

Solar drying for outsourcing crop processing in Kenya

Plumbee Wholefoods Business Case



Horticulture



SWP



Innovation Fund



Executive Summary

Plumbee Wholefoods, a Kenyan women-led start-up which manufactures children's food, applied to the SEFFA innovation fund with an idea to transfer the first stage of food processing to women smallholder farmers (SHFs). The pre-processing includes chipping and solar drying vegetables and fruits. Plumbee designed and installed an automated solar drier with a capacity of 500kgs, recruited 88 SHFs (86 being women), organised them into producer groups and capacitated them with essential skills and knowledge in growing and pre-processing pumpkin for use in fortifying children's foods. The company introduced three new packaged children's food product lines and signed a supply contract with the women farmer groups who have already supplied 3,000 kg of pumpkin produce earning the farmers more than EUR 2,100 in additional farm income. Plumbee plans to capacitate and sign supply contracts with more smallholder women farmers groups, introduce beetroot as an additional crop, and promote solar powered irrigation to counter reliance on rain for production.

The project's primary objective is to decentralise the initial stage of food processing to SHF in rural Kenya, with a specific emphasis on empowering low-income rural women.

Participating farmers benefited in two key ways: Through the sale of pumpkins cultivated under supply agreements with Plumbee, eliminating exploitative middlemen and ensuring that

- farmers receive higher prices for their supplies. Farmers are engaged in pre-processing (chipping and solar drying) of produce at the newly constructed production facilities, creating jobs and earning them additional income.

- In addition to the benefit on the farmers' side, Plumbee has supported their suppliers to produce high quality inputs and has contributed to their social mission by empowering women farmers.

Case Data



Kenya



Solar Drying, Horticulture



EUR 22,500



Plumbee Wholefoods Ltd



GIZ



- Develop and implement a plan for transferring Plumbee's first-stage food processing to women smallholder farmers.
- Empower rural women to use sustainable solar drying technology for primary processing of fruits and vegetables.
- 90 Smallholder women farmers capacitated with good agricultural practices and pre-processing in pumpkin and beetroot value chains. Design and installation of an automated solar dryer with a capacity of 500kgs. 3,000 Kg of pumpkin produced earning women farmers more than EUR 2,100 additional farm income. Solar drier effectiveness was shown in time and costs savings as well as quality of the output.



Innovation Fund



- 500kg drying capacity installed
- 3T of produce dried
- 30% reduction in drying times



Crops: Pumpkin, Beetroot



Problem statement

Over 70% of Kenya's population consists of rural SHFs who face significant challenges related to poverty and malnutrition. Rural SHFs, primarily women, engage in low-value subsistence activities and remain excluded from profitable value chains that serve national, regional, or export markets. Limited access to commercial markets, finance, education, training, and business skills perpetuates gender inequalities.



Assumptions

- Smallholder women farmers when capacitated and linked to markets will be motivated to participate in production and value addition in horticultural value chains.
- Application of solar drying in value addition in horticulture value chains will result in job creation and additional income for rural women.

Business Case Details

Plumbee Wholefoods is a children's food company with a strong social commitment towards promoting family health and nutrition. Plumbee is building capacity with women-led groups to pilot the outsourcing of pre-processed ingredients for fortified infant and family flour. The company is promoting the use of solar drying technology to attain better quality dried fruits and vegetables which form part of the healthy ingredients Plumbee uses for the manufacture of children's food. Plumbee has started to transfer the first stage of food processing to smallholder women farmers in rural Kenya, with a particular focus on empowering women by enhancing their capacity to grow required farm produce and providing a reliable market. By doing this, the company addresses the inequalities faced by women farmers and provides them with access to income generating activities in agriculture, leveraging renewable energy technologies for job creation. The specific activities implemented include:

1. Developing and implementing a plan for transferring Plumbee's first-stage food processing to women SHFs.
2. Recruiting and training rural women on good agricultural practices and climate smart technologies necessary for growing horticulture crops.
3. Empowering rural women to use sustainable solar drying technology for value addition of fruits and vegetables.
4. Improving food and nutrition security of SHFs households by minimising post-harvest food loss and encouraging the consumption of fruits and vegetables.

The location of the pilot project is synonymous with small land sizes and predominantly relies on maize farming. Pumpkin was successfully introduced as a higher value alternative crop. Women farmers were recruited and taken through a 5-week training curriculum which included training on good agricultural practices, climate smart technologies and pre-processing activities for solar drying.

A centralised solar drier model was adopted for this pilot where producer groups agreed with Plumbee on a central location for the installation of the dryer.

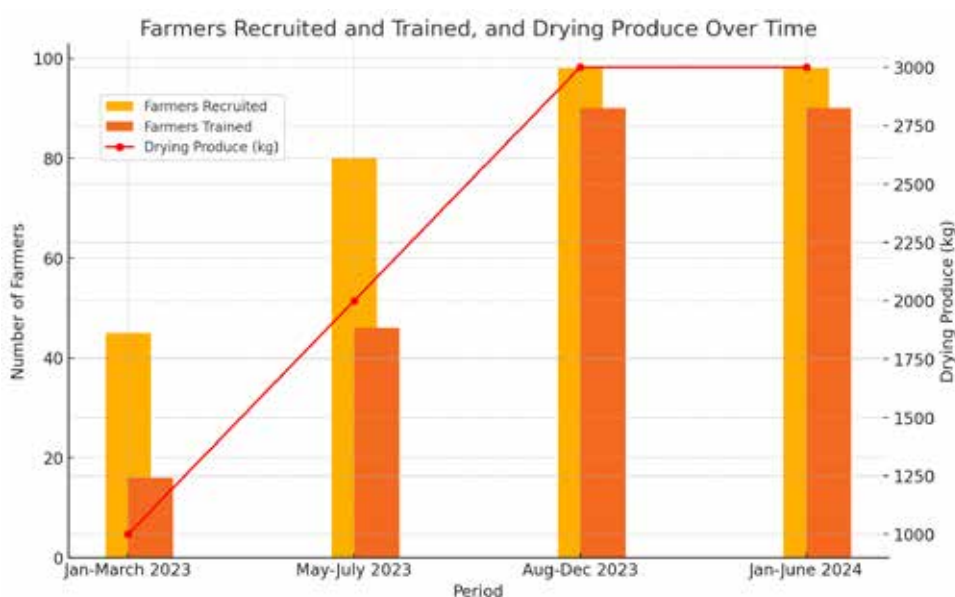


Figure 1: Farmers Recruited and Trained, and Drying Produce Over time

Aggregation, cleaning, and chipping of the produce is carried out centrally and dried in compliance with food handling regulations. In 2024, more than 3,000 kg of pumpkins were procured from women-led farmer groups, processed and dried in the installed solar dryer earning women farmers more than EUR 2,100 in income. Iteration of the solar drier design to include automation reduced drying time and resulted in higher quality dried products.

Business case analysis found that smallholder women farmers will be in a positive financial position if they adopted pumpkin growing in a contract farming arrangement with Plumbee Wholefoods. Solar drying technologies have proven their ability in value addition as the pilot showed job creation resulting in higher incomes for SHFs and contributed to improved livelihoods for rural households.



Business Case Attractiveness

Long-term outlook

The approach shows a good degree of replicability: linking farmers and an established business who required the processed goods is a key step in sustainability. The women farmers groups have seen increased incomes and Plumbee is expanding into procuring dried beetroot from the farmers group.

Business viability

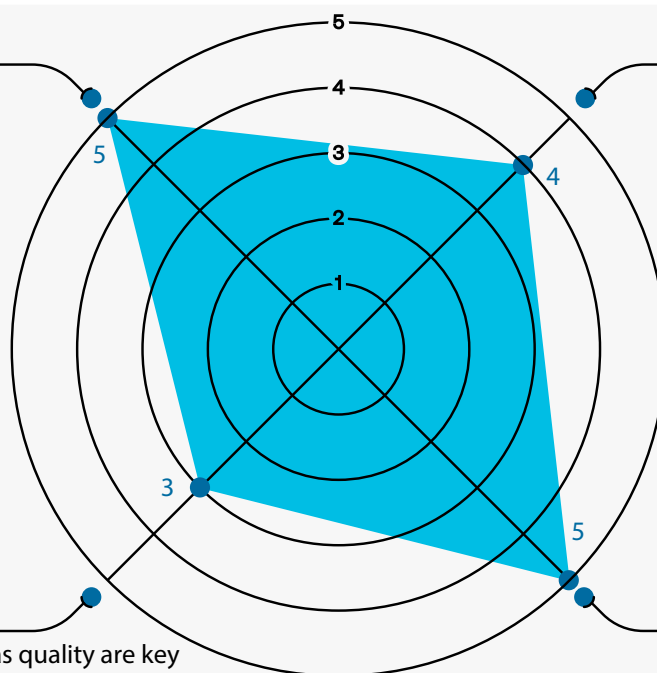
Plumbee was able to confirm that the business case for solar drying in horticulture value chains such as pumpkin and beetroot is viable. They also determined that empowering smallholder women farmers to supply quality farm produce and their inclusion in value addition activities results in reliable supply of ingredients and transformation of rural livelihoods.

Financial viability

Cost and time savings as well as quality are key determinants of financial viability of this solar drying business case. Automated solar driers reduce drying time by about 30% and improved the colour of dried pumpkin chips.

Technical feasibility

Centralised solar dryers were successfully installed in local communities for value addition on horticultural crops with simple processing and quality requirements. Automation achieves better cost and time savings as well as better quality of output.



Outcomes

- 90 SHFs (97% women) capacitated on pumpkin growing and use of solar dryers for value addition of fruits and vegetables
- 3,000kgs of pumpkin harvests received from smallholder women farmers, an additional harvest of up to 8000kgs expected in 2024
- Earnings of more than EUR 2,100 received by smallholder women farmers

Key Takeaways



Project Design

- Capacitation of end users when introducing new technologies is important to ensure full benefits are achieved.
- Allow opportunities for iteration and improving technologies on pilot.



Overcoming Financial Barriers

- Forming partnerships with food processing companies is a good path to removing the barriers associated with asset ownership for drying and other technology that would require a high investment.



Overcoming Logistical Barriers

- Procurement logistics is difficult to plan when dealing with smallholder farmers who harvest small quantities of produce, this was addressed by planned production and aggregation of produce.



Overcoming Farmers' Barriers

- Training for farmers on business and financial literacy should be implemented, alongside farming practice training.
- Access to finance for high value equipment like solar dryers is a challenge to access especially by women and smallholder farmers.



Overcoming Technology Specific Barriers

- Solar drying has a business case in farm produce that have simple processing and quality requirements.
- Automation of solar dryers has superior benefits in time savings and quality.



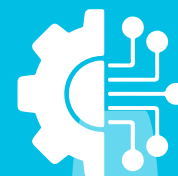
Overcoming Value Chain Specific Barriers

- Capacity building, market linkages and aggregation in horticulture value chains have added value in enabling success of productive use of solar business cases.
- Behaviour changes strategies when targeting special focus groups like women should have a clear demonstration of benefit (income, jobs and nutrition) for target end users.

Understanding the Context of SEFFA: Farmers' experience

Several layers of barriers to the adoption of PUE technologies.

Technologies



Financial Barrier



Logistical Barrier



Farmer Internal Barrier



Farmers



Iconography

Financial Instruments



Result-Based
Funding



Innovation Fund



Fee-for-Service



Consumer Credit



Lease-to-Own

Types of Barriers



Farmer



Logistics



Technology Related



Financial



Value Chain
Related

Agriculture Chain



Dairy



Horticulture



Irrigation



Cooling



Drying

Technologies

Other



Total Budget



Farm Size

Location



Ethiopia



Kenya



Uganda



About SEFFA

The Sustainable Energy for Smallholder Farmers (SEFFA) in Ethiopia, Kenya and Uganda project was designed by leveraging over 15 years of practical experience of EnDev. The strategic partnership identified lack of modern energy access as one of the critical development barriers in rural areas since it undermines agricultural productivity, exacerbates pre- and post-harvest loss, and makes it challenging to store and process produce. The IKEA Foundation has provided an €8 million grant to support EnDev's efforts. Learn more about the project [here](#).

About the IKEA Foundation

The IKEA Foundation is a strategic philanthropy that focuses its grant making efforts on tackling the two biggest threats to children's futures: poverty and climate change. It currently grants more than €200 million per year to help improve family incomes and quality of life while protecting the planet from climate change. Since 2009, the IKEA Foundation has granted €2 billion to create a better future for children and their families. In 2021 the Board of the IKEA Foundation decided to make an additional €1 billion available over the next five years to accelerate the reduction of Greenhouse Gas emissions.

Learn more at: www.ikeafoundation.org or by following them on LinkedIn or Twitter.

About EnDev

EnDev improves the lives of the most vulnerable by providing access to sustainable energy in 20 countries worldwide. Currently, EnDev is funded by Germany, the Netherlands, Norway, and Switzerland and coordinated jointly by GIZ and RVO. The strategic partnership is working with experienced implementers, with SNV being one of the most prominent partners. Learn more at www.endev.info or by following them on LinkedIn.

Funded by:



Co-financed by:



Coordinated and implemented by:

