Energising change

Access Unlocked: Financing adoption of solar PU in agriculture

endev

Executive Summary

The Sustainable Energy for Smallholder Farmers (SEFFA) project was an initiative aimed at promoting the adoption of Productive Use of Energy (PUE) technologies in the dairy and horticulture value chains in Ethiopia, Kenya, and Uganda. Cooling, Drying and Irrigation technologies were piloted and scaled concentrating on promoting the technologies to Smallholder Farmers (SHF) in both the dairy and horticulture chains. This document is a project brief setting the scene for the project and the financial instruments used to assist in the promotion of PUE technologies. We give an overview of project target beneficiaries, the project costs, the financial instruments used and cases of where they were piloted, as well as the project's results and impacts in enhancing agricultural outputs and incomes amongst the SHFs.

SEFFA used demand side instruments to help the target beneficiaries to bridge the affordability gap. Consumer credit was supporting in creating loan products for solar equipment and both fee-for-service and lease-to-own models allow farmers to access the technologies without needing to cover the cost of the asset upfront.

Supply side interventions centered on Innovation Fund grants for testing and piloting technical and economic feasibility of nascent technologies and Results-Based Financing (RBF) to promote access to more mature scalable technologies, in this case Solar Water Pumps (SWP).

8 Million EUR total project Budget, 771,500 for Financial instruments

Jan 2023 - Jun 2024

Ethiopia, Kenya, and Uganda

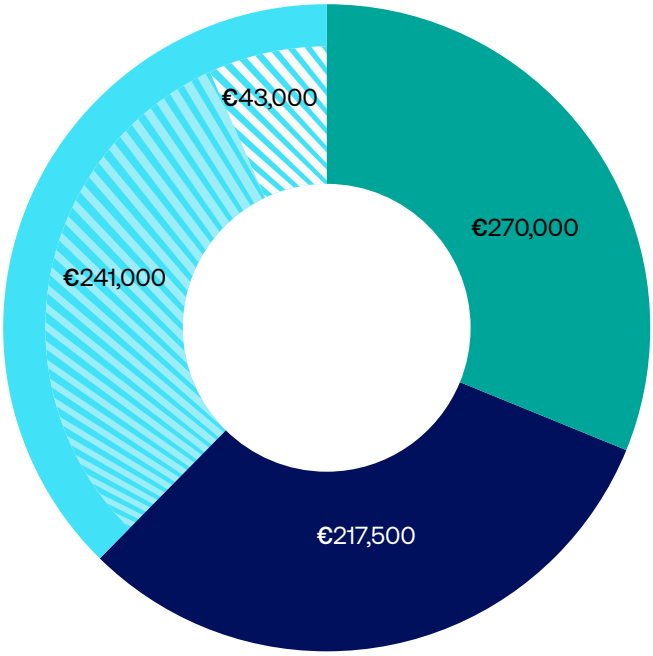


Figure 1: Financial Instruments Budgets Breakdown

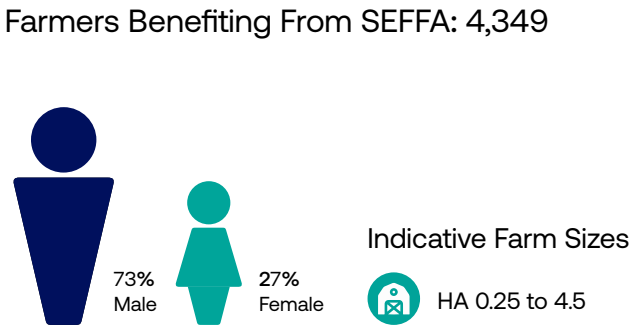


Figure 2: SEFFA Beneficiaries

Key takeaways emerged from the use of financial instruments to increase the access to and adoption of PUE for SHFs in the target countries. We saw that both the RBF and Innovation Fund (IF) proved effective in increasing the supply of SWPs. SEFFA's experience also saw that IF required a significant amount of capacity building to make the products viable. Furthermore, demand side strategies are required to overcome financial barriers to PUE adoption due to the high cost of imported technology, and these strategies and instruments should be tailored to seasonal incomes.

By leveraging shared resources, enhanced access to financing, centralised training, and improved market linkages, cooperatives and agri-SMEs can play a crucial role in making solar cooling and solar drying technology beneficial to SHFs.

Training of farmers on the installed equipment combined with trainings on business improvement and farming practices is vital. Targeted matchmaking and awareness campaigns at the community level proved highly effective in reaching SHFs and fostering the adoption of PUE technologies.

Regional Context

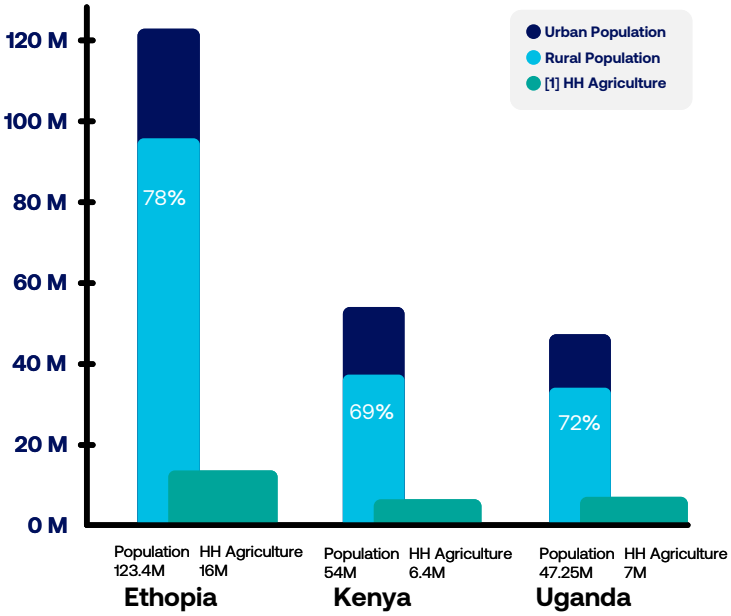


Figure 3: Population and Households in Agriculture

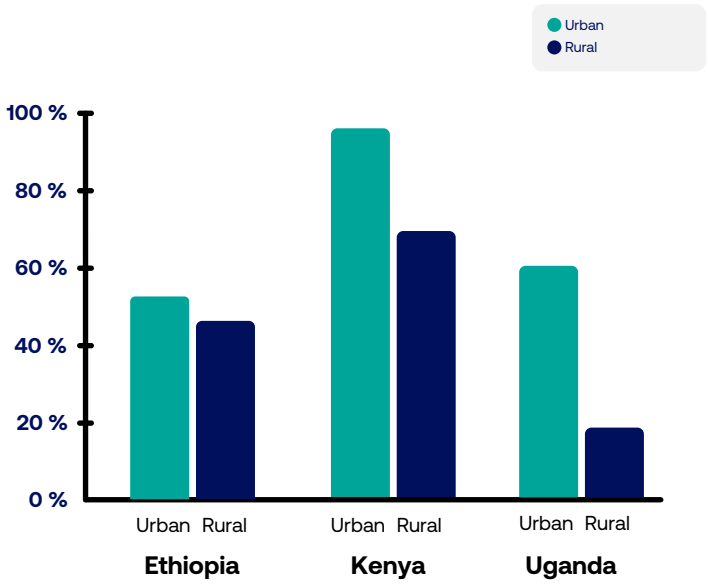


Figure 4: Urban Vs Rural Access to Electricity

The Affordability Gap: Why Financial Instruments are Needed

When working to increase access to PUE technologies for SHFs, there are significant affordability gaps - purchasing assets is not within the reach of SHFs based on their incomes. Cooperatives and agri-SMEs may also require assistance to acquire the technologies which make their business more efficient and thereby able to provide higher incomes to the SHFs that supply them. Therefore, SEFFA looked at different supply side and demand side financing instruments to improve access to PUEs.

Farmers' incomes in the region vary from 80-100 EUR per month for SHFs in horticulture to 400 EUR per month for dairy farmers having supplemental businesses alongside their farming, such as yoghurt making. Credit provision for agriculture by the established financial intermediaries in the region is still very low where available. Given the market prices for SWPs, Cooling and Dryers, SHFs would not be able to access most PUE technologies without the provision of financial instruments.

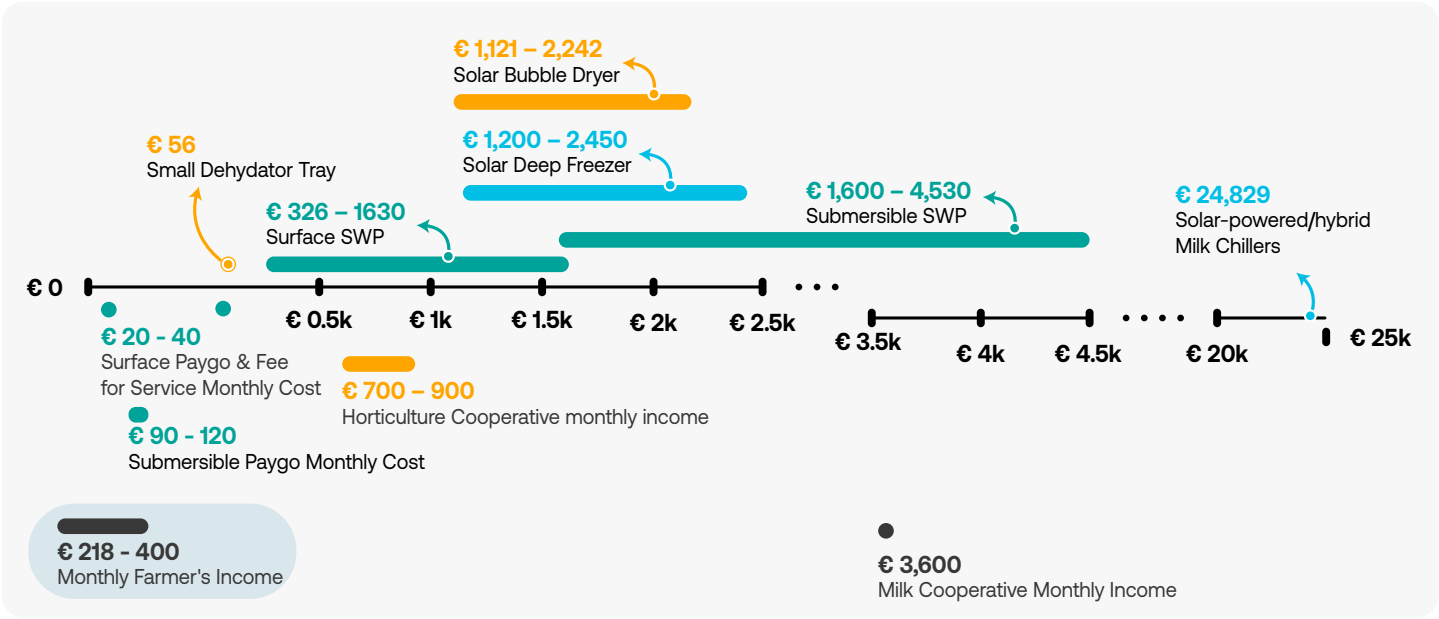


Figure 5: Technologies used in SEFFA - Prices and Farm Incomes

[1] Average household size in the region is 5 persons per household

Overview of Financial Instruments Used in SEFFA

Financial instruments are designed to enhance the adoption of sustainable technologies by addressing the financial barriers faced by SHFs. They aim to promote sustainable agricultural practices by making technology more accessible and affordable.

Along with providing access to instruments, SEFFA provided funds for training financial intermediaries on PUE technologies for agriculture and how to assess credit risk when constructing loans for such equipment. Better understanding of the PUE equipment by financial intermediaries will also lead to easier access to credit for equipment companies. And so support to Financial Intermediaries has an effect on both the supply side and demand side.

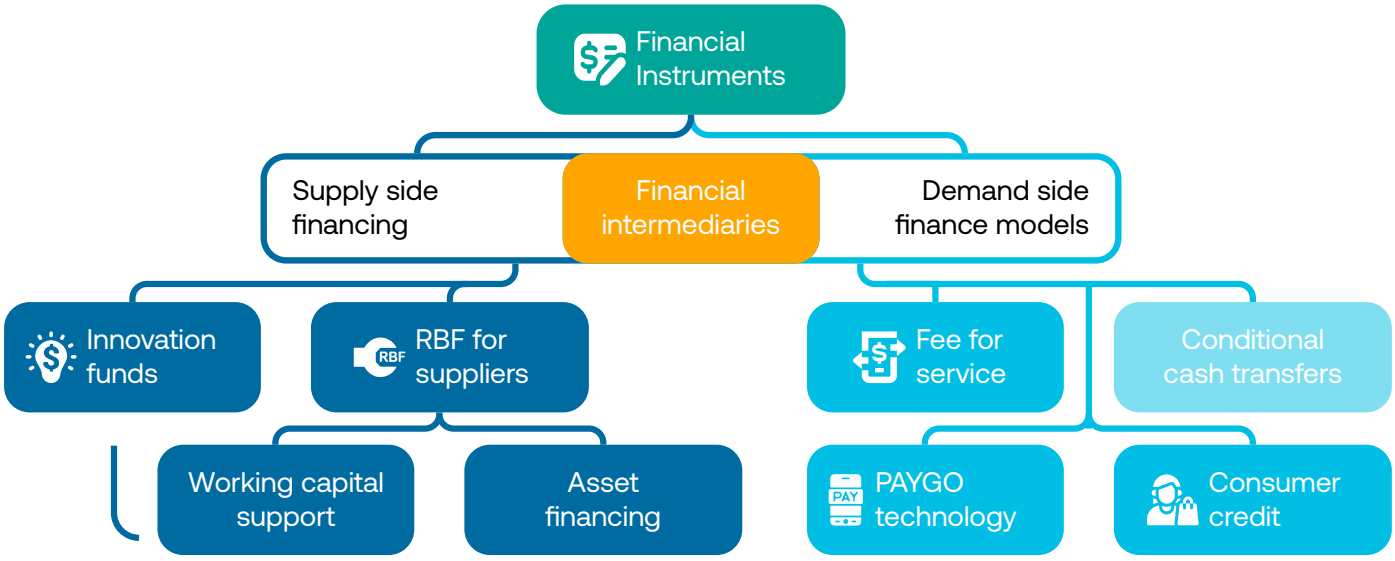


Figure 6: Financial Instruments for PUE Technologies

When to use Different Financial Instruments

There are three key questions to consider when deciding which financial instrument will best support the access to and uptake of PUE technology among SHFs.

- How mature or competitive is the private sector generally and more specifically in the companies who supply PUE equipment? Are there several established suppliers with inventory in country or is equipment supplied primarily by tender or by small or less formal merchants?

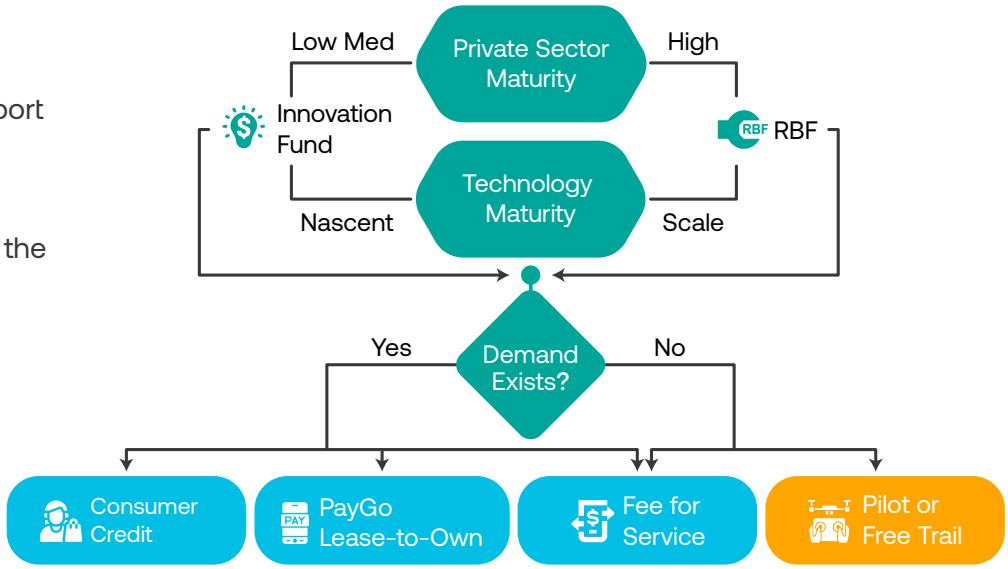


Figure 7: Overview of Financial Instruments

- Is the technology under consideration nascent, scalable or mature?
- Is there a proven demand for the technology among the target farmers or is demand activation needed?

The flowchart shown summarises the findings from SEFFA on which technology should be used under the different circumstances.

Supply Side Financing Instruments

1. Innovation Fund

The IF was established to support the piloting of nascent PUE technologies and innovations. It aimed to provide financial support for early-stage initiatives and foster experimentation and learning. While the IF complemented the project's goals by funding innovative projects, challenges related to technology readiness, market acceptance, and scalability were observed.

- Objective: Accelerate the development of innovative business cases for SHFs' access to energy services.
- Process: Employed a two-stage competitive process involving concept note submissions and full proposal assessments.
- Outcome: Successfully selected and supported innovative projects, spanning solar drying for value addition, solar cooling for horticulture, and adaptive PAYGO solutions.

The fund supported the testing of innovative business models and technologies by providing small grants (max 22,500 EUR) to assess technical, organisational, and financial viability.

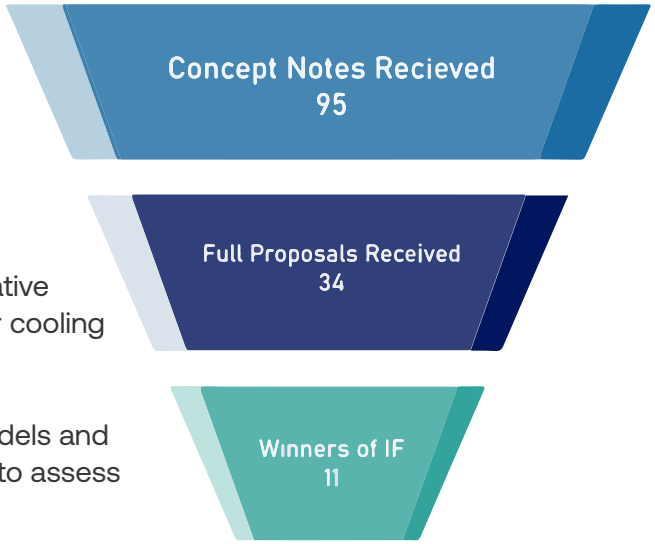


Figure 8: Innovation Fund Competitive Process Funnel

Number of Companies	Country	Results from the Innovation Fund
3	Uganda	• Piloting solar milking machine • Promoting the use of solar cold chain to reduce post-harvest losses of fruits and vegetables at the market level • Piloting solar irrigation for increased yields coupled with solar drying for decreased post-harvest losses in tomatoes
4	Kenya	• Solar drying capacity installed for smallholders • Cooling as a service pilot in horticulture • PAYGO system for SWP based on seasonal cash flows
4	Ethiopia	• Solar milk cooling for a cooperative • PAYGO trials for SWP • Replacement of diesel fuel water pumps for irrigation

Innovation Fund Example: PAYGO for SWP to address the affordability gap in Ethiopia

Innovation Grant Details	Total Amount	22,500 EUR
	Disbursement schedule	An initial advance of 14,000 EUR was issued to fund the first installment of project activities over the initial four months, as per the approved scope of work. The funds were provided as foreign exchange (forex) to facilitate procurement, as accessing forex is a significant challenge for importers in Ethiopia.
Short Project Description		Hello Solar piloted a PAYGO system for SWPs for Ethiopian farmers to allow them to access SWPs without outlaying the full asset cost upfront.
What were the funds used for?		60% of the fund used for the importation of SWP products and the remaining 40% for travel and HR cost
Impact and Learning		• Innovation Fund grants were effective in increasing the supply of SWP to SHFs in Ethiopia • Enhanced income because of increase in production and better nutrition from the ability to grow garden vegetables for domestic use • Reduced cost for irrigation through avoiding cost of fuel • Reduction in GHG emission through the use of solar powered irrigation

2. Results-Based Financing (RBF) Facility

RBF provides financial incentives to private sector companies upon achieving pre-agreed results, such as the sale and utilisation of SWPs by SHFs. RBF was utilised to incentivise the scaling of solar-powered irrigation systems in Kenya and Uganda. The RBF facility was designed to reward measurable outcomes such as the number of systems installed, area of land irrigated, water savings achieved, and productivity gains for farmers. Payments are made after verification of results.

In the SEFFA project, six companies successfully implemented RBF contracts selling SWPs in two countries, leading to incentive payments totaling 241,200 EUR. One Kenyan company accounted for 86% and 70% of the incentive units and RBF incentive value, respectively.

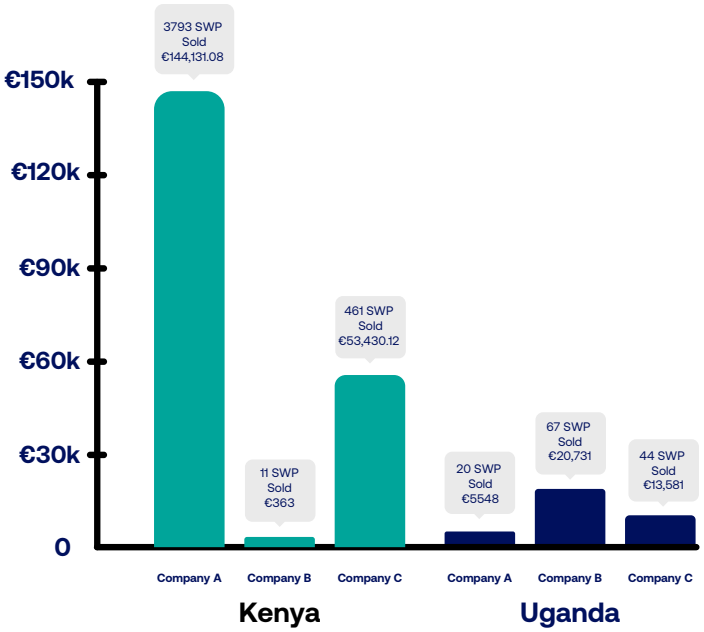
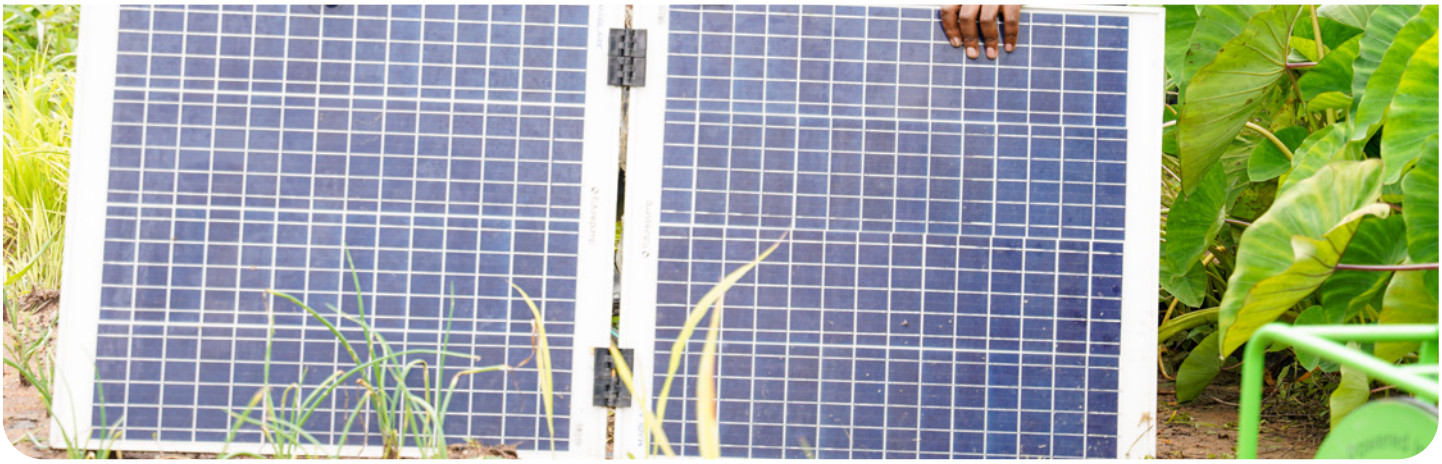


Figure 9: RBF Incentives and Solar Water Pumps Sold by Company in Kenya and Uganda

Furthermore, data from the Ugandan solar water pump suppliers shows interesting information on leads to sales for companies who are extending their operations into new areas of the country.

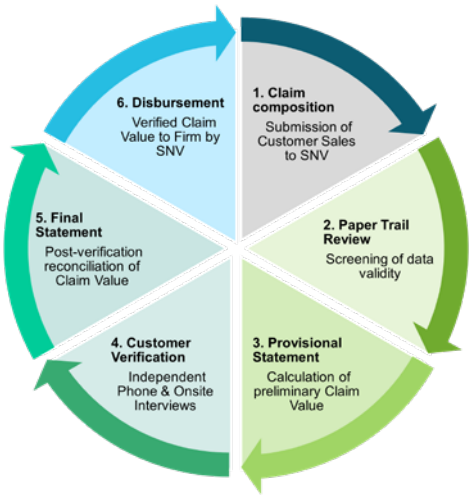
Company	Company A	Company B	Company C
Leads Generated	222	313	1014
Total Sales	--	67	52
Eligible (Verified) Sales	20	63	45

Figure 10: RBF Incentives and Solar Water Pumps Sold by Company in Kenya and Uganda



RBF Example: SunCulture's success in increasing access to SWPs in rural Kenya

RBF details	Total amount	144,131 EUR
	Disbursement Schedule (Tranches)	RBF funds were disbursed in 3 verification cycles. The verification window averaged 2 months before funds were disbursed.
	Disbursement Criteria	RBF funds were disbursed when the SWP sales data were verified by external agent. The verification checked that the sales were in use by SHFs.



What were the funds used for?	• Setting up demo kits in different customer trainings and agricultural shows where the products were showcased. • Technicians visited farmers to train them and install their water pumps as well as to address any issues with the products.
Impact and Learning	• Significant increase in the adoption of SWPs, with units rising from 390 in 2022 to 3793 verified sales of SWPs in the target areas by 2024 • Enhanced productivity and reduced costs for SHFs. • Challenges persisted, such as the need for more technical training and awareness of SWP technologies. • Installed water pumps are used to demonstrate value to other community members.

Demand Side Financing Instruments

3. Consumer Credit

Consumer credit involves providing loans or financing options to consumers (farmers) to purchase products, such as SWPs. This model often includes flexible repayment terms to match the income cycles of the consumers. The SEFFA project also provided training to financial intermediaries to help them create loan products for PUE technologies and thus impact the availability of consumer credit.

4. Fee for Service

This model involves charging users a fee for the service provided rather than selling the equipment outright and in so doing removes the burden of asset ownership from farmers. It is often used for services like water pumping or cooling where the infrastructure remains with the service provider. This model helps in reducing the upfront costs for farmers and ensures better maintenance and efficiency of the equipment.

5. Lease to Own (including PAYGO)

Access to end-user credit was indicated as the biggest barrier for technologies distributed by private sector partners selling on a cash basis.

Lease-to-own models allow farmers to use the equipment before they own it outright and regular repayments are made towards full ownership of the equipment. PAYGO technologies support lease-to-own models by allowing the equipment to be disabled remotely if the agreed repayments are not made in a timely manner.

Lease-to-own models are popular for costly farm equipment, as an example 71% of the SWP purchased by the SHFs were sold on credit through the PAYGO payment model by one partner. Credit provision for PUE by financial intermediaries is still very low where available. There is a need for solar companies (especially those still selling on a cash basis) to actively promote credit provision through the PAYGO models.

Financial Instrument	How was Financing Offered	What was the Impact
Solar Loans with Rwanyamahembe SACCO	SNV provided financial and technical support to the SACCO to develop a solar loan product for SHFs and their local businesses.	In eight months, the SACCO developed a solar loan product which enabled 113 SHFs to access PUE technologies for dairy cooling and processing. During this time, the SACCO partnered with Solar Today as a PUE technical service provider to offer good quality solar products with 2-3 years warranty, and conducted financial literacy trainings reaching 437 people.
Energy as a service by FRES	This model allowed clients to pay a connection fee and a fixed monthly energy access fee based on the size of the solar system. FRES Uganda retained ownership of the system, providing maintenance and replacements, while clients benefitted from a sustainable and affordable energy source.	The technical feasibility and initial customer demand for energy-as-a-service model for dairy cooling and processing has been verified. FRES Uganda Limited extended its services to 53 local businesses engaged in the retailing of dairy products. This initiative has not only resulted in the creation or enhancement of 80 employment opportunities but has also impacted 168 SHFs in the local communities.
Cooling as a Service (CaaS) by Growably	Provision of energy services in horticulture through a solar walk-in cold room (cooling as a service) implemented by Growably Agriventures is an example where farmers pay for the cooling service rather than buying the cooling equipment.	Pilot proved technical feasibility of solar cooling but there was little uptake from potential customers.
Supporting Pay-as-you-go to increase access to SWP in Ethiopia	Customers pay 50% of the costs of the pumps (about USD 800) as a downpayment upfront, which minimised the defaulting risk of the company and the remaining 50% will be paid monthly basis in 18 – 24 months' time.	This approach was successful, with 100% of SWPs sold on credit through the PAYGO model.

Key Takeaways

Project Design

- Project finance design need to take into account the cash flows of the farmers.
- Innovation fund required a lot of capacity building to make the product viable.

Overcoming Financial Barriers

- Demand side strategies are required to overcome financial barriers to PUE adoption and these should be tailored to seasonal incomes.

Overcoming Logistical Barriers

- RBF proved effective in promoting the availability of SWP in target areas.
- The high cost of imported technology remains a significant barrier to widespread PUE solutions' adoption. To address this challenge, efforts should be directed towards promoting the development and utilisation of locally available technologies.

Overcoming Farmers' Barriers

- Training of farmers on all equipment is vital, both technical and on business improvement for their farms.
- Targeted matchmaking and awareness campaigns at the community level proved highly effective in reaching SHFs and fostering the adoption of PUE technologies.

Overcoming Technology Specific Barriers

SWP

- Financial barriers remain a significant issue for SWP adoption, necessitating the promotion of flexible credit options like
- PAYGO (Pay-As-You-Go) models.

Drying

- Solar drying remains unaffordable for most individual SHFs. However, when adopted at the cooperative level or by agri-SMEs, they are more practical and financially viable.

Cooling

- Cold storage PUE technologies should be equipped with high-efficiency compressors to optimise energy consumption. This approach minimises the size and cost of the required solar energy system, making the overall installation more economical and efficient.

Overcoming Value Chain Specific Barriers

Horticulture

- Solar cooling in horticulture was not in demand for smaller market vendors and thaeir customers

Dairy

- The economic case for use of solar cooling to replace diesel generators in low electrified areas has been proven by SEFFA tech demos. Dairy businesses saw a 135% increase in monthly income due to better productivity and lower energy costs.

Several layers of barriers to the adoption of PUE technologies

Iconography

Financial Instruments

Result-Based Financing

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

Technologies

Irrigation

Cooling

Drying

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

The Energising Development (EnDev) programme is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ), the Netherlands Ministry of Foreign Affairs (DGIS), the Norwegian Ministry of Foreign Affairs and the Norwegian Agency for Development Cooperation (NORAD) and the Swiss Agency for Development and Cooperation (SDC). The programme is implemented in 20 countries across Africa and Asia in close cooperation with leading international organisations and key local stakeholders.

EnDev is jointly coordinated by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and Netherlands Enterprise Agency (RVO.nl) with strategic partnership is with the SNV being one of the most prominent partners. Learn more at www.endev.info

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