

► ILO Brief

March 2026

Boosting productivity and decent work through affordable greenhouse upgrades¹

Key points

- As smallholder farmers face increasing challenges from outdated infrastructure and limited resources, the ILO *Building Inclusive Markets and Decent Work for Syrian Refugees and Lebanese Host Communities* project ([BOUZOUR](#)), funded by the Swedish International Development Agency (Sida), worked with local welders and manufacturers to develop a more inclusive and affordable market for greenhouse upgrades that improve productivity and working conditions.
- The pilot enabled local workshops to upgrade or install low-cost, double-span greenhouses at 33–50 per cent lower cost than prevailing market solutions. This approach strengthens local manufacturing capacity, improves farm-level productivity, and creates safer, more stable jobs for mixed teams of Syrian and Lebanese workers.
- Following the pilot and associated market facilitation activities, farmers placed approximately 20 greenhouse upgrade orders within two months after direct project support ended, generating an estimated 216 short term job opportunities.
- Farmers adopting upgraded structures recorded a 20–35 per cent increase in usable planting area and estimated 20–30 per cent higher seasonal incomes. Worker interviews showed clear improvements in working conditions, with 100 per cent reporting better ventilation and over 90 per cent reporting reduced heat stress and easier movement inside upgraded greenhouses.

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



Traditional tunnel greenhouses prior to upgrade, highlighting baseline limitations in ventilation, space, and structural performance addressed by upgraded double-span models. © ILO



Hands-on and theoretical training sessions to strengthen technical manufacturing skills for greenhouse structures. © ILO

Shifting market behavior and expanding supply

In Lebanon, access to modern greenhouse infrastructure is limited by high costs and market concentration, leaving many small-scale farmers reliant on outdated single-tunnel structures with poor ventilation, low productivity, and unsafe working conditions. At the same time, local metal workshops often operate without a steady pipeline of work and lack the technical and commercial capacity needed to compete with dominant suppliers. The [ILO BOUZOUR](#) project greenhouse upgrade intervention was designed to address these gaps by enabling local manufacturers to deliver affordable, improved greenhouse solutions while strengthening productivity, climate resilience, and decent work outcomes in protected agriculture.

Compared to conventional greenhouse solutions offered by dominant suppliers, the upgrade model developed with local manufacturers can be delivered at approximately **33–50 per cent lower cost**, while maintaining comparable structural quality.

The project engaged local metal workshops and manufacturers to develop decentralized, lower-cost greenhouse supply options, improving access for farmers while creating employment in light manufacturing. On the supply side, manufacturers were supported to reposition greenhouse installation as a viable business line rather than occasional fabrication work. Through hands-on technical training, business coaching, and field exposure, manufacturers developed the capacity to market, price, and deliver greenhouse upgrades as a standardized service. In collaboration with the local partner SHiFT, ILO provided training on cost-efficient designs, ventilation systems, marketing, customer engagement, and business planning, strengthening product quality, service delivery, and manufacturers' ability to build longer-term client relationships.

The project also ensured that greenhouse upgrades integrate improvements in ventilation, workflow design, and safety, directly enhancing working conditions for agricultural labourers. Larger and better-ventilated structures reduce heat stress, improve air quality, and create safer pathways for workers, particularly Syrian refugees and women who perform most day-to-day tasks inside greenhouses.



Awareness-raising session with farmers, showcasing improved greenhouse models and safer, climate-responsive practices. © ILO

Raising awareness and unlocking demand

On the demand side, many farmers were unaware that improved, affordable greenhouse options existed. The project therefore organized awareness-raising workshops, demonstration days, and field visits in partnership with cooperatives and farmer groups. These sessions offered hands-on exposure to upgraded structures, peer testimonials, and clear pricing, helping farmers assess returns on investment.

Overall, more than 460 farmers and workers participated in awareness sessions, with wider online dissemination amplifying outreach. Peer learning proved particularly effective, with farmers hearing directly from other smallholders helping to overcome scepticism and accelerate adoption.

Voices from the field

The initiative has sparked excitement across the greenhouse supply chain, from metal workshops to the fields. Local installers and manufacturers are beginning to view greenhouse upgrades not as one-off construction jobs, but as a long-term business opportunity with real potential for growth and impact.

The project has not only strengthened the technical capacity of installers but also introduced them to a broader network and a new way of thinking about greenhouse construction, as a scalable service rather than just seasonal work.



We never saw greenhouse installations as a market. Through this initiative, we realized there's a real business model here.

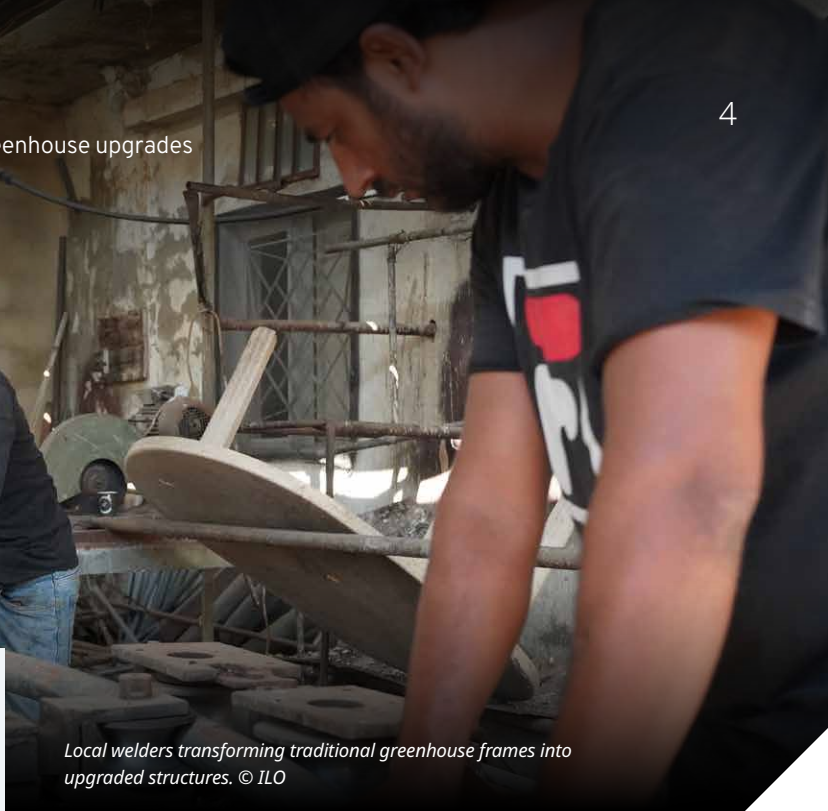
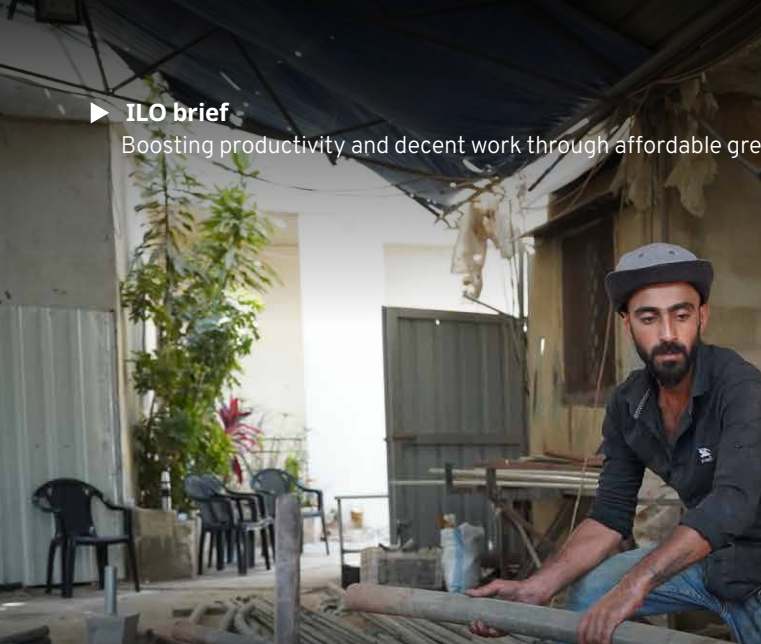
► **Ahmad Attiyeh**
Greenhouse Manufacturer - Akkar

This combination of technical training, business coaching, and exposure to real farm-level demand represents a first for many local manufacturers and is already shifting market behaviour. Farmers have shown strong interest, with awareness-raising sessions and demonstration visits also serving as a direct bridge between farmers and manufacturers, enabling immediate exchanges and requests for quotations for upgraded greenhouse solutions tailored to local working conditions and climate challenges.



This project gave us technical training, something we never received before as manufacturers.

► **Zeinab El Moussawi**
Greenhouse Manufacturer - Baalbek



Local welders transforming traditional greenhouse frames into upgraded structures. © ILO

Market uptake and service adoption

To support initial market uptake, participating manufacturers completed seven upgraded double-span demonstration units, which served as live showrooms for farmers and a marketing tool for workshops. These demonstration sites helped manufacturers build credibility and clearly communicate the benefits of the new designs.

Following the awareness activities, all participating manufacturers formally launched greenhouse upgrade services and initiated outreach to farmers. Within weeks, workshops reported a rise in quotation requests, reflecting a clear shift from expressed interest to active demand. As a result, local workshops are beginning to treat greenhouse upgrades as a recurring service line rather than one-off fabrication work.



Productivity gains within the upgraded structure. © ILO

Impact on productivity and working conditions

Baseline and endline assessments conducted with the seven participating farms showed clear and measurable improvements after shifting from single tunnels to double- or multi-span structures. Usable planting area increased by 20–35%, ventilation improved, and temperature regulation strengthened.

All seven farmers estimated a **20–30% rise** in seasonal income linked to the structural upgrade.

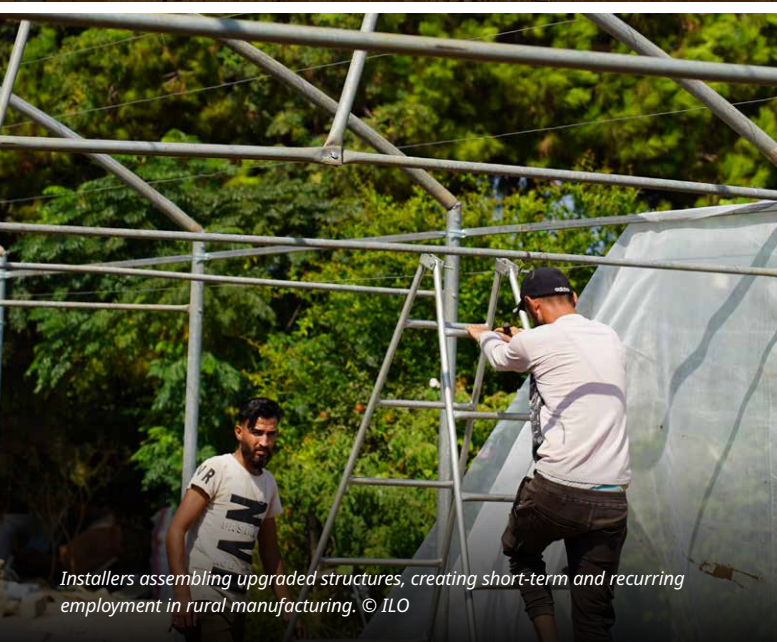
These gains are partly due to improved planting space, as double- and multi-span structures eliminate the non-productive gaps typical of stand-alone tunnels. Double- and multi-span structures remove these gaps, making more of the greenhouse footprint productive. These features are especially valuable this season, as farmers face higher temperatures and irregular water availability due to climate change. Larger, better-ventilated structures provide more stable conditions, making production more resilient despite extreme weather.

Interviews with 20 labourers working on the pilot intervention farms revealed significant improvements in daily working conditions. At baseline, over 80% reported poor ventilation, restricted movement inside narrow tunnels, and frequent health issues such as heat stress, allergies, and breathing difficulties.

Following the greenhouse upgrades, all workers (**100%**) **rated ventilation as “much better,”** and over 90% reported easier movement and reduced heat discomfort.



Transformation from traditional tunnel greenhouse to a newly upgraded double-span model by trained manufacturers, serving as a demonstration unit to guide farmers' decisions and build market demand. © ILO



Installers assembling upgraded structures, creating short-term and recurring employment in rural manufacturing. © ILO

Complaints related to breathing and allergies also declined, reflecting a noticeable improvement in comfort, workflow, and overall working conditions inside the upgraded structures.

The upgraded structures also reduced pest pressure through net-covered openings, which lowered pesticide use and limited workers' exposure to chemicals. Improved ventilation and climate control helped keep humidity down, reduce disease risk, increase irrigation efficiency, and decrease the need for inputs. Workers reported fewer lingering pesticide fumes after spraying, indicating better post-application air quality. These results show that structural upgrades provide a solid foundation for safer and more productive greenhouses. To fully ensure safe, decent, and resilient working conditions, however, they must be complemented by targeted occupational safety and health measures, particularly proper protective equipment and safe spraying practices.

Job creation and local employment dynamics

Following the completion of the pilot and awareness activities, farmer-driven demand for greenhouse upgrades translated into measurable short-term employment in rural manufacturing. Manufacturers reported receiving additional quotation requests shortly after completing initial orders and indicated that continued demand could allow them to retain skilled welders and installers more consistently.

This shift is reflected in post-pilot uptake: A total of 27 greenhouse upgrades were implemented, including 7 demonstration units supported directly by the project and 20 additional orders placed independently by farmers with participating manufacturers in the two months following the end of direct project support. Each upgrade required mixed teams of Syrian and Lebanese welders and installers, typically engaging around eight workers over one to three weeks for fabrication and installation, depending on workshop size and structural complexity.

On this basis, these orders resulted in an estimated **216 short-term** worker engagements, with Syrian workers accounting for around 70 per cent of total engagements.

Several manufacturers also reported the capacity to produce up to 50 upgraded units per year, suggesting potential for a shift from ad hoc fabrication toward more stable, recurring employment in rural light manufacturing.

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تعزيز الإنتاجية وظروف العمل في الزراعة المحمية

تطوير الزراعة المحمية باستخدام الصالات

إنتاجية أعلى و نوعية أفضل

فترة زراعة أطول

مبيدات أقل

استخدام مساحة أكبر من الأرض

Newly upgraded double-span greenhouse by trained manufacturers serving as a demonstration unit to guide farmers' decisions and build market demand. © ILO

Strengthening greenhouse markets, creating local jobs

The pilot has activated both sides of the greenhouse market system. On the supply side, a network of trained local manufacturers now produces standardized, improved greenhouse structures at comparable quality and at significantly lower cost than prevailing market prices, helping to increase competition in a market that previously had only a few suppliers. On the demand side, farmers are now actively requesting quotations and comparing models based on transparent pricing, clearer technical specifications, and demonstrated performance.

Strengthening the capacity of local manufacturers in multiple regions has expanded income opportunities, increases local employment for both Syrian and Lebanese workers, and improves access for small-scale farmers who were previously excluded by high upfront costs. Through a functioning manufacturer network and farmer-led demand, the pilot demonstrates that locally manufactured, affordable greenhouse upgrades can strengthen productivity, climate resilience, and working conditions in Lebanon's protected agriculture sector, while offering a replicable and scalable model for inclusive market growth.



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