Food & Business Knowledge Platform

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Factsheet final findings Applied Research Fund Call 1

Development of automated solar powered fruit drying technology for smallholder farmers in Ghana

Summary

The main goal of the project was to develop a low entry-cost automated prototype drying oven for 1,000 smallholder mango farmers in the Kintampo areas of Ghana. This was expected to catalyze small scale farm processing of mangoes and reduce waste, thereby substantially increasing household income, improving nutritional status, reducing poverty and encouraging young farmers to go into fruit processing.

The consortium designed, developed and constructed an integrated solar/LPG powered dryer which is capable of drying mangoes and other fruits and vegetables. The dryer costs just about 50% of the cost of standard commercial fruit dryers. It was constructed by local artisans using local materials, and installed at its current location, which is now a central processing unit. A section of a warehouse was converted into a fruit processing factory meeting the required Hazard Analysis and Critical Control Points (HACCP) standards. The first test of the newly installed dryer recorded a temperature of 85℃ and successfully dried mangoes and pawpaw (papaya). The dried fruits were tested at the Kwame Nkrumah University of Science and Technology (KNUST). Results showed no microbial contamination and the product had a favourable chemical and nutritional composition.

Research Findings

The main result of the project is innovation introduced to design, develop and commission a low-entry cost, solar drying technology for fruit and vegetable processing. This project has demonstrated that local artisans can be trained to develop a highly efficient fruit drying machine with two main energy sources. The use of solar and gas as main energy sources is a great innovation in an environment where grid electricity is either unavailable or unreliable at best. Laboratory analysis showed that the fruits processed using this technology are free from contamination of any kind and have a quality that is comparable to fruits dried from more expensive commercial dryers. The study has shown how local materials can be harnessed to solve fundamental problems affecting smallholder farmers.

Outcomes achieved

The low-cost solar dryer developed is a key output of this project and has provided a reliable market for harvested fruits which otherwise would have gone to waste. Improved market access for over 1000 smallholders in the project area contributed substantially to farmer household income and subsequently reduced poverty. Although the project could not systematically assess the impact of the solar drying and the increasing market access of the farmers, anecdotal and field observations showed post-harvest losses have been reduced from 40% at the baseline to around 5% and income levels increased by over 180%.
Absence of a post-harvest terminal in the Brong Ahafo region meant that post-harvest loses were at 40%-50% of biological yield. Harvested produce was wasted away or sold at giveaway prices. These invariables left the farmers poor and continued to deepen the already depressed poor standard of living. Some farmers were cutting their mango trees to grow more profitable crops. With the commencement of the project, confidence in mango has been regained and spread to

non-mango farmers. Tomato growers in the area, upon hearing the news of successful mango processing, demanded to have such a facility to process tomatoes and other vegetables.

Project messages to

A) Actors from private sector:
Entrepreneurs are driven by commercial motives, while researchers' primary incentive is to publish about an innovation in peer-reviewed journals. A very pragmatic solution to make sure these differences of interest do not hamper the collaboration, is to make commitments at project start-up to allocate shares to each partner in case the innovation starts making money. So all the partners benefit equally. This commitment to allocate commercial shares during the commercialization phase of the project offers enough incentives for all partners, both private operators and researchers.

B) Civil society and practitioners organizations:
Civil society engagements are central to the success of projects of this nature. However, selection of partner civil societies must be done carefully. Most civil society organizations have different interests that may not align with the objectives of the project.

C) Policy makers:
Participation of policy makers has been central to the success of the project. The consortium knew that the results of the innovation will be commercialized, but to ensure its sustainability and replicability, policy makers must understand the value to be created right at the onset of the project. Some of these policy makers at the local level have become ambassadors of the innovation developed.

Knowledge products

Working paper

- Standard operating procedures for on-farm fruit and vegetable drying; Simeon Gyewu, Daniel Asare-Kyei and Valentijn Venus, November 2017
- Dehydromatic, a Smartphone App to guide farmers and micro-processors in the solar drying of their fruits and vegetables; Wahyu Anggara Raya, Firdaus Kurniawan Zulqornain, Valen!jn Venus, Firman Wahyudi, June 2018

Tool

- Construction manual for the development of dual energy solar oven for fruits and vegetable drying – The Fruitprotech Dryer; Simeon Gyewu, Daniel Asare-Kyei and Valentijn Venus, November 2017

Co-creation

Co-creation and project location are obviously key factors that have contributed positively to project outcomes. The expertise of different project partners, for example, strong engineering skills of project coordinator has been key in ensuring timely development of the efficient drying unit. In addition, development and research expertise has been very beneficial. Finally, close prior personal relationship between the partners has helped to facilitate communication, reduce tensions and bridge the gap between differences in perceptions.
Projects are jointly developed by all consortium partners. However, during implementation it may turn out that they do not share the same ideas on approaches or priorities, and at times their interests may even clash. It is therefore vital to maintain an open dialogue on how to proceed, while never losing sight of the initial goals. Experience shows that the cultural, professional and institutional differences that challenge transdisciplinary partnerships, including practical challenges such as coordinating with international partners across time zones, are much easier to deal with when the partners have worked together before embarking on the project. New partners need to consciously invest in building up their relationship and mutual understanding.

Consortium Partners

- Sustenance Agro Ventures (SAVE)
- Eucharia Farms Ltd
- Ujuizi Laboratories
- Horticulture Department, Kwame Nkrumah University of Science and Technology

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Project website

F&BKP Research Project page