124 Boost sustainable food production through solar powered irrigation in multi-stakeholder partnerships

The Solution: A multi-stakeholder and integrated approach to promote wide-scale adoption of small-scale solar-powered irrigation systems (SPIS) by individual farmers or farmer organisations, such as women's agricultural groups. SPIS consist of a pump powered by photovoltaic panels that pumps (ground)water into a storage tank or directly to the field, where it feeds an irrigation system. The solution aims to improve farmers' access to water in order to secure more stable and increased crop production while adapting to the effects of climate change. SPIS is truly a 'nexus' solution that includes food and energy security as well as optimised use of natural resources and thus contributes to the goals of Action Track 3 as well as those of Action Track 1.

Source(s) of the Solution: This is proposed by the joint international initiative Water and Energy for Food (WE4F). In crafting this solution, WE4F capitalised on the lessons learned from its predecessor programme Powering Agriculture: An Energy Grand Challenge for Development and the Securing Water for Food Grand Challenge. Both programmes concluded that SPIS is a mature solution that could play an essential role in boosting food production in arid and semi-arid areas.

Problem addressed within food systems: In LMICs, 76.7% of the small-scale farms are located in water-scarce regions, while most of them rely on rain-fed agriculture[1]. These food systems are extremely vulnerable to climate change, increasing the risks of food insecurity and hunger. Furthermore, because of climate change and the growing pressure on water resources, smallholder farmers encounter more and more difficulties accessing water while conventional diesel pumps use a limited resource that emits GHG and an electricity grid is often unavailable or unreliable in rural areas in LMICs. Addressing these issues is essential for reducing hunger because agricultural production can only be sustained with access to water in sufficient quantity and quality. Access to water for smallholder farmers, especially women, who are often marginalised in terms of access to high-quality land, will allow a significant increase in productivity, crop quality. and diversification. Hence, making reliable, sustainable, and affordable irrigation technology available to smallholders contributes strongly to ensuring access to safe and nutritious food. According to a recent study, small-scale irrigation has the potential to lift more than 150 million people out of hunger and poverty at an investment cost of less than 30 USD per person[1].

How this solution will address that problem: We expect that an increased uptake of SPIS in LMICs will lead to three key impacts: *social impacts* like improved food and nutrition security; *economic impacts* such as increased productivity, additional income, and job creation; and *environmental impacts* like more sustainable water and energy use and reduced GHG emissions. Experience has indicated that the main barriers to farmers adopting irrigation innovations are knowledge of the technology, affordability (cost effectiveness, ability to pay etc.), availability (distribution network, market, etc.), and attraction (functional value, perceived quality). Therefore, encouraging adoption of SPIS needs a market-driven approach that takes account of the availability of high-quality technology; better access to information, markets, and finance; and improved technical and business capacities. Currently, WE4F Regional Innovation Hubs (in West and East Africa) work with the private sector to accelerate irrigation innovation and transform food value chains. The Hub model could be replicated in different regions in order to: 1) disseminate required information on SPIS through informational campaigns, south-south exchanges, experience sharing, etc.; 2) train and educate farmers, their organisations, and other value chain actors on new innovations; 3) collaborate with finance institutions to develop customised finance instruments and products for smallholder

[1] Laborde, D., Murphy, S., Parent, M., Porciello, J. & Smaller C., Ceres2030: Sustainable Solutions to End Hunger - Report, Cornell University, IFPRI and IISD, 2020.

farmers; and 4) provide SPIS suppliers with technical assistance (TA), investment facilitation, and business development support.

Regardless of the energy source, irrigation can pose environmental risks like groundwater depletion, overuse of surface water, and degradation of irrigated lands and the regional ecology. Therefore, it is of vital importance to manage surface water, groundwater, and irrigation systems in a sustainable fashion. In order to facilitate sustainable management and decision making, WE4F is developing an online SPIS Suitability Map in cooperation with the International Water Management Institute (IWMI) and WE4F is testing SPIS monitoring solutions together with the International Centre for Advanced Mediterranean Agronomic Studies in southern Italy.

Solution's alignment to the 'game changing and systemic solution' criteria:
Impact potential at scale: although only 6% of the agricultural land in Africa is irrigated, irrigated land produces 38% of the crop agricultural value. This indicates the possible impact of upscaling SPIS on the social, economic, and environmental fronts.
Actionability: SPIS has been an overarching subject ever since the beginning of WE4F precursor programmes Powering Agriculture and Securing Water for Food. Therefore, WE4F has a profound background and a very capable staff on this topic. Leading international institutions like FAO and IWMI were involved in the development of the SPIS knowledge and tools. With the institutional experience of the global initiative's partners, WE4F is well able to act and foster change with its solutions.
Sustainability: Irrigation empowers farmers to grow more and a wider variety of crops and grow crops with a higher market value (especially nutrient-dense fruits and vegetables), thereby increasing their income and risk-bearing capacity while making farming more attractive for future generations. Irrigation permits longer growing periods in area that currently rely on rain-fed production. With the right financing mechanisms in place, SPIS can be accessible for farmers. Payment plans can be fulfilled by approaches like "pay as you grow" while increased yield and income allow farmers to pay for repair and maintenance.

Existing evidence: Recent studies show that an integrated approach in the context of multistakeholder efforts is needed to sustainably modernise the food system in LMICs. Priority should be given to investing in water- and energy-efficient and climate-resilient food system solutions and supporting local, private sector-led development.[2] Irrigation in LMICs has the potential to increase crop yields by 100-400%[3]. The increasing number of suppliers of SPIS technology shows the demand for SPIS and thus the relevance of the solution.

Current/likely political support: This solution is promoted by WE4F, a joint international initiative of the German Federal Ministry for Economic Cooperation and Development (BMZ), the European Union (EU), the Ministry of Foreign Affairs of the Government of the Netherlands, Sweden through the Swedish International Development Cooperation Agency (Sida), and the U.S. Agency for International Development (USAID). FAO and IWMI expressed their interest to proactively support this idea and engage in associated events. Finally, the ECOWAS Centre for Renewable Energy and Energy Efficiency and WE4F are setting up a partnership to scale-up high-potential innovations in agribusiness.

Contexts where this is well/not well suited: The solution is particularly relevant for Africa, where the great dependence on rain-fed agriculture makes food systems extremely vulnerable to climate change and climate variability, increasing the risk of food insecurity and hunger.

[2] Braun et al. October 12, 2020. Ending Hunger by 2030 – policy actions and costs

[3] FAO (1996), World Food Summit – Food for all