

► ILO Brief

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Building pathways for green jobs and climate-smart agritech in Lebanon¹

Key points

- As climate change and water scarcity increasingly impact agricultural sustainability, [ILO Building Inclusive Markets and Decent Work for Syrian Refugees and Lebanese Host Communities \(BOUZOUR\)](#) project, funded by Swedish International Development Agency (Sida), is **fostering green jobs and promoting climate-resilient practices**.
- This update presents results from pilot interventions that improved farm productivity while reducing pressure on groundwater resources, based on findings from an [ILO study](#) on climate-smart and water-efficient agriculture in Lebanon (2025).² Climate-smart irrigation and fertigation systems **reduced water use by up to 50% while increasing yields up to 20%** and strengthening farm profitability with **returns on investment ranging between 14–22%** with cost recovery achieved within one to three cropping cycles. Automation improved occupational safety and working conditions, supporting decent green jobs in agriculture.
- The intervention **strengthened local agritech enterprises and embedded climate-smart solutions** within existing input and advisory networks. This expanded demand for installation, maintenance, and advisory services, supporting green job creation across the agricultural market system beyond the pilot farms.

1 This intervention and brief were carried out by Bahjat Loutfi with support from Luana Ayala

2 International Labour Organization (ILO) (2025). Climate-smart and water-efficient agriculture in Lebanon: enhancing productivity, sustainability, and decent work.





Installation of Smartland agri system. © ILO

Tackling water scarcity challenges through agritech solutions

As climate change and water scarcity increasingly affect agricultural sustainability, Lebanese farmers face rising irrigation costs, inefficient water use, and polluted water sources that threaten productivity. Many rely on groundwater pumping for irrigation, contributing to declining water tables and forcing farmers to drill deeper wells, further accelerating resource depletion. In response, the [ILO BOUZOUR](#) project, funded by the Swedish International Development Cooperation Agency (Sida), promoted climate-resilient and water-efficient agriculture practices. The intervention demonstrated how market-driven agritech solutions can simultaneously improve environmental sustainability, farm productivity, and decent employment outcomes. Pilot interventions focused on reducing groundwater use while strengthening the economic case for farmers to adopt climate-smart practices, offering a practical and commercially viable pathway toward long-term sustainability. To enable uptake beyond the pilot phase, the intervention worked with local agritech companies to expand service delivery, with cooperatives and agro-companies to host demonstration plots, and with agro-pharmacies to serve as permanent access points for technical advice and products. Through

these partnerships, the intervention focused on:

- Improving farmers' access to climate-smart agriculture systems by demonstrating their economic viability and supporting agritech providers in reaching underserved areas.
- Raising awareness among farmers of the productivity, cost-saving, and environmental benefits of data driven water and nutrient management through demonstration and peer learning.

The intervention was implemented across 15 farms in collaboration with six cooperatives and one agricultural company, covering horticultural crops such as leafy greens and vegetables grown in greenhouses and open fields, as well as fruit tree orchards. This crop mix allowed the model to be tested under diverse farming conditions. On each farm, plots were divided between traditional practices and climate-smart irrigation and fertigation technologies, enabling direct comparison under real production conditions. This comparative approach assessed key performance indicators, including water use, fertilizer consumption, labour efficiency, and productivity, generating practical evidence on both environmental and economic performance. The results provided farmers with clear, field-tested proof of the technology's feasibility, profitability, and suitability for wider adoption.

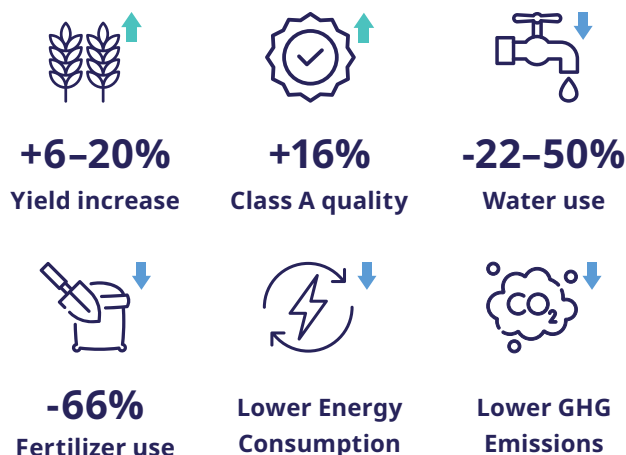


Consultant delivering training on the system. © ILO

Engaging Local Service Providers for Climate-Smart Solutions

The intervention was implemented in partnership with SmartLand Agri, a Lebanese agritech enterprise specialising in precision irrigation and fertigation systems tailored to farmers' needs. Through this collaboration, the project focused on making climate-smart irrigation solutions more reachable for farmers by supporting local providers in strengthening their outreach, demonstrating value under real farming conditions, and integrating their services within existing cooperative and agro-pharmacy networks. The systems integrate sensors, weather data, and machine-learning tools to optimise water and nutrient application, improving crop uptake while minimising waste and environmental impact. By reducing pumping hours and input losses, the technology enables farmers to maintain or improve productivity while lowering energy costs and protecting soil health. Beyond on-farm results, the intervention highlighted the commercial viability of climate-smart agritech services. Increasing uptake over the pilot period reflected growing farmer demand for practical, water-efficient solutions and strengthened the business case for local agritech providers, contributing to the expansion of green jobs in installation, maintenance, and advisory services.

Affordable investment, measurable results



Data from the 15 pilot farms confirm the strong environmental and economic performance of sensor-based irrigation and fertigation systems. **Yields increased by 6-20%**, while the share of **Class A produce rose by 16%**. **Water consumption declined by 22-40%, reaching up to 50%** in orchards, and fertilizer use dropped by up to two-thirds without yield loss. Reduced pumping hours and lower fertilizer application also contributed to lower energy use and greenhouse-gas emissions.

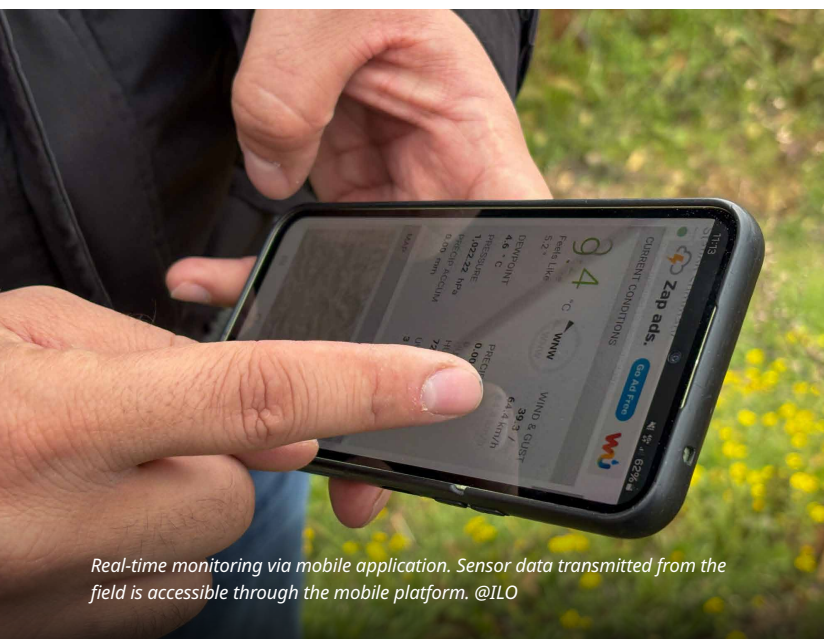
Beyond environmental gains, the pilots advanced the ILO's decent work objectives. Automation reduced direct contact with chemical fertilizers and exposure to heat during manual irrigation, improving occupational safety. Labour productivity improved as farmers and workers saved 18-25 working hours per production cycle, enabling better work planning, reduced physical strain, and more stable schedules. **Workers reported less fatigue and greater control over daily tasks**, reflecting the qualitative improvements accompanying technological modernisation.

From a financial perspective, returns on investment ranged between **14-22%**, with cost recovery achieved within one to three cropping cycles.

While the average system cost of approximately USD 600 per hectare represents a significant investment for smallholders, the short payback period and lower operating costs made adoption financially attractive. Encouraged by these results, most participating farmers expressed plans to expand their systems, while neighbouring farmers began requesting installations.



A shared milestone for the farmers, workers and trainers driving climate-smart irrigation forward. @ILO



Real-time monitoring via mobile application. Sensor data transmitted from the field is accessible through the mobile platform. @ILO



Peer-to-peer farmer learning. Tarek Daoud hosts neighbouring farmers visiting his greenhouse to observe the sensor-based system and discuss improved irrigation and crop management practices. © ILO

Farmers Leading Change

Peach grower Ahmad Attiyeh, who manages 1.2 hectares in West Bekaa, adopted sensor-based irrigation to optimise resource use. Soil tests showed that nutrient levels in the soil were already above recommended levels, enabling him to halve the amount of fertiliser applied to sensor-based plots. Yields remained unchanged compared to those not managed by sensors, while water use fell by around 13 per cent. This shift replaced intuition with data, enabling him to reduce inputs without affecting productivity.



The data showed me that I didn't need to apply too much fertiliser. I kept the same yields and used less water.

► **Ahmad Attiyeh**
Farmer, West Bekaa

In Akkar, the Jarrouj family piloted the system across six tunnel greenhouses. Water, fertilizer, and fuel use fell by over 40%, cutting operational costs by half, while yields increased by 8% and product quality improved. The system paid for itself in three seasons and significantly reduced repetitive irrigation work, freeing time for crop care and marketing.

These farms now serve as demonstration sites, enabling peer-to-peer learning as neighbouring farmers observe firsthand the differences between traditional and climate smart practices.



Before the system, we used to irrigate by guesswork. Now we know exactly what plants need, especially when rainfall is unpredictable.

► **Celine Jarrouj**
Farmer – Qobayat



: Agricultural worker operating a sensor-based irrigation and fertigation farming plot. © ILO

From pilot to systemic change

Building on the pilot's success, the project increased the availability of climate-smart irrigation solutions for farmers by integrating sensor-based systems into selected agro-pharmacies, trusted outlets where farmers regularly access inputs and technical advice. This strengthened access and created sustainable distribution channels for climate-smart irrigation services.

On the institutional side, evidence and results generated through the pilot were used to support the **training of over 100 Ministry of Agriculture extension officers**, helping embed climate-smart irrigation practices within

national advisory services. Through field trainings, cooperative-based sessions, and demonstration visits, **more than 200 farmers were reached**, generating strong demand for practical, data-driven approaches to water and nutrient management.

By embedding agritech solutions within existing farmer networks, retail systems, and public extension services, the intervention laid the groundwork for scaling beyond pilot farms. These results demonstrate that addressing Lebanon's water crisis requires inclusive and well-functioning markets, where local enterprises see a viable business case and farmers experience measurable gains that drive sustained adoption.



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