

Pre-Cooked Beans for Consumer Convenience

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Summary

Common bean is a major staple food in eastern and southern Africa, the second-most important source of human dietary protein and the third-most important source of calories. Yet the sale and consumption of whole dried common beans is discouraged by their long cooking time, and high energy and water requirements. Pre-cooking combined with canned or frozen preservation techniques substantially decreases preparation time and fuel use, making it more attractive to urban and middle-class consumers and creating a growing commercial opportunity. This technology not only improves food and nutritional security but also the income of farmers by stimulating demand and opening up access to higher-value markets. Pre-cooked products further strengthen the common bean value chain in Sub-Saharan Africa, offering greater marketability and profit margins. Women homemakers and canteen caterers especially benefit from the time savings to prepare meals with beans as they are freed up to do other more productive activities.

Technical Description

Pre-cooked whole beans come as dried, canned and frozen products which can be prepared in only 10 to 30 minutes, saving over 1.5 hours of cooking time, eliminating the need for soaking and hugely reducing fuel expenditure. The process of making pre-cooked beans starts with sorting, washing and sizing for which air and water is passed over the food product. This is followed by blanching at 95°C for 3 minutes, soaking at 45°C for 120 minutes, sterilization and cooking of hydrated beans at 97°C for 120 minutes, and drying at room temperature for approximately 24 hours. Beans are then packaged and frozen. Processing of canned beans involves the same soaking, blanching and cooking procedure which is followed by brine addition, cooling, canning and labeling. Pre-cooked frozen and canned beans can be commercialized for both local and export markets.

Uses

The pre-cooking technology for whole beans is ideally suited to make nutritious diets more widely available to consumers. It serves as a way for marketing biofortified bean varieties with higher iron and zinc levels to middle-class urban populations that are decreasingly reliant upon beans. This food processing technique can be implemented by artisanal and industrial enterprises as simple low-cost equipment setups are required.

Frozen pre-cooked bean products require cold chain storage and transport, reliable delivery infrastructure and strong links with markets.

Composition

High-quality soft-cooking varieties of common bean with appealing taste and color should be used for this processing technique, such as is the case with NABE 4, NABE 14, Rosecoco and Wairimu in Kenya and Uganda. The equipment needed for producing pre-cooked beans includes sorters for color grading, sieves and screens for removing stones and woody stems and shells, baths for washing and soaking, and vessels for boiling which are available as manual or automated systems in different sizes and that draw power from wood fuel, natural gas or electricity.

Means of application

Selecting common bean varieties for pre-cooked products that meet the dietary preference and culinary practices of consumers is based upon a series of factors such as ease of growing, preparation time, color and micronutrient content. Farmers operating as out growers for processing facilities require access to quality seed, fertilizer and other accompanying inputs to ensure adequate supply of whole beans. There are a number of ways to achieve this which have proven very efficient for the commercialization of pre-cooked bean products in Kenya and Uganda. Among the most popular schemes are the seed credit model involving contracts with loans that are amortized in cash from sales to processors, and the revolving seed model where credit gets repaid through delivery of whole grain. Preparing frozen products typically involves cooking very large batches of whole beans whereas for canned products this step is done inside metal tins as it eases the work and improves food hygiene. Different models can be employed such as collective enterprises with a single common processing plant, or pooled enterprises with multiple small plants at separate locations.

Agroecologies	Moist savanna, Humid forest, Dryland area, Highlands.
Regions	Africa South of Sahara.
Developed in Countries	Benin, Zambia, Nigeria, Cameroon, Gabon, Ivory Coast, Senegal, Ghana, Malawi, Sierra Leone, Burundi, Mozambique, Uganda, Tanzania, South Sudan, Rwanda, Kenya, Democratic Republic of the Congo, Central African Republic.
Available in	Benin, Zambia, Nigeria, Cameroon, Gabon, Ivory Coast, Senegal, Ghana, Malawi, Sierra Leone, Burundi, Mozambique, Uganda, Tanzania, South Sudan, Rwanda, Kenya, Democratic Republic of the Congo, Central African Republic.

Solution Forms	Equipment.
Solution Applications	Post-harvest handling.
Agricultural Commodities	Common bean.
Target Beneficiaries	Small-scale farmers, Commercial farmers, Women, Youth, Agro-manufacturers.

Commercialization

Commercialization Category

Commercially available

Startup Requirements

Entering into this food processing venture follows these steps: 1) Awareness raising with farmers, agri-food companies and investors about the business opportunities created by the technology, 2) Formulating appropriate product standards, packaging sizes and prices based on consumer demand, 3) Identifying profitable, durable and equitable models for production and marketing of pre-cooked beans, 4) Organizing reliable supply of beans by contracting nucleus farms and out grower networks, 5) Installing energy-efficient and labor-saving equipment to minimize production costs, and 6) Training operators and workers on safety and quality adherence throughout the process.

Production Costs

The main investments for this food processing technology are related to the supply of whole beans, hiring of skilled labor and purchase of equipment. Industrial-scale operations require considerable investment but operations for frozen and canned products may be modified around other existing manufacturing lines. A small electric cooker system for making pre-cooked beans with a capacity of 100 liter is sold at US \$1,500, whereas a large hot water boiler powered with petrol or natural gas with a capacity of 0.5 ton per hour costs US \$20,000. The total initial investment required for a 12,000 ton per year bean canning facility in Rwanda totaled US \$8 million, with construction of the yard and purchase of the equipment requiring US \$4.6 million and the acquisition of a 450 hectare nucleus farm.

Customer Segmentation

Whole bean pre-cooking technologies appeal to small-scale processors, community-based or cooperative enterprises and large industrial food manufacturers. Rural and urban households in African countries form the largest consumer base for pre-cooked

beans, and are more than willing to pay for the convenience of faster preparation time. There is large demand from schools, armed forces, hospitals and prisons for this nutritious food as well. Poorer households are discouraged from consuming whole dried beans because of the time, fuel and water requirements, and this is addressed through pre-cooking. In particular, owners of small eateries expected to serve beans earlier in the day recognize the advantage of preparing pre-cooked bean products.

Potential Profitability

Households relying upon precooked beans save about US \$0.30 per meal. One of the main benefits of the food processing technology is that it lowers cooking costs by 90% which leads to saving in energy expenditure of households. Decreases of wood and fossil fuel use for cooking beans furthermore conserve forests and mitigate carbon emissions. The total market size for pre-cooked beans in Rwanda alone is estimated at US \$50 million to \$85 million with a demand of 2,628 metric tons per year. Economic analysis has shown that investments on bean processing can achieve an internal rate of return of 32% to 53% which allow a processor to realize a positive cash flow in three years.

Licensing Requirements

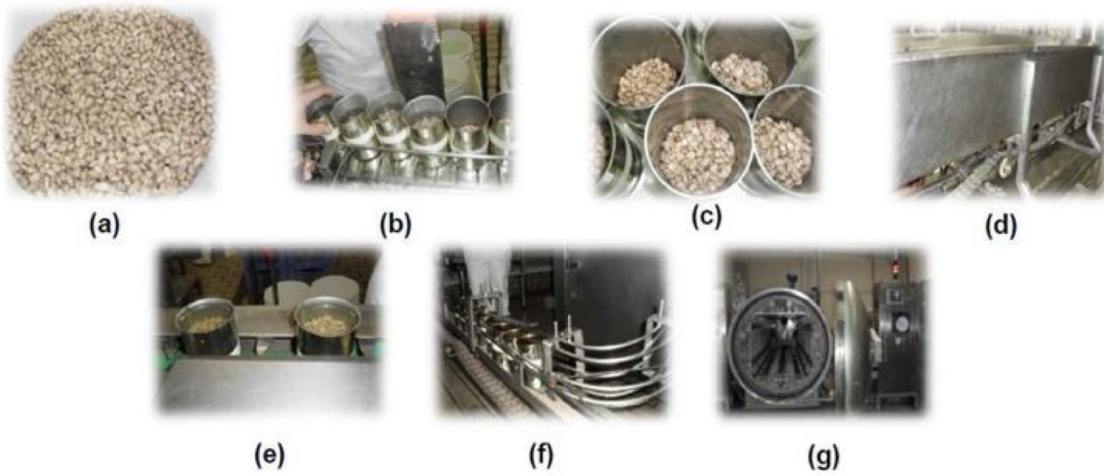
Pre-cooked beans are readily advanced as consumer-friendly products through public-private partnerships. Producers of pre-cooked bean products must comply with food safety regulations applicable locally, regionally and internationally depending on the target market. Most of the simple cottage style machinery and equipment can be fabricated free of license, while larger industrial systems fall under intellectual property protection.

Innovation as Public Good

Some technologies for processing pre-cooked bean products are a public good, and ABC and its partners are actively involved in disseminating this information across Sub-Saharan Africa.

Solution Images





Industrial preparation of canned pre-cooked beans: a) sorting and cleaning, b) adding brine, c) adding beans, d) deoxygenation, e) filling with brine, f) seaming lid on can, and g) cooking and sterilization

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