail shop can sell tools and supplies for farm management and postharvest handling, packages, plastic crates, and other goods that can reduce losses and ensure food safety.

Conclusions

Local MSMEs possess the potential to substantially reduce food losses and ensure food safety standards and practices. They can be agents for significant economic development by reducing postharvest losses and malnutrition while ensuring food and nutritional security, food safety, and economic sustainability. Cost-benefit analysis of any intervention to be introduced would allow assessment of the sustainability of the business. Adequate training and capacity building programs are as important as providing the technical and financial resources required to support and establish businesses.

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Table 1: Cost benefits for use of RPCS for mangoes in Ethiopia in 2020.

Assume harvest 1000 kg, 20 birr = \$US1

	Current Practice	New Practice
Describe: the analysis is based on the percentage marketable fruits	Harvest Mango Fruits	Harvest Mango Fruits
	Bamboo or wooden crates	Plastic crates
COSTS (capital outlay)		
Wooden crates (20 birr/crate, holds 50 kg)	20 crates \$20	
Plastic crates (100 birr/crate, holds 20 kg)		50 crates \$250
	20	250
Relative cost	20 (400 birr)	+ \$220 (4400 birr)
EXPECTED BENEFITS		Better quality, lower losses, Higher market price
% losses	25%	5%
	250 kg	50kg
Amount for sale	750	950
Value/kg	5 birr/kg	15 birr/kg
Total market value	3,750 birr	14,250 birr
Value-costs	3,750 birr- 400 birr	14,250 birr- 4400 birr
	3,350 birr	9,850 birr
Relative profit		9,850 birr- 3,350 birr
		+ 6,500 birr (= \$325)