PROGRESS

Promoting Green Deal Readiness in the Eastern Partnership Countries

On behalf of:

Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety

of the Federal Republic of Germany

IKI INTERNATIONAL CLIMATE INITIATIVE

HIGH-TUNNEL BLUEBERRY PRODUCTION USING SOILLESS GROWING SYSTEMS

EUROPEAN BUSINESS ASSOCIATION EBA MOLDOVA ASOCIAȚIA BUSINESSULUI EUROPEAN

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High tunnel production combined with soilless technologies offers blueberry growers a proven pathway to higher yields, extended harvest seasons, and premium market access.

This approach integrates modern input solutions, such as locally supplied tunnels, coco coir or peat substrates, precision fertigation, and cold chain logistics, with full value chain considerations from input supply to waste recycling.

Picture 1. High-Tunnel Blueberry Production Using Soilless Growing Systems, Agrodome (n.d.)

By adopting these systems, producers can meet EU quality and sustainability standards under the European Green Deal, reduce chemical use, optimize water efficiency, and respond to rising consumer demand for early, high-quality blueberries.

Scalable and adaptable to local conditions, this model is supported by Government of Georgia's (GoG) co-financing subsidy program - Preferential Agro Credit, making it a viable and competitive investment for forward-thinking farmers, cooperatives, and agribusinesses ready to upgrade their operations and secure stronger export positions.

High-tunnel blueberry production using soilless growing systems

High-tunnel blueberry production is a form of protected cultivation where crops are grown under semi-permanent polyethylene-covered structures without active heating. These tunnels create a warmer, more controlled microclimate than open fields, enabling earlier planting, extended harvest seasons, and protection from rain, wind, and pests.

Difference from Greenhouses

High tunnels are usually not heated, rely on passive solar energy, and have simpler ventilation (side-roll or end-wall openings). They are less expensive to build and maintain and are mainly used for season extension rather than year-round production.

Greenhouses are fully enclosed, often with climate-control system (e.g., heating, cooling), and designed for precise year-round production. However, it requires significantly higher investment and operational costs.

Soilless Technologies in Blueberries

Soilless technologies in blueberries refer to cultivation methods where plants are grown in inert or organic substrates instead of natural soil, allowing precise control over root-zone conditions.

Common substrates include peat, coco coir, and perlite mixes, often placed in Container System in Pots, Grow Bags, or trough / elevated systems. These setups are paired with drip fertigation systems that deliver water and nutrients directly to the roots in measured amounts, ensuring optimal growth and fruit quality.

Soilless systems make it easier to maintain the acidic pH blueberries require (typically 4.5–5.5), improve drainage and aeration, reduce soil-borne diseases, and enable production in areas with unsuitable local natural soils.

In Georgia, blueberry cultivation is relatively new and has traditionally been conducted in open fields.

However, soilless technologies are emerging as an important innovation.

Legro Blueberry Substrate

Alongside other available options, one notable example is the Legro blueberry substrate, developed in the Netherlands, is specifically engineered for optimal blueberry production in soilless systems. With its ideal acidic pH of 4.5–5.5, it ensures maximum nutrient uptake, while excellent drainage and aeration promote healthy, vigorous root growth. This technology shows strong potential for wider adoption among blueberry growers and agricultural investors in the country.

Made from premium, sustainable raw materials, the substrate maintains long-term structural stability, supporting productive plants for 6–8 years without shrinkage or compaction. Growers benefit from higher yields, healthier and more disease-resistant plants, stronger root systems, and reduced replacement costs. This makes Legro the smart choice for maximizing both harvest quality and profitability.

Combining high tunnel production with soilless technologies gives blueberry growers precise control over the root environment while also protecting plants from weather extremes, enabling earlier harvests and extended seasons. This leads to improved fruit size, flavor, and consistency, while reducing risks from soil-borne diseases and excessive rainfall.

In EaP countries such as Armenia, Georgia, and Ukraine, season extension is becoming a critical competitive advantage, allowing producers to enter export markets earlier, capture higher prices, and meet the strict quality demands of EU buyers. The system includes the integration of soilless technologies and high tunnel production to optimize blueberry cultivation. Specifically, it involves:

High-tunnel structures

Semi-permanent, low-cost polyethylene-covered tunnels that create a controlled microclimate, protecting plants from adverse weather, extending the growing season, and reducing disease pressure.

Soilles growing media

Use of substrates such as peat, coco coir, or perlite mixes instead of natural soil, providing better control of root-zone conditions, improved drainage, and prevention of soil-borne diseases.

Cultivation techniques

Blueberry cultivation under protected conditions relies on several key practices: drip irrigation combined with fertigation systems ensures the precise delivery of water and nutrients directly to the plant roots, maximizing resource efficiency while maintaining optimal moisture and nutrient balance. Environmental controls, such as passive ventilation through side-roll or end-wall openings, the use of shading nets, and temperature regulation within tunnels, help maintain ideal growing conditions throughout the season.

Equally important is careful pH and nutrient management, where growers monitor and adjust the substrate to remain within the optimal range of 4.5–5.5, while fine-tuning nutrient concentrations to support vigorous growth and high fruit quality. Together, these measures form the foundation of sustainable and productive blueberry production.

Together, these components form a system that enhances blueberry production by improving yield, fruit quality, resource efficiency, and adaptability to varying climatic conditions.

Useful information on funding opportunities for farmers

The Loan Annual Interest Rate Subsidy Preferential Agri Credit Program, implemented by the NNLE "Rural Development Agency", provides financial support to farmers modernizing their production through high tunnel cultivation and soilless blueberry farming.

The program subsidizes commercial loans over several years with a fixed annual interest rate, as a rule covering the dominant part of the annual commercial interest rate of the agro loan, specifically targeting the establishment of high tunnel structures and soilless systems using substrate container systems, thereby reducing upfront investment costs.

Complementing this, the Enterprise Georgia Agency integrates its Credit Guarantee Scheme to the program, offering farmers collateral coverage of the part of the loan, which lowers lending risks and encourages adoption. Together, these mechanisms enhance access to affordable credit, enabling growers to implement climate-smart technologies that boost yields, extend harvest seasons, and meet export-quality standards, thus strengthening Georgia's competitiveness at regional and international berry markets.

Additional information

Additional information can be obtained by visiting the links: Green Solution on Substrate and Blueberry Bags in High Tunnel

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Agrodome, "Maximizing Blueberry Farming with High Tunnels: A Comprehensive Guide" article (photo), accessed15 February, 2026.
Niadagi. *Blueberry farms.* Facebook, 2025.

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TECHNOLOGY SOLUTIONS FOR HIGH-TUNNEL BLUEBERRY PRODUCTION USING SOILLESS GROWING SYSTEMS

EUROPEAN BUSINESS ASSOCIATION EBA MOLDOVA ASOCIAȚIA BUSINESSULUI EUROPEAN

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High tunnels are semi-permanent, polyethylene-covered frames that create a protected microclimate for crops. In Georgia and neighboring EaP countries, several local suppliers offer affordable, durable tunnel kits tailored to regional climate conditions. These structures are designed to withstand seasonal winds, snow loads, and UV exposure. For high-end projects, EU-certified imports provide advanced materials and modular designs that can improve durability and ease the installation.

Picture 1. High-tunnel greenhouse with blueberry containers, GBGA (2021)

Local availability ensures timely support and replacement opportunity, while EU-certified options guarantee compliance with international quality standards and longer lifespans.

High Tunnel Structures

Substrate & Containers

Substrates such as coco coir, peat mixes, or combinations thereof, which provide ideal aeration, moisture retention, and nutrient-holding capacity for roots are typically used for soilless blueberry cultivation. These substrates are lightweight, renewable, and widely available in the region, either through local suppliers or imported in bulk.

Picture 2-3. Blueberry containers and substrate, Niadagi (2024)

Irrigation & fertigation systems

Drip irrigation systems with inline emitters provide precise water delivery directly to the root zone, minimizing waste and ensuring uniform moisture levels critical for blueberry growth.

Fertigation allows growers to supply nutrients in exact amounts tailored to the crop's exact stage of development, optimizing yield and quality while reducing excess fertilizer runoff. Automated dosing units further enhance efficiency by controlling nutrient concentrations and irrigation timing, reducing labor costs and human mistakes.

Many suppliers in Georgia and EaP countries offer modular drip and fertigation kits suited for small to medium-sized high tunnel farms.

Shading nets help moderate sunlight intensity and temperature, protecting plants from heat stress and sunburn while conserving water. In Eastern Georgia (Kakheti, Kvemo Kartli, Shida Kartli), where summers are hot, dry, and very sunny, blueberry tunnels need additional protection from excessive solar radiation and heat stress.

The most effective solution is to install external shading nets over the tunnels (30–40%), which reduce sunlight and

temperature before it enters, prevent berry sunburn, and decrease water loss through evapotranspiration. In higher-tech systems, these can be combined with internal retractable nets, but external shading alone is the most cost-effective and practical option for the region's climate.

In Western Georgia (Samegrelo, Guria, Adjara, Imereti), where the climate is humid, rainy, and often cloudy, the main challenge is excess humidity and fungal disease pressure rather than heat. Here, the priority is ventilation, achieved through side-wall and end-wall shading nets that allow airflow while softening incoming light.

Overhead shading nets are generally unnecessary, and in very wet areas may even trap humidity. Thus, tunnel systems in western Georgia should focus on roll-up side nets to improve air circulation and maintain a balanced microclimate for blueberries.

These environmentally friendly solutions require minimal energy input, align with sustainable practices, and are widely available locally or through regional distributors. Proper environmental control enhances crop health, extends the growing season, and improves fruit quality.

Examples from other countries

Moldova

Moldova's pilot high tunnel blueberry production with drip irrigation & substrate bags show that using substrate bags under tunnels with drip fertigation enables early fruiting and simpler pest control without high-tech climate control.

For Georgia, this model is suitable for lowland and mid-elevation farms where inexpensive tunnel structures and locally sourced coco/peat mixes can produce early-season berries for regional markets.

Poland

Polish growers use extensive tunnel systems to bring berries to market in early spring. Replication of scalable planting densities and logistics planning from these farms can help Georgian cooperatives and commercial growers capture higher early-season prices for exports to EU and regional markets.

Spain

Spain's southern berry producers successfully use coco coir in tunnels to override problematic alkaline soils and maintain the low pH blueberries need. In Georgia, coco coir is a practical solution for regions with calcareous soils or where native pH is unsuitable, combining coir with controlled fertigation ensures standardize fruit quality across varied sites.

Netherlands

Dutch systems demonstrate high labor-efficiency and resource-use optimization through automated dosing and sensors. For Georgian high-tunnel soilless farms, adopting scaled-down precision fertigation (nutrient injectors, EC/pH monitoring) can significantly reduce input costs and improve consistency without requiring full-scale automation.

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IKI INTERNATIONAL CLIMATE INITIATIVE

ORGANIC FERTILIZATION IN ALMOND PRODUCTION

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Almonds thrive in well-drained soils with neutral to slightly alkaline pH (6.5–8.0) and benefit from organic-origin fertilization that improves soil fertility, structure, and microbial activity. Unlike blueberries, almonds tolerate moderate soil alkalinity but are sensitive to salinity and poor drainage.

Organic-origin fertilization sustains long-term orchard health, improves nut quality, and strengthens Opportunities to access to EU organic markets.

Picture 1. Almond garden in Kakheti (kalaki.ge, n.d.)

Organic-Origin Fertilization in Almond

Conventional chemical fertilizers may provide high yields short-term but risk soil compaction, nutrient imbalance, and reduced biodiversity. By contrast, Organic-Origin Fertilizers, such as composted manures, cover crops, mulches, and biofertilizers, improve soil structure, water retention, and long-term sustainability while aligning with the requirements by supporting certification for organic exports.

Locally feasible practices

Composted cattle and poultry manure: Widely available in Kakheti and Shida Kartli; must be well-composted to avoid ammonia burn and excessive salts. Applied in winter or early spring to build soil fertility.

Green manure and cover crops (legumes, vetch, clover): Enhances nitrogen in soil naturally, reduces erosion, and increases organic matter when incorporated into the soil.

Pruning residues and orchard biomass: Can be shredded and composted on-site, recycling nutrients and reducing costs.

Mulching with straw, wood chips, or shredded prunings: Conserves soil moisture, reduces weeds, and promotes microbial activity.

Liquid organic fertilizers and biofertilizers: Fermented plant extracts, compost teas, or microbial inoculants improve soil life and can be applied through fertigation.

Nota Bene: In Georgia, many manures and composts have high salinity (EC) or pH. Testing is essential before application to prevent long-term soil damage.

How It Is Applied (Practical Steps)

Soil preparation and mulching

Before planting, incorporate composted manure or green manure crops to improve soil fertility. Mulching with straw or wood chips maintains moisture in dry summers in Kakheti region.

Base fertilization

Apply composted manure in late winter/early spring as a soil amendment.

Combine with shredded pruning biomass to enhance nutrient cycling.

Fergiation based on monitoring

In established orchards with drip irrigation, liquid organic fertilizers (compost tea, fish hydrolysate, amino-acid products) can be applied in small doses, guided by soil and leaf analysis. Nitrogen, potassium, and calcium are most critical for nut yield and quality.

Seasonal adjustment

Spring (flowering–fruit set): Apply biofertilizers and organic nitrogen sources to support early growth.

Summer (kernel filling): Focus on potassium-rich organic sources (e.g., composted wood ash in small doses, vinasse-based products).

Post-harvest: Apply organic calcium and phosphorus to strengthen trees for the following season.

Circular economy integration

Composting pruning residues and cover crop biomass on-site reduces dependence on external inputs and supports sustainability.

Benefits of Organic-Origin Fertilization in Almond Production

- Improves soil structure and water retention in dry regions like Kakheti.
- Enhances microbial activity and long-term soil fertility.
- Reduces reliance on synthetic fertilizers and external inputs.
- Supports organic and sustainable certification, expanding access to EU markets.
- Improves nut quality, kernel size, and storage life, increasing export competitiveness.

Best Practices from Other Countries – Organic Almond Production

Spain (Andalusia, Valencia)

Organic almond growers integrate green manures (legumes) with composted manures to sustain nitrogen and maintain soil fertility in dry Mediterranean climates.

Italy (Apulia, Sicily)

Use mulching and compost from pruning residues; integrate sheep grazing in orchards for natural fertilization and weed control.

United States (California)

Combine composted manure with fertigation of organic liquid fertilizers (fish hydrolysate, kelp). Emphasis on soil and leaf testing to fine-tune nutrient management.

Australia

Focus on composted green waste and biofertilizers to maintain soil health in semi-arid regions, with strong emphasis on irrigation-water efficiency.

Relevance for Georgia:

Adopting these practices, especially green manures, composting orchard residues, drip fertigation with liquid organic fertilizers, and cooperative certification, can help Georgian almond growers to reduce costs, improve soil health, and build competitiveness in the organic export market.

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