

Sunlit models to switch SHFs to solar-irrigated agriculture



Summary

In 2022, GIZ Uganda provided technical assistance to KAB Consult Ltd. under the SEFFA project in identifying and selecting farmer groups to demonstrate the effectiveness of solar irrigation and solar drying technologies and conducted baseline data collection to understand the status of irrigation and post-harvest handling among farmers in Nakaseke district, Central Uganda.

The baseline study highlighted key challenges for farmers in adopting SWPs. Challenges identified include the financial burden of irrigation expenses and the unreliable availability of water, compounded by expensive gasoline water pumps. To address these issues, KAB Consult introduced cost-effective and sustainable solar-powered water pumps, aiming to provide reliable water access for irrigation. The company collaborated with Tulima Solar, a supplier of SWPs, and implemented training programmes to enhance farmers' capacity and agricultural practices.

The availability of innovative financial models and performing activities to encourage the acceptance of solar technology among farming communities are crucial strategies in access to Productive Use of Energy (PUE) for agriculture – in this case, facilitating group purchase of SWPs made the technology more affordable. Linking SHFs with an offtake company for their product was also key to turning increased productivity into increased incomes; in this case, tomato SHFs were linked with tomato powder manufacturing and were provided with solar dryers to allow them to engage in pre-processing of their tomatoes.

Quick Facts



Uganda



Solar Water Pumps (SWP) and Solar Dryers for horticulture



EUR 22,500



KAB Consult Ltd, Ministry of Energy and Mineral Development



GIZ Uganda



Improve access to reliable irrigation methods and inadequate post-harvest handling techniques for horticulture for smallholder farmers.



- Successful trial of group ownership/ use of SWPs among lease holding smallholder farmers (SHF)
- Cost reduction in irrigation and reduction in water usage among participating farmers
- SHF trained in agronomy and irrigation practises



Innovation Fund



- Plot size: 0.4 – 0.8 HA (3 acre farms with 1.5 acres allocated to tomato)
- Water source: surface ponds
- Drying capacity: 200kg of fresh produce



Crops: Tomato, watermelon, aubergine, beans, cabbage



Problem statement

SHFs face important obstacles, for example limited access to reliable irrigation methods and inadequate post-harvest handling techniques for horticulture.

These challenges hinder their capacity to produce high-quality tomatoes and capitalise on value-added opportunities.



Assumptions

- The challenges are primarily due to a lack of appropriate technology solutions rather than other systemic or environmental factors.
- The introduction of solar-powered technologies would be met without significant resistance or scepticism.
- Small-scale farmers will experience a noticeable increase in productivity with solar irrigation.
- Establishing partnerships with private sector companies to provide and support the adoption of solar technologies for agriculture will result in sustainable business models.

Business Case Details

KAB Consult, collaborated with the SEFFA project to promote the adoption of solar technologies among SHFs and raise awareness about their benefits.

The reliance on expensive gasoline water pumps compounds financial issues for SHFs in the dry season and, furthermore, waste and spoilage from the lack of post-harvest processing are significant. To tackle these problems, KAB Consult aimed to promote the adoption of solar technologies among SHFs in Uganda. The target was to improve SHFs' capacity to produce tomatoes using solar irrigation and to leverage the potential of solar drying to produce dried tomatoes as pre-processed raw materials for tomato powder manufacturing by local firm Daniagro.

This project used a baseline assessment prior to starting activities to understand the challenges in SWP adoption. Such studies are important for future SWP projects, as is providing training on sustainable farming practices and fostering collaborations, especially between SHFs and commercial offtakers of their product.

By introducing SWPs as an alternative to gasoline pumps or as an improvement on manual irrigation, KAB Consult sought to trial their pump sharing approach with three farmer groups. The groups of farmers were selected from leaseholders who do not own the land they farm, and therefore do not have access to permanent water reservoirs and must rely on ponds. The pump sharing model was well received by the farmer groups who highlighted cost savings over diesel pumps and agronomy advice provided by the project as the main benefits, though some logistical challenges were noted based on the distance between farms.

”

Previously, we practiced poor tomato agronomy and were often cheated by agro-input suppliers because we did not know the right pesticides and their correct application for tomato production.

Chairman, Namusale farmer group

”

The unexpected challenges faced during the implementation of this project, such as capital limitations among the SHFs, the need for support beyond the project's original scope, pump theft, and crop diversity among target farmers, have prompted KAB Consult to adapt and seek new solutions. They have encouraged farmers to acquire water reservoirs to optimise the use of solar pumps and adhere to proper irrigation schedules.

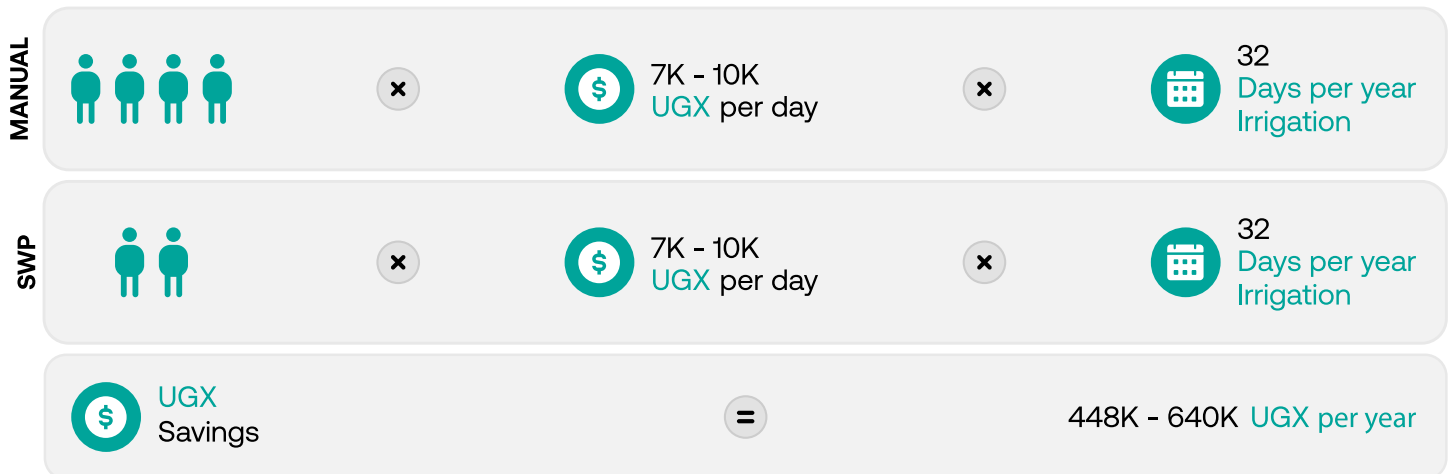
To activate demand for the solar-powered solutions, KAB Consult conducted awareness campaigns to educate farmers about the benefits of solar technologies and to encourage them to adopt these solutions. Additionally, KAB Consult connected farmer groups to premium export markets, providing opportunities and expanded market access for their agricultural produce. By facilitating the formation of farmer groups and mini cooperatives for high-value crops, KAB Consult fostered a collective approach to increasing demand and amplifying the impact of their initiatives.

For irrigation, the farmers typically allocate two days per week, and the tomato plants are irrigated for typically 1.5 to 2 months per season, totalling 3 to 4 months per year. This is an equivalent of 24 to 32 days of irrigation annually. SWPs provide a cost saving for farmers when compared to manual or diesel powered irrigation (see overleaf).

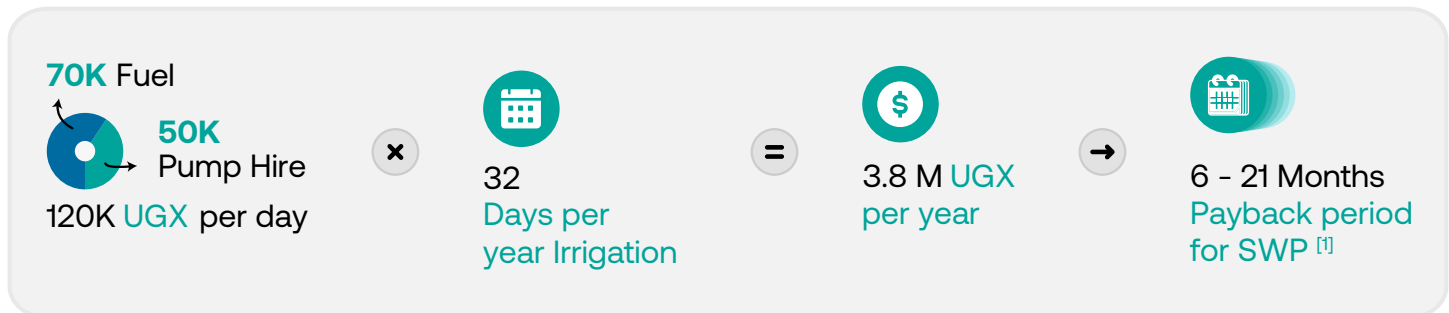


Cost savings in switching to SWP

Vs Manual Irrigation



Vs Diesel Powered Irrigation



Recognising the need for behaviour change among farmers, KAB Consult implemented robust capacity building programmes. They provided training on solar technology usage, agricultural best practices, and sustainable farming techniques. By empowering farmers with knowledge and skills, KAB Consult facilitated the adoption of new behaviours that improved productivity, profitability, and overall livelihoods.

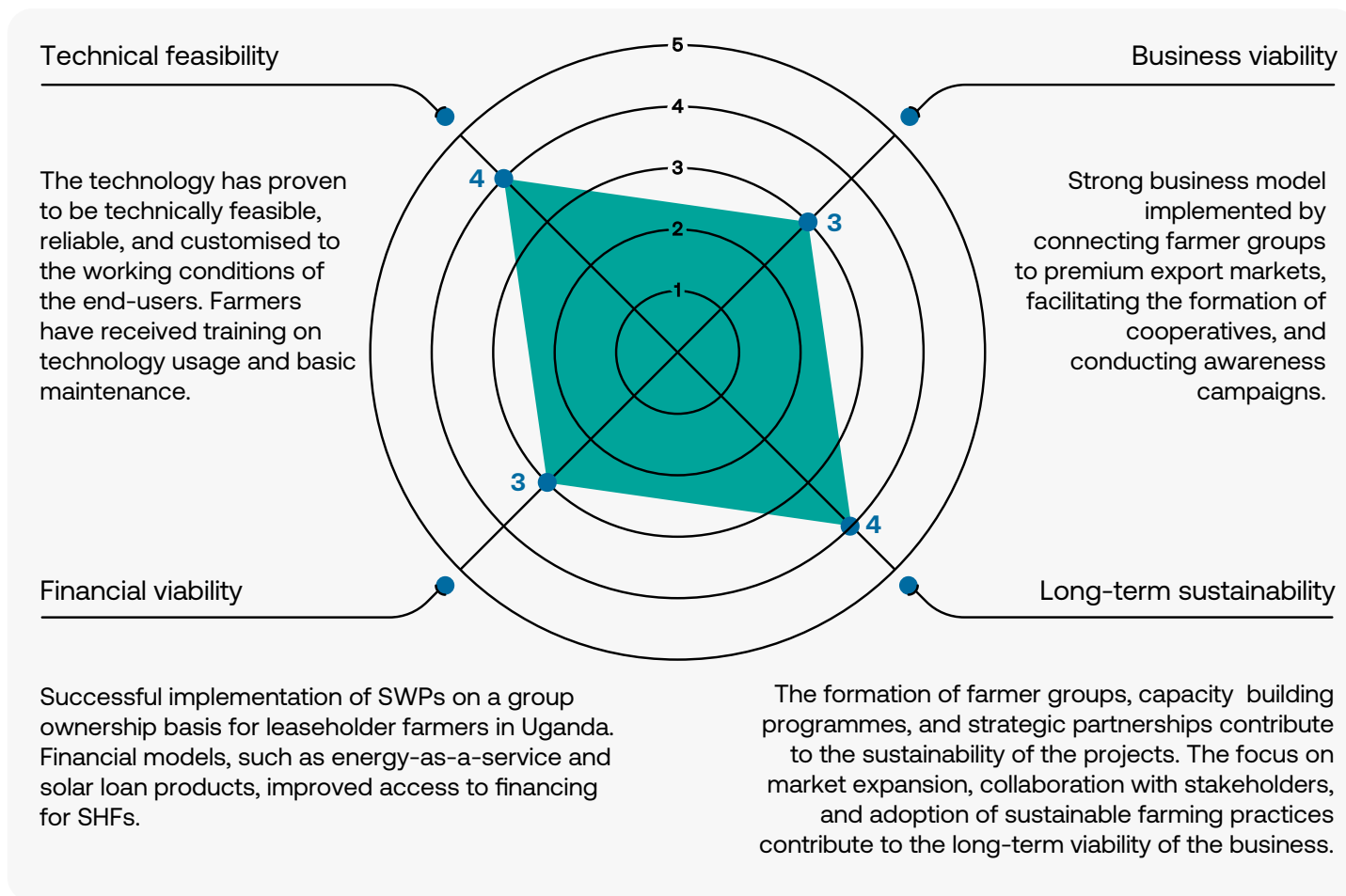
The next step of this project (2024 onwards) is to operationalise a 200kg dryer at the KAB premises as an aggregator for processing the tomato crop, to provide dried tomatoes to Daniagro processors thereby furthering solar solutions in the tomato value chain.



^[1] Depending on pump chosen, based on price range of 1.7M to 6.5M UGX for a surface pump



Business Case Attractiveness



Outcomes

- **Increased Access to Sustainable Energy:** KAB Consult introduced SWPs to address the high cost of irrigation and unreliable access to water during the dry season. SWPs helped farmers reduce operational costs for irrigation.
- **Strengthened Farmer Groups and Agricultural Cooperatives:** The formation of cooperatives and farmer groups helped SHFs access premium export markets for their agricultural produce. The project's partnership with a local middle-sized company has opened new market opportunities for both raw and dried tomatoes.
- **Improved Agricultural Best Practices:** KAB Consult conducted capacity building programmes that provided training on solar technology usage, agricultural best practices, and sustainable farming techniques. This allowed farmers to adopt new behaviours for sustainable agriculture and improved productivity.

Key Takeaways

Understanding the Context of SEFFA: Farmers' experience



Project Design

- The SWP group ownership model fosters collaboration where farmers exchange knowledge and improve their agricultural practices as well as the equipment.
- Baseline and market assessments are important to identify the specific needs and challenges of SHFs in the target areas along the full value chain.
- Training programmes should include agronomy, value addition, and market linkages to enhance the capacity of farmers.



Overcoming Financial Barriers

- Varied financial models such as energy-as-a-service and solar loan products in collaboration with financial and supply organisations assist the adoption of solar-powered technologies.
- Financial literacy training for farmers are useful, particularly when the goal is to sell to offtakers.



Overcoming Logistical Barriers

- Project funds to assist private companies to provide after-sale services and warranties are useful to build trust and confidence among farmers.



Overcoming Farmers' Barriers

- The sharing model works, but with limitations: While the SWP-sharing model is generally effective, it faces challenges such as the need for additional pumps to serve larger groups of farmers adequately.
- Provide comprehensive training to the farmers on the usage, maintenance, and troubleshooting of solar-powered technologies.
- Ensure the availability of quality and tested solar energy products to meet the demand of SHFs.



Overcoming Technology Specific Barriers

- Movable water storage solutions are necessary to optimise the usage of SWPs among farmers who lease land.
- Conduct regular maintenance and monitoring of solar systems to ensure their optimal performance.
- Battery storage is instrumental in situations where water storage is impractical: Incorporating battery storage into the solar pumps could significantly extend irrigation capabilities beyond daylight hours, addressing the limitations posed by cloudy weather or the setting sun.



Overcoming Value Chain Specific Barriers

- Farmers currently lack a coordinated marketing approach, making them susceptible to exploitation by middlemen. There is a significant opportunity to develop a cooperative marketing system to improve market access and profitability.

Several layers of barriers to the adoption of PUE technologies.

Technologies



Financial Barrier



Logistical Barrier



Farmer Internal Barrier



Farmers



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



Irrigation



Cooling



Drying

Other



Total
Budget



Farm
Size



Ethiopia



Kenya



Uganda

Technologies

Location



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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