



**Climate change is a threat multiplier for smallholder farmers, as it amplifies the threat of food insecurity. Smallholder farmers produce a large proportion of the available food but have the most limited capacity to adapt to become climate resilient. In line with the intergovernmental panel on climate change, we define climate resilience as the ability of a system to absorb, adapt, and transform its functioning and continue to produce results when exposed to current and future climate-related shocks, stresses, changes, and uncertainties.**

UNEP estimates annual adaptation financing needs for developing countries at US\$202 billion<sup>1</sup>. The private sector provides products and services that enable the adoption of climate adaptation strategies in a cost-efficient manner. These products and services – including irrigation infrastructure, improved crop varieties and grain storage facilities<sup>2</sup> – are particularly valuable for reaching smallholder farmers that are underserved by public services. However, businesses fostering smallholder inclusion struggle to access capital for growth due to perceived risks. Innovations Against Poverty (IAP) catalyses grant funding and non-financial support to such inclusive businesses integrating climate adaptation. These businesses enhance smallholders' resilience by providing adaptive products and services.

<sup>1</sup> UNEP (2022). Adaptation Gap Report 2022: Too Little, Too Slow – Climate adaptation failure puts world at risk. Nairobi, page 24. [\[link\]](#)

<sup>2</sup> Cacho, O.J., Moss, J., Thornton, P.K. et al. (2020) The value of climate-resilient seeds for smallholder adaptation in sub-Saharan Africa. *Climatic Change* 162, 1213–1229. [\[link\]](#)

<sup>3</sup> Li, S., Wang, Q., & Chun, J. A. (2017). Climate change impact on rice productivity in Indochinese Peninsula. *Int. J. Climatol.*, 37, 1147–1160. [UNEP \(2022\). Adaptation Gap Report 2022: Too Little, Too Slow. Nairobi, p. 24.](#)

## Solar-powered irrigation improves climate resilience of rice farmers

Rice is the staple crop in Cambodia. Without adaptation, the country faces net rice yield losses of an expected 10 to 15% by the 2040s<sup>3</sup>.

Rice agriculture's vulnerability in Cambodia originates from the prevalence of rain-fed systems, making it more susceptible to water shortage or excess.

Solar Green Energy (SOGE) Cambodia Ltd sells high quality solar products – on- and off-grid systems, hybrid systems, mini-grids, street lighting, and water pumps – and provides installation, maintenance, and repair services for customers. With IAP support, they expanded into solar-powered irrigation services for small-scale rice farmers, ensuring reliable water supply and enhancing resilience to droughts. Its reliability is grounded in a sun-tracked grid-connected solar hybrid system with low operation and maintenance costs, developed by skilled in-house technicians.

With support from IAP, SOGE piloted its water service model in Kampong Cham, serving more than 300 rice farmers. After successfully serving these early customers, SOGE secured a non-collateral loan from AMK, a local MFI, for expansion. To date they have expanded their operations to seven sites and are consistently working to secure additional financing to allow them to further scale their services across Cambodia. With its current footprint SOGE is supplying almost 800 farmers, the majority cultivating less than two hectares of land; this service model has led to an increase in rice yields of about 13%.

## Climate-resilient crop models

In Zambia, most smallholder farmers grow maize and rely on a guaranteed market through the government-run Food Reserve Agency. However, profit margins on maize cultivation are low. Climate change simulations predict a 15 to 20% decline in rainfed yield (2035-2066) .



While optimizing crop management can counteract some of the impacts, an attractive alternative for smallholders in Northern Province is growing Mbereshi beans.

Stewards Globe Limited (SGL) is a Zambian seed company producing regionally adapted seed varieties of cereals and legumes distributed under the Afriseed brand. In 2021, SGL partnered with IAP to pilot seed multiplication for Mbereshi beans where smallholders act as outgrowers. It also expanded its seed distribution network to rural farming communities. Increasing the consumption of Mbereshi beans enhances nutrition security, as they are rich in iron and zinc. Mbereshi bean is a short season crop, which allows for late planting and even replanting in case of a drought or delayed onset of rains. This overall drought tolerance improves farmers' climate resilience, enhances soil fertility through nitrogen fixation from the air (reducing the need for costly artificial fertilisers), and helps farmers diversify from maize monocropping to higher value nutritious crops. Overall farm incomes increase substantially<sup>5</sup>.

<sup>3</sup> Siatwiinda et al. (2021). Climatic Change, 167, 39.  
<https://doi.org/10.1007/s10584-021-03191-0>

<sup>5</sup> IAP (2023). Magical Mbereshi beans. <https://www.iap.com/mbereshi>



SGL's seed multiplication model required substantial working capital to bridge the income gap from investment until revenue generation, due to the seasonality of production. IAP's funding catalyst a EUR 1.7m loan from the Zambia National Commercial Bank (Zanaco) in 2022 for scaling. In addition, SGL is also applying to the Dutch Fund for Climate and Development to further access a concessional loan at a larger ticket size.

Mbereshi beans are popular due to their taste and quick cooking time. In Zambia, demand surged from 100 to 500 tonnes (2022 to 2023). With no possibility of mechanical harvesting, an out-grower scheme with smallholder farmers is vital. Between August 2021 and December 2022, 28 tonnes of parent seed (worth EUR 24k) were sold to farmers for multiplication. SGL bought back 170 tonnes (of harvested seed worth EUR 164k) from farmers for processing and packaging. After investments in field days, inspections and agronomic training, yields increased by 40%. To enhance the model, SGL is considering investments in mobile seed cleaning stations to cut transportation costs.

## Technology reduces post-harvest food loss

Ethiopia faces significant post-harvest food loss, particularly during storage. Shayashone's hermetic Purdue Improved Crop Storage (PICS) bags, combat storage loss from weevils, rodents and grain mould. These three-layered bags extend grain freshness and use threefold, uniquely combining storage and protection. In 2017, IAP partnered with Shayashone Trading Plc to pilot a youth resellers distribution model for the PICS bags to reach remote smallholder farmers.

Since the IAP partnership, Shayashone has sold more than 10 million bags, saving around 222 thousand tonnes of maize from storage loss. With a remarkable 45% annual sales growth (2017-2021), their strategy heavily relies on demand creation. The youth resellers model is a catalyst for market development and product knowledge transfer.



Shayashone recently secured a USD 500k investment from the Global Social Impact Fund and USD 1.2 million from the Development Bank of Ethiopia. Shayashone sustains last-mile distribution with customer promoters, keeping marketing costs low. IAP research shows 86% of customers promote the product, supporting the company's overall healthy profit margin. One farmer explained the value of the PICs bag: "It preserves agricultural products for a long period. I kept my products for more than one year without [them] being spoiled."

### Replicate and scale climate adaptation innovations

To address climate-induced food insecurity, new farming practices and adaptation technologies must reach global smallholders. Proven enterprise solutions exist, emphasizing the transformative potential of focusing on customers at the bottom of the economy pyramid. However, successful integration of smallholders in the value chain of a business requires vision, sustained investments, trial and error, and building relations of trust. Available follow-on financing is crucial for scaling proven business models.



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**-One farmer explained the value of the PICs bag**

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#### For Further Details

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