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Innovative Business Models for Proximate Processing of Fresh Fruits and Vegetables

Postharvest Loss Alliance for Nutrition (PLAN)

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Summary

Processing fresh fruits and vegetables has numerous benefits for both businesses and consumers, yet it is estimated that 30% of fruits and vegetables that are grown are lost prior to reaching the processing stage of the value chain. By moving processing closer to production, also known as proximate processing, businesses can overcome this challenge, reducing the volume of nutritious foods lost and bringing more goods to market.

In this Learning Brief, the Postharvest Loss Alliance for Nutrition (PLAN) explores various business models for proximate processing that are being applied in other countries. This Brief is meant to serve as a primer for Nigerian business owners interested in learning more about proximate processing and its potential applications for their business.

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Overview

Like many areas of the world, West Africa has experienced a rapid shift to a more urbanized population. Nigeria is at the front of this trend with the greatest number of cities and the largest urban population on the continent, and one of the top 10 largest in the world¹. One result of this trend is that food is increasingly being purchased from supermarkets². This trend will be important for Nigerian agribusinesses to consider, should they wish to engage in expanding urban markets, because these new markets often demand food products that can be easily stored and transported, or are pre-cut or packaged for easy consumption. To take advantage of this opportunity, agribusinesses are encouraged to explore processing, which will help maintain quality on the way from farm to market.

Processing is a traditional method for extending the shelf life of agricultural products, while also preserving nutritional quality and improving food safety. Processing takes a raw product, such as fresh tomato, and transforms it into another form, such as tomato paste, which extends its shelf life, is often more convenient for consumers, reduces transport or logistical challenges, and increases variety and desirability.

Processing is actually a broad term that includes a range of activities, which can be roughly divided into **primary and secondary processing**. Primary processing involves minimal change to the physical, chemical, and nutritional properties of the food. For fresh fruits and vegetables (FFVs), this includes washing, cutting, freezing, coating, and packaging the fresh produce. Secondary processing involves changing the food into other types of products. For FFVs, this includes cooking, canning, jamming, dehydrating, juicing, and other procedures that alter the food from its natural state. More information on processing types can be found in Table 1.

Table 1: Types and Examples of Processing

PROCESSING OF FRESH FRUITS AND VEGETABLES	
PRIMARY PROCESSING <i>Minimal change to a food's physical, chemical, and nutritional properties</i>	SECONDARY PROCESSING <i>Altering a food from its natural state and turning it into other products</i>
EXAMPLES Sliced fresh fruits and vegetables Washed and waxed apples Bagged leafy greens Frozen fruits and vegetables	EXAMPLES Pickled vegetables Canned fruits and vegetables Tomato paste or powder Dried/dehydrated mangoes Fruit jam or jelly Fruit puree or juice

For PLAN members in Nigeria, the challenge is not access to processing techniques and best practices. Information on this can be readily found at leading agricultural organizations such as the [Food and Agricultural Organization of the United Nations](#) (FAO), the [United Nations Industrial Development Organization](#) (UNIDO), and [the University of California Davis](#). Rather, processing efforts in Nigeria are often impeded by inconsistent power supply, poor rural infrastructure, diffuse smallholder suppliers, and other systemic barriers.

In the face of these challenges, proximate processing holds potential to provide agribusinesses with a new solution. Through innovative business models, PLAN members can bring processing of FFVs closer to the site of production. In this Learning Brief, we review innovative proximate processing models that are being trialed in other countries. In doing so, we outline the benefits and challenges of proximate processing, and several key considerations for assessing whether proximate processing is right for your business. With this information, we hope that PLAN members will gain a better understanding of the pros and cons of different proximate processing business models and their suitability in different contexts.

¹Moriconi-Ebard, F., Harre, D., &Heinrigs, P. 2015. *Urbanisation Dynamics in West Africa 1950-2010. Africapolis I, 2015 Update*. OECD.

² FAO. 2017. *The Future of Food and Agriculture. Trends and Challenges*.

What is Proximate Processing?

Traditionally, processing and packaging take place midway through the value chain, as shown in the diagram below. This means that, prior to processing and packaging, there are ample opportunities for postharvest losses (PHL) to occur. Across Sub-Saharan Africa, an estimated 75% of PHL occurs in the first two stages (i.e., production and handling and storage), with only 7% of PHL occurring in the processing and packaging stage, and 18% after³. In terms of different rates of PHL corresponding with different value chains, FFVs have the greatest volume of losses compared to grains, proteins, and root crops.

Figure 1: Stages of the Value Chain



While these statistics suggest that there are significant challenges in the handling of FFVs throughout the value chain, they also present an opportunity for savvy businesses to find ways to reduce these losses and increase the volume of goods sold. According to Duro Kuteyi of Betamark Production Company Limited, the #1 piece of advice he would offer to young entrepreneurs interested in starting a processing business is: “To increase your chance of success, you should locate [your business] close to the raw materials on a good road to market, and make sure you have the working capital needed in the raw material season to source inputs.” Proximate processing is one way of effectively achieving this.

At its core, proximate processing is about moving processing activities nearer to production sources or organizing supply chain actors closer together to create shorter, more efficient supply chains. Just as processing is a broad term for a variety of methods for transforming agricultural products, proximate processing is an overarching term for a variety of business models for bringing processing closer to the source of production. **By bringing processing closer to the source of production, the product can undergo processing and packaging earlier in the journey from farm to market. This helps to create a shorter, more efficient supply chain.**

Proximate processing helps reduce PHL in a variety of ways. For primary processing activities like packaging, proximate processing would reduce the potential for loss as a result of rough handling. Secondary processing activities like canning, while more resource intensive, can reduce PHL that results from a lack of cold chain access. All of these activities, however, increase the value of the product being sold.

Business models for proximate processing can take various forms, depending on the type of product, geographical context, and scale of operation. For FFVs in Nigeria we identified four successful business models for proximate processing: mobile processing, near-farm factories, collective ownership, and processing as an aggregator. On the following pages, we review these four business models and offer examples of how they’re being applied in the agricultural sector in different countries.

³Lipinski, B. et al. 2013. *Reducing Food Loss and Waste. Working Paper, Installment 2 of Creating a Sustainable Food Future*. Washington, DC: World Resources Institute.

Innovative Business Models

Proximate processing approaches are being used all over the world in both high- and low-income countries. In this section, we present an overview of four business models being used, offer examples of companies engaged in proximate processing, and provide some considerations for entrepreneurs interested in building a proximate processing business.

#1 MOBILE PROCESSING

A mobile processing business model takes processing to the source of production by traveling around rural areas with a mobile unit, such as a truck, that contains the necessary equipment. Because a truck offers less space than a full-size factory, this model is likely to be more successful if used with less resource-intensive types of processing, such as juicing or drying. Its key advantage, however, is farmers' ability to see firsthand the benefits of processing, which can encourage them to return as customers. Another factor that could improve success would be the ability to serve multiple crop types with a single unit, which would increase the marketability of the mobile processing unit. Businesses considering mobile processing would need to identify an appropriate payment model, such as a pay-per-use or seasonal subscription, and be able to respond to high variability in long-term operating costs, such as fuel.

Case study: Mobile Processing in the United States

Kentucky State University (KSU) developed a [mobile processing unit](#), or MPU, in 2001 for poultry and fish farmers. The MPU is a refurbished trailer that contains equipment to slaughter, clean, and package animal products in compliance with food safety regulations. An operator travels around the region, visiting agricultural centers on a predetermined schedule and offering fee-for-service processing.

After KSU's first success, they developed an MPU for fresh fruits and vegetables in 2015. Equipped with a kitchen, evaporative dryer, and blast freezer, operators can process a wide range of horticulture crops into jams, jellies, pickles, and frozen bagged fruits and vegetables.

Other examples: [The Dutch Agricultural Development and Trading Company](#) has a three-part mobile model for cassava processing in operation in Nigeria. It consists of processing, refining, and drying units that can be used for cassava paste production. A UK-based processing company, Alvan Blanch, created a [mobile juicing plant](#) in 2012, which it is currently being [piloted in Uganda](#).

#2 NEAR-FARM FACTORIES

Near-farm factories are a means of bringing higher-tech processing equipment to rural areas. One of the key elements of this model is that it turns a factory from a static, immovable property to an asset that can be relocated, added to, and reconstructed according to need. This allows the owner of the factory to travel to different geographies in accordance with harvest schedules, thus ensuring a continuous supply of inputs. Businesses considering near-farm factories would need to take into account the volume of processed goods they are trying to produce vis-à-vis the size of factory they can afford.

Case study: Modular Factories in Central and East Africa

UK-based [InspiraFarms](#) has commercialized several models of near-farm factories, designed to provide agribusinesses and farmers in Central and East Africa access to on- or near-farm pre-cooling, cold storage, and processing. Compared to traditional warehouses and plants, these modular factories are lower cost and can be assembled anywhere. InspiraFarms factories can be scaled to accommodate larger volumes by adding additional modules; solar panels are available for all models; and financing options are available for those who can pass a credit assessment.

Other examples: In Costa Rica, a small-scale banana company, APPTA, is building a near-farm [fruit puree factory](#) to process farmers' crops and service international export markets.

Innovative Business Models

#3 COLLECTIVE OWNERSHIP

Cooperative models of ownership are typically thought of in relation to farming, but they can also be used by businesses as a means of pooling resources to gain a competitive edge. For processing, cooperative services can be used to provide a multitude of processing services, spanning different crop types, and different types of processing. These services can be made available to a combination of farmers, aggregators, and distributors, who can buy-in according to their needs, and share in the benefits of reducing loss through value-added services.

Other examples: The [AgroShelter](#) won a 2016 challenge focused on reducing food waste and loss. It uses a cooperative model to bring solar-powered drying, packaging, and milling to rice producers in Nepal.

Case study: Cooperative Dairy Packaging & Processing in Brazil

The [Cooperative Central Gaúcha Ltd.](#) is a Brazilian dairy cooperative created to integrate multiple agribusiness activities and generate competitive advantages for its member dairy producers. One of the ways it does this is through processing and packaging solutions focused on creating powdered milk products suitable for export markets.

#4 PROCESSOR AS AGGREGATOR

Aggregation is a great model for established processors looking to increase their profits. By taking on the role of aggregator and purchasing goods directly from farmers, agribusinesses can reduce their costs by cutting out steps for raw materials to make it to a factory. However, the sourcing of goods could prove difficult without strong networks and knowledge of producers in the area. This means that building strong relationships with farmers is essential to success.

Other examples: [S4S Technologies](#) is a food processing company that contracts its services. They source the raw materials, process, and pack products under the brand of another company, which then sells the end-products to markets.

Case study: Aggregating Fruit in India

[Pick 'N Serve](#) uses an aggregation model to source bananas, pomegranates, mangoes, and other fresh fruits from all over India. Using 4 trucks, they travel to farms and unload a small on-site cooling facility to pre-cool and, in some cases, package the fruits. Once cool, they are transferred to nearby reefer storage containers. Packaged fruits are then transported directly to markets; unpackaged fruits are sent to proprietary processing centers for pulping, canning, or slicing.

[Tomato Jos](#) uses an aggregation model for their tomato paste production operation. The model relies on what is called a 'nucleus estate' to work directly with farmers, who grow the produce and are then able to supply the tomato paste production factory with a continuous supply of inputs during the harvest season, which allows the factory to operate at capacity to maximize profits.

Conclusion

Proximate processing has untapped potential in Nigeria, where there are still high levels of PHLW early in the value chain. By placing processing as close to farm gate as possible, businesses stand to increase profits, reduce PHL, and increase the quantity of nutritious foods that reach consumers.

Any agribusiness considering introducing proximate processing into their business model will need to consider the types of fruits or vegetables they handle and the appropriate processing technology that best matches. For example, while canning might offer a good processing option for tomatoes, it may be more efficient to convert fresh tomatoes into raw paste that is eventually sold to remanufacturing companies to bulk (add water, spices, flavorings, etc.), and other additives to make specialized retail products such as sauces and ketchup. Conversely, other fruits or vegetables, such as mangoes, may be better suited for juicing or jamming. Finding the right match of input and end-product will also help to narrow down the type of proximate processing business model that may be suitable as some are more resource-intensive than others.

For questions about the PLAN Network in Nigeria, please contact Roberta Lauretti-Bernhard at rbernhard@gainhealth.org or Dr. Augustine Okoruwa at aokoruwa@gainhealth.org

To continue the conversation, or to ask the PLAN Network for further advice on accessing finance, join the [PLAN Facebook Group](#)—the dedicated forum for PLAN members to discuss topics relevant to reducing postharvest losses in their operations.