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Market report on Needs Assessment Protected Crop in Ukraine

International opportunities for Dutch SMEs

Commissioned by the Netherlands Enterprise Agency (RVO)

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Summary

Summary of the needs of the Ukrainian protected cultivation sector

Ukraine's protected cultivation sector is operating in a high-risk, rapidly evolving environment shaped by wartime disruption, energy volatility, and constrained investment capacity. At the same time, the sector remains critical for domestic supply of fresh produce, income generation in rural areas, and recovery-oriented value chains. This study combines desk research, stakeholder mapping, interviews with Dutch and Ukrainian stakeholders, and two structured surveys (small greenhouse producers and industrial greenhouse complexes) to identify the market baseline, needs, barriers, and practical entry pathways for Dutch companies and programmes.

Labour and skills shortages are an increasing operational challenge. Survey feedback highlights a predominantly female workforce (up to 100%) across the surveyed greenhouse operations, with the average age of workers exceeding 45–50 years.

This demographic profile underscores the need for accessible training formats and human-centred mechanisation and automation that enhance ergonomics, safety, and ease of use.

Greenhouse operations also present opportunities to support veteran-led businesses and to serve as a form of therapeutic, rehabilitative employment.

In Ukrainian greenhouses, a lack of packaging equipment was evident: the survey showed that 100% of respondents relied on manual rather than automated packaging solutions. There is also a clear need for improvements in post-harvest handling and cold chain infrastructure to reduce losses and ensure greater consistency in product quality.

Financial and regulatory constraints further compound these challenges. Ongoing war-related uncertainty has led financial institutions to classify greenhouse production as a high-risk activity, resulting in limited access to affordable credit. While state grants and subsidised loan programmes offer partial relief, they reach only a small share of producers, leaving the majority without access to long-term financing for modernisation or expansion.

Despite the ongoing full-scale invasion, most surveyed greenhouse operations continue to plan for development and investment. Only 18% of respondents—representing just 5% of the total greenhouse area—reported having no current development or investment plans.

Logistical and trade disruptions further weaken competitiveness. Greenhouse products are highly perishable and depend on temperature-controlled logistics, yet air attacks, port blockades, border delays, fuel shortages, and elevated transport costs have made both domestic distribution and export activities costly and unreliable. These constraints have reduced Ukraine's presence in international markets and increased dependence on fragmented domestic sales channels.

Climate change and extreme weather events add an additional layer of systemic risk. Although greenhouses provide partial protection from external climatic conditions, operations remain dependent on stable energy supply, water availability, and functioning infrastructure. Increasing temperature volatility, droughts, floods, and extreme weather events already cause unpredictable production disruptions, water shortages, and infrastructure damage, reinforcing the case for climate-resilient design, energy-efficient systems, and low-emission technologies.

Taken together, these factors define a sector in which short-term survival, incremental upgrading, and risk-mitigating investment models are more realistic than rapid, capital-intensive transformation. Applying a Build Back Better approach—anchored in renewable energy adoption (solar and geothermal), efficiency

improvements, and integrated system design—offers a pathway not only to restore lost production capacity, but to rebuild Ukraine’s protected cultivation sector as a more resilient, competitive, and future-oriented component of the national agri-food system.

A central finding is that protected cultivation in Ukraine functions as a two-speed market. Industrial greenhouse complexes (around 250-270 ha) are predominantly high-technology operations, often using soilless/hydroponic systems, with higher energy dependence and stronger requirements for integrated solutions, commissioning, and service guarantees. Small producers operate mainly low- and mid-technology greenhouses (around 4-7 000 ha), are more dispersed and seasonal, and are highly sensitive to affordability and access to practical support. A significant share of the smallholder segment consists of new greenhouses established with grant support, forming a “future-facing” group likely to upgrade automation over time if credible pathways, training, and service ecosystems are in place.

Survey evidence points to an acute need for bundled support rather than stand-alone equipment delivery.

Across both segments, priority needs cluster around:

- energy efficiency and resilience (particularly for high-tech complexes),
- water reliability and fertigation discipline,
- post-harvest handling and cold chain improvements to reduce losses and improve quality consistency,
- skills, advisory services, and commissioning to convert investments into measurable performance. Labour and skills constraints are a growing operational issue, and survey feedback indicates a predominantly female workforce in greenhouse operations in the surveyed cases; this underscores the value of accessible training formats and human-centred mechanisation/automation that improves ergonomics, safety, and usability.

Market entry barriers are significant but manageable with the right delivery model. Key constraints include security and logistics risk, financing gaps, energy price uncertainty, limited local service and spare parts capacity, and the complexity of implementing advanced systems without structured follow-up. These factors make local partnering, commissioning, and after-sales support decisive competitive elements. For smallholders, the most scalable approach is a dealer/distributor model with standardized starter packages delivered alongside short-cycle training and SOPs. For industrial complexes, effective entry is based on direct B2B engagement supported by local service partners, defined SLAs, and performance-oriented optimization.

The sector currently operates in a largely self-sustaining mode. Although there are registered associations that include greenhouse producers among their members, there is no active, consistent and effective lobby in the sector that supports market development, coordinates collective actions and represent (industrial) protected cultivation producers in the regular dialogue with the Ukrainian government or in cooperation with international partners.

International donor support remains an important enabler for recovery and adoption. Donor-funded initiatives can reduce affordability barriers and de-risk first deployments when solutions are offered as integrated bundles (technology + installation/commissioning + training/advisory + monitoring). Organic production should be framed realistically: EU-aligned organic rules typically require soil-based production and therefore represent a selective niche for protected cultivation, more feasible for smaller operators. For wider impact across the greenhouse sector, the most scalable pathway is low-input, IPM-first upgrading (biocontrol, monitoring routines, compliance-ready documentation) that improves resilience and market readiness without requiring full organic conversion, especially for hydroponic high-tech operations.

Based on these findings, Dutch engagement has a clear opportunity to contribute through performance-led upgrading and ecosystem building. Priority pathways include:

1. scalable packages for low-/mid-tech producers (water-smart production modules, basic climate upgrades, post-harvest starter sets) delivered through local channels.
2. efficiency and integration upgrades for high-tech complexes (energy optimisation, climate–fertigation coordination, post-harvest workflow improvements) delivered with commissioning and service contracts;
3. demonstration and training hubs that validate solutions under Ukrainian conditions and build local technician and advisory capacity. Taken together, these approaches can deliver near-term recovery gains

while laying the foundation for sustained modernisation of Ukraine's greenhouse industry and a stronger platform for Dutch–Ukrainian cooperation in the sector.

4. sharing Dutch knowledge and experience in organising greenhouse producers and stakeholders into cooperatives or structured networks, strengthening collective action, market representation, and dialogue with government and international partners.

Ukraine's vision for protected cultivation is driven by food security, post-war recovery, and long-term EU integration. While a dedicated greenhouse strategy is still emerging, government policy consistently supports protected cultivation as a way to ensure year-round vegetable supply, reduce import dependence, and increase resilience to climate and external shocks. Current support focuses on rapid deployment of low- and entry-level mid-tech greenhouses, prioritising affordability, speed, and broad participation under current economic and energy constraints.

The longer-term vision is one of incremental modernisation rather than rapid transformation. Government and sector stakeholders recognise the need to gradually upgrade greenhouse systems in areas such as energy efficiency, climate control, input management, and professional operations, increasingly influenced by EU standards and sustainability principles. Producers and local suppliers view current grant-funded projects as stepping stones toward more advanced, efficient, and market-oriented production models.

To support this transition, the report proposes establishing an innovation-driven protected cultivation cluster. This cluster would bridge the gap between baseline expansion and performance-led upgrading by providing demonstration and training hubs, applied advisory and commissioning services, an innovation pipeline for validated solutions, and finance-ready investment packages. The model would serve both smallholders and larger greenhouse complexes through differentiated services, implemented in phased stages from pilots to national scaling.

The Netherlands is well positioned to contribute by focusing on upgrading, system integration, and knowledge transfer rather than basic construction. In the short term, Dutch technologies and expertise can improve performance in existing greenhouses through modular upgrades, energy and water efficiency, monitoring, and training. In the medium term, Dutch engagement becomes increasingly relevant in supporting compliance with evolving EU standards related to sustainability, chemical use, traceability, and resource efficiency. Demonstration-based delivery models and local capacity building are key to maximising impact.

Organic production should be positioned realistically within a broader agenda of climate resilience and resource efficiency. The future vision should distinguish between organic, soil-based protected cultivation—more suitable for smallholders and niche markets—and high-tech, hydroponic greenhouse systems for industrial producers. Demonstration and advisory services can play a central role in validating viable organic protocols as well as efficiency and IPM improvements in high-tech systems, ensuring both tracks contribute to a resilient and modern protected cultivation sector.

To work effectively under current Ukrainian conditions, capacity-building efforts should rely on practical, repeatable, and scalable delivery methods:

- Train-the-trainer approaches: develop a strong local base of consultants and technicians who can roll out training widely. This should include upgrading the skills of university lecturers and vocational instructors in modern greenhouse systems and production practices.
- Strengthening universities: help higher education institutions embed contemporary greenhouse technologies into their curricula, expand hands-on training infrastructure (such as laboratories, demonstration greenhouses, and digital learning tools), and produce industry-relevant programmes and teaching materials.
- Producer association development: support the creation or reinforcement of national or regional greenhouse producers' associations that can function as hubs for knowledge sharing, coordinated training, best-practice dissemination, sector representation, and collaboration among growers, academia, technology suppliers, and public authorities.

- Investment-linked advisory support: provide targeted commissioning assistance followed by short, structured advisory periods (typically 3–6 months), particularly for systems involving automation, climate management, and fertigation.
- Field-oriented SOP toolkits: develop practical operating packages—such as checklists, seasonal production plans, and problem-solving guides—adapted to both low-tech and mid/high-tech greenhouse operations.
- Blended support models: combine remote monitoring and online consulting with scheduled on-site visits to allow efficient, cost-effective scaling of advisory services.

Why demonstration greenhouses are critical for sector progress

Well-conceived demonstration greenhouses can play a catalytic role in advancing the protected cultivation sector by:

- Lowering adoption risk: growers and investors can directly observe how technologies and practices perform under real Ukrainian conditions, including energy limitations, input availability, and labour constraints.
- Accelerating learning: hands-on trials, combined with clear operating procedures, allow producers to replace costly experimentation with validated production routines.
- Strengthening service networks: demonstration sites can function as practical training hubs for installers, technicians, and advisors, which is essential for scaling solutions beyond isolated pilot projects.
- Providing reliable benchmarks: systematically collected data on yields, energy consumption, water use, and product quality creates credible evidence for financial institutions, donors, and policymakers.

Priority focus areas for demonstration initiatives

To remain effective and relevant, demonstration projects should concentrate on a limited set of high-impact themes aligned with the sector's most pressing needs:

A) Small-scale and low-tech greenhouse producers

- Season extension and basic resilience solutions: simple heating options, energy back-up measures, and improved water security.
- Efficient water use: robust irrigation systems, basic fertigation practices, and labour-efficient operating routines.
- Foundational post-harvest handling: cost-effective cold storage, packing, and handling practices that minimise losses.
- Low-input transition practices: introductory IPM and biocontrol approaches that reduce chemical use while maintaining acceptable yields.

B) Industrial and mid-high tech greenhouse operations

- Energy optimisation and efficiency: retrofitting, performance monitoring, system fine-tuning, and targeted operational coaching.
- Integrated system management: coordination of climate, irrigation, and lighting systems supported by structured commissioning protocols.
- Post-harvest performance improvements: workflow optimisation, stepwise mechanisation, and improved consistency of product quality.
- Nursery and biosecurity management: protocols for crop uniformity, hygiene, traceability, and diversification through applied trials.

Together, these measures provide a realistic, Build Back Better pathway for restoring and modernising Ukraine's protected cultivation sector—one that combines resilience, sustainability, and competitiveness while laying a strong foundation for long-term Dutch-Ukrainian cooperation.

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1 Introduction

Protected cultivation plays an important role in rebuilding Ukraine's agricultural sector, which has suffered severe disruptions due to the war, because it underpins domestic fresh produce supply, supports rural economic stability, and accelerates the restoration of agri-food value chains. Large areas of open-field vegetable production have been damaged or become inaccessible, supply chains have been broken, and storage and processing facilities have been destroyed. The situation is further aggravated by growing water challenges: pollution from military activity, disruption of irrigation systems, and the catastrophic consequences of the Kakhovka dam destruction, which caused long-term water shortages and contamination in several regions. In some areas, open-field cultivation may no longer be viable due to depleted water resources and soil degradation.

In this context, greenhouses provide a reliable way to restore production quickly, regardless of season, climate fluctuations, or regional security conditions. They also allow for controlled and efficient use of water—an increasingly critical factor for Ukraine's food system under current pressure.

Modern protected cultivation optimizes land, water, and energy use, helping ensure stable supplies of fresh vegetables for local markets, strengthening food security, and reducing dependence on imports at a time when logistics remain unpredictable.

Dutch greenhouse technology will play crucial role in Ukrainian sector rebuilding as the sector requires more than simply replacing damaged facilities. Growers need updated technologies, automation, skilled personnel, starting materials such as seeds and young plants, and accessible financial instruments to restart production.

It enables the country to rebuild in a more resilient, resource-efficient way and to align its agricultural development with European standards and future market demands.

1.1 Purpose and objectives of the study

Ukraine and the Netherlands have a long-standing cooperation in the agri-food sector, with a particular focus on horticulture, innovation, and knowledge transfer. The Netherlands is globally recognised as a leader in protected cultivation technologies, seed development, greenhouse construction, and integrated value chain solutions. Ukrainian–Dutch cooperation has historically included trade in agricultural inputs, technical assistance projects, capacity-building programmes, and public–private partnerships supported by the Dutch government, RVO, and the Embassy of the Kingdom of the Netherlands in Ukraine.

In recent years, this cooperation has increasingly shifted from pure trade relations towards development-oriented and resilience-focused engagement, including support for modernisation, sustainability, and institutional strengthening. Against the backdrop of Ukraine's EU integration trajectory and post-war recovery agenda, protected cultivation has emerged as a natural area for deepening cooperation, combining Dutch technological expertise with Ukraine's agricultural potential and market demand.

This study focuses on identifying where Ukrainian demand aligns with Dutch capabilities, ensuring that future cooperation delivers practical value for Ukraine while creating mutually beneficial opportunities for the Netherlands.

The study seeks to pinpoint where cooperation between the Netherlands and Ukraine can be most effective in the field of protected cultivation. To do this, it carries out a broad market exploration focused on Ukraine's horticultural recovery and future development. It identifies business opportunities that match Dutch

strengths—from greenhouse technologies across all tech levels to supply chain improvements, starting materials, and training or knowledge-transfer initiatives.

The research also reviews the regulatory environment governing greenhouse development in Ukraine, including construction permits, operational requirements, customs rules, import procedures, and incentives or constraints that may influence foreign participation.

Additionally, the study will assess the impact of the ongoing war on the sector and identify areas where Dutch expertise and technology can contribute to rebuilding. The goal is to support the development of a resilient greenhouse sector based on the principles of “Build Back Better.”

A detailed needs assessment is conducted among Ukrainian stakeholders to understand their priorities in technology, education, storage infrastructure, and access to seeds and planting materials. Alongside this, the study maps relevant public and private actors—government bodies, research institutions, associations, companies, and NGOs—to identify where partnerships, joint ventures, or pilot projects could be developed.

Potential challenges are examined as well, including war-related risks, financing obstacles, supply chain vulnerabilities, and logistical limitations. The study proposes strategies to reduce these risks and support informed decision-making.

Finally, the research aims to encourage dialogue with Ukrainian authorities to shape a shared vision for the sector and formulates concrete recommendations for Dutch organizations. These include guidance on market entry, collaboration models, and steps for building a coordinated ecosystem to support the sustainable growth of protected cultivation in Ukraine.

1.2 Methodology

Our research combined multiple methods to provide a comprehensive picture of Ukraine’s protected cultivation sector. We conducted extensive desk research and carried out interviews with greenhouse producers across all technology levels—high-, mid-, and low-tech—and of varying sizes, from small farms to large commercial operations. These interviews covered different regions of Ukraine, each experiencing distinct levels of impact from the war. The study also included producers growing a wide range of crops, including vegetables, flowers, leafy greens, and berries.

In addition, the analysis draws on data from two structured survey samples conducted in 2025: small greenhouse producers (n=50) and industrial greenhouse complexes (n=11).

Overall, the methodology consisted of:

- desk research including permits, custom procedure, laws, grants and subsidy programs etc.
- price analysis of cultivated crops
- stakeholder mapping
- stakeholder interviews:
 - greenhouse owners and greenhouse employees (agronomist, engineers)
 - suppliers of greenhouse equipment (greenhouse builders, seeds companies, young plant suppliers etc.)
 - associations related to greenhouse industry
 - educational institutions and training centres
 - others.

1.3 Research limitation

The findings of this study should be viewed considering several limitations.

First, the ongoing war created constraints on data availability and access. In some regions, up-to-date statistics, production figures, and infrastructure assessments are incomplete, inconsistent, or not publicly reported. This reduces the ability to compare regions with high accuracy.

Second, field visits were not possible in all areas due to security risks. As a result, some insights rely on interviews rather than on-site observation, which may introduce subjective perspectives from respondents.

Third, the greenhouse sector in Ukraine is highly diverse—technologically, geographically, and by crop specialization. While the study includes interviews with a broad range of producers (low-, mid-, and high-tech; small and large; different crops and regions), it cannot capture the full variation within the sector.

Fourth, economic conditions in Ukraine are rapidly changing due to the war, fluctuations in energy prices, and shifting logistics. This means that cost estimates, market opportunities, and investment conditions may evolve quickly, potentially making some findings time sensitive.

Fifth, access to financial data from private companies was limited. Some respondents were reluctant to share information on profitability, production volumes, or losses, which restricts the depth of quantitative analysis.

Lastly, although stakeholder mapping is comprehensive, it may not include newly created organizations, emerging initiatives, or informal market actors who play a role in sector recovery.

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