

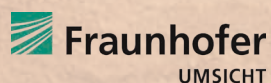


Innovations for Light and Energy

THE 3-CLIMATES GREENHOUSE



**Designed for Extreme Climates
Optimized for All Climates**





CONTACT AND CONSORTIUM OVERVIEW

GREEN DOME TRADING W.L.L.
SERALINES INC. / BIYOFIDAN INC.



Sennefelder Street 4
48284 Emsdetten
GERMANY

Email: info@3-climates.com
Website: www.3-climates.com

Phone: +49 2572 92 389
Phone: +49 177 2497414



Shop/Office No: 2508, Building No: 1565
Street/Road No: 1722, Block: 317
District/Region: Diplomatic Area, Manama,
BAHRAIN

Email: contact@green-dome-trading.com
Website: www.green-dome-trading.com
Phone: +973 - 3421 9506
Phone: +90 - 506 0919771



Rasim Koçal St. Elmalık Road
Kocadereler Ave. No:7
Kazimiye/Yalova/TURKEY

Email:
info@biyofidan.com.tr
www.biyofidan.com.tr
Phone: +90544 540 77 00

AGROMINI®





CONTENTS

Limitations of Traditional Greenhouses in the Age of Climate Change

2

3 Climates and 3 Climate Greenhouses

4

Innovation 1:

6

Innovation 2:

8

Innovation 3: Digital Twin

10

3 Innovations and Performance-Enhancing Harmony

11

Energy Efficiency Verification

12

Net Zero / Energy Balanced Greenhouse Climate Control

13

Climate Engineering and Economic Viability

14

Indicators of ETFE Research

15

Water Management

16

International Cultivation Expertise

17

Prototype Overview

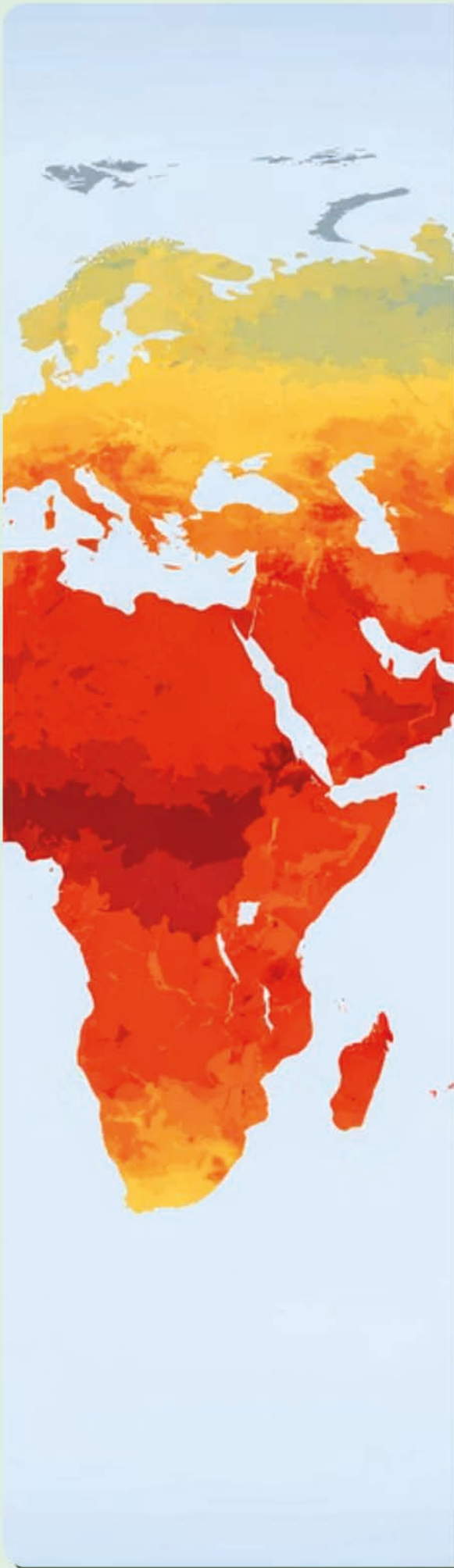
18

Brazil / Participation in COP30

20

Engineering Expertise & International Consortium

21



Limits of Traditional Greenhouses in the Age of Climate Change

Today's greenhouse problem is no longer just about production; it's about energy management, resilience, and long-term operating costs.

Increasing heat load and extreme conditions due to climate change magnify the need for control in traditional systems; shorten equipment lifespan and increase operational risk.

Main reasons for performance decline in new climate conditions:

- Solar radiation excessively heats the interior
- High solar load causes uncontrolled heat buildup within the indoor volume
- Cooling/climate control systems constantly operate under high load
- Energy management becomes difficult; consumption rapidly increases (*in most at least $\geq 300 \text{ kWh/m}^2/\text{year}$*)
- Humidity balance moves outside the optimal range
- Water loss increases (high evaporation and inefficient cycles)
- Equipment wear accelerates; maintenance needs increase, system lifespan shortens
- Plant stress increases; disease risk and yield loss increase

Resulting problems:

Low Production Stability

Unpredictable production cycles and inconsistent harvest quality

Very High Operating Costs

Energy costs making operations financially unsustainable

Seasonal Production Interruptions

Mandatory shutdowns during extreme weather conditions

Extremely Low Profitability

Severe, especially in extreme climates

Conclusion: Traditional greenhouse models cannot meet global demands for sustainable, reliable, and year-round food production.



3-CLIMATES

Innovations for Light & Energy



**BUT,
THE 3-CLIMATES GREENHOUSE**

**IS SOLVING THIS EXACT PROBLEM AT THE
CLIMATE REGIONS YOU WOULD NEVER HAVE
EXPECTED...**





THE 3-CLIMATES GREENHOUSE:



The 3 Climates greenhouse type is a universal greenhouse system developed with German R&D, featuring a revolutionary thermodynamic architecture, specially designed for regions with extreme climates.

Basic principle: Climate control through an light-optimized control system, instead of energy consumption.

The structure uses:

- 3 to 5 internal air layers serve for air mass separation, functioning as heat and cold buffers.
- Highly transparent ETFE film with thermoreflective coating.
- Automatic shading and reflection systems.
- Digital twin of the climate model for continuous optimization.

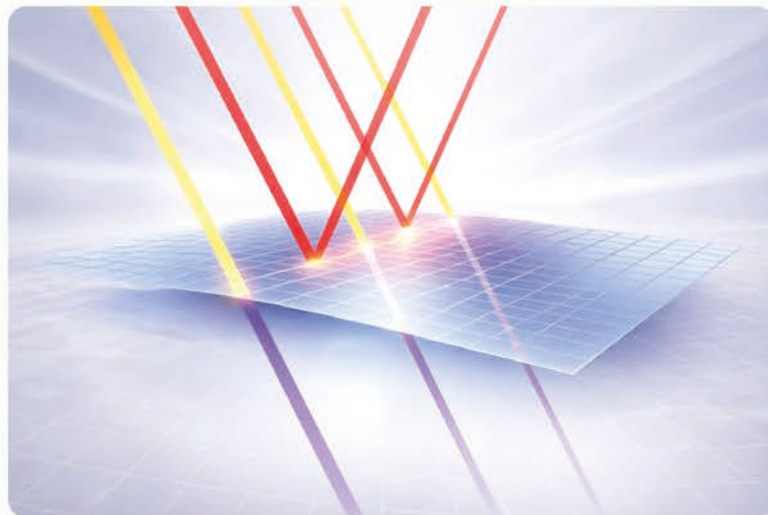
Advantages:

- Stable indoor temperatures 24 hours a day, 7 days a week.
- Minimum cooling requirements.
- Reduced heating load.
- Significant reduction in plant stress.
- Higher product uniformity and growth curves.
- Year-round production, even in extreme climates (hot and cold).

The 3 Climates architecture is the first greenhouse system designed to operate effectively and profitably where traditional systems fail.



1. INNOVATION: THERMO-REFLECTIVE 3-CLIMATES ETFE FOIL



Our advanced thermo-reflective ETFE foils offer unique optical and thermal performance:

94%

**Visible Light
Transmittance**

Maximum photosynthetic efficiency

83%

UV Transmittance

Important factor for pigmentation,
taste, and plant immunity

45%

Infrared Reflection

Reduces heat build-up

20+

Years of Durability

Under extreme UV conditions

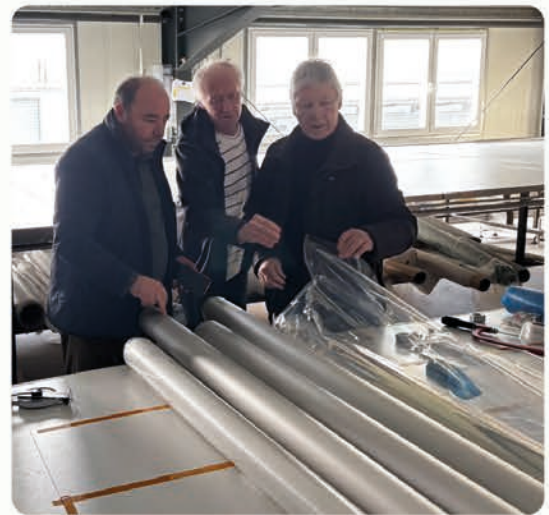
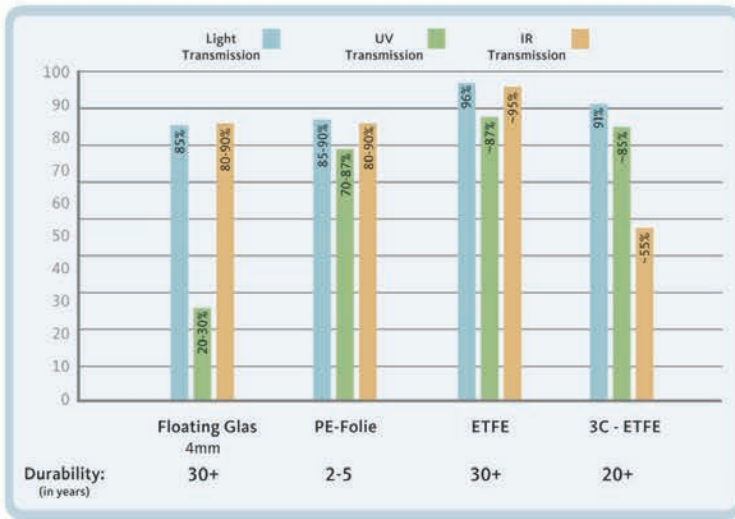
- 'Lotus Drip-Free' surface – prevents condensation droplets
- Fully recyclable and better light spectrum than glass

The film significantly reduces thermal load and ensures optimal UV and PAR light reaches plants.

This balance is crucial for:

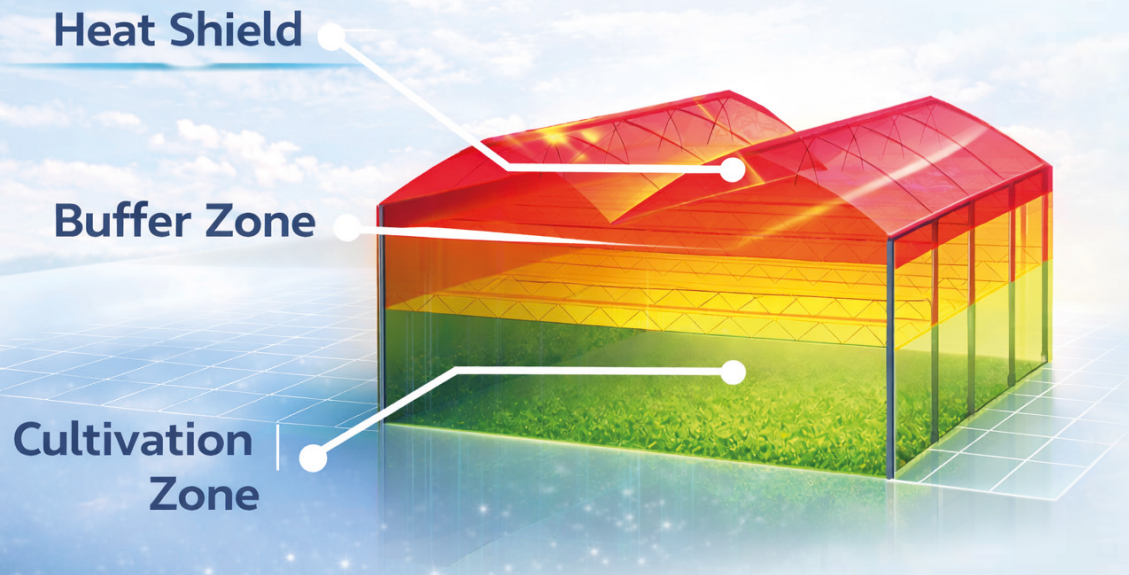
- Fruit quality
- accelerated growth
- stronger natural plant defenses
- lower energy consumption for cooling and heating.

It outperforms glass, PE, and all traditional greenhouse materials.



2. INNOVATION: THERMODYNAMIC LAYERED ARCHITECTURE

The 3 to 5-layer air gap is the core of 3 climate systems that regulate temperature through optimal air mass separation.



Thermal Neutralization

Air layers act as insulation, slowing down heat transfer from outside to inside. Less cooling on hot days, less heating on cold nights.

Passive Cooling

As the temperature in the upper air masses rises, the upper curtains open while the lower layers remain insulated. This causes hot air to rise automatically preventing heat from spreading downwards.

Temperature Stability

Day/night fluctuations are corrected without the need for additional energy, providing a more consistent climate for crops:

Optimized Conditions for Plants

The final temperature adjustment is regulated by a mist system that cools the lowest air mass through evaporative cooling, but also controls the necessary humidity for the cultivated plant.

Insulation Panels

The side walls of the greenhouse are covered with sandwich panels providing thermal insulation. In this way, the thermodynamic structure with three climate systems continues to operate with high performance without being affected by extreme hot or cold weather conditions.



Morning - Warming with sun begins



Noon - Heat curtains begin to close with the outside temperature.



Noon - Heat accumulates in the ceiling area. insulation panels



Noon - The roof opens, excessively hot air escapes upwards, and internal climate layers are balanced

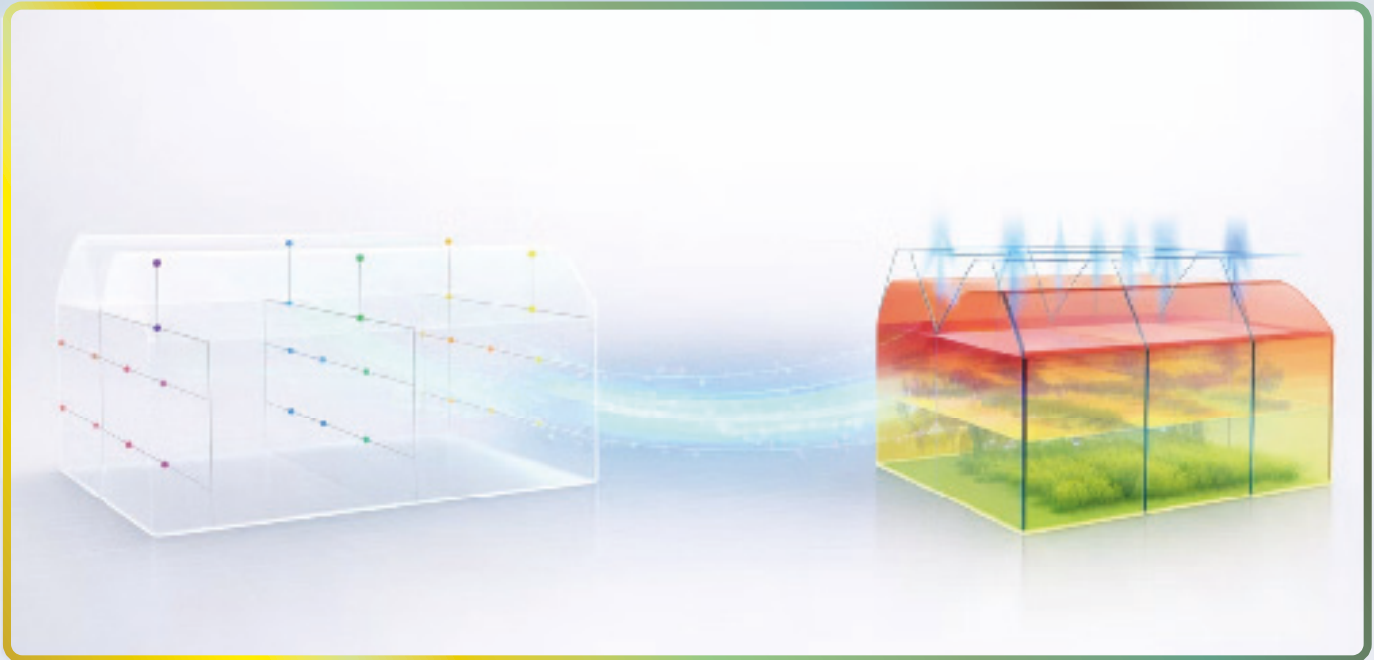


Noon - The fog system balances humidity and coolness at plant level as needed



Night - Heat curtains close and heat is fully preserved thanks to the insulating wall panels

3. INNOVATION: DIGITAL TWIN AND SENSOR NETWORK



The greenhouse transforms into a self-learning organism thanks to its digital twin by Fraunhofer Umsicht in Germany.

The multi-layer sensor network monitors:



Advantages:

- Real-time climate visualization
- Early detection of risk conditions
- Precise control for maximum yield
- Research data for continuous optimization

The digital twin provides unprecedented transparency and fine-tuning.



3 INNOVATIONS AND PERFORMANCE-ENHANCING HARMONY

Orchestrated by the digital twin, 3 climate systems ensure the perfect balance of light and temperature. Thermoreflective energy screens made of ETFE with special coatings reduce incoming infrared radiation by approximately 30% to 45% at each level, making it possible to control light intensity and temperature with high precision.

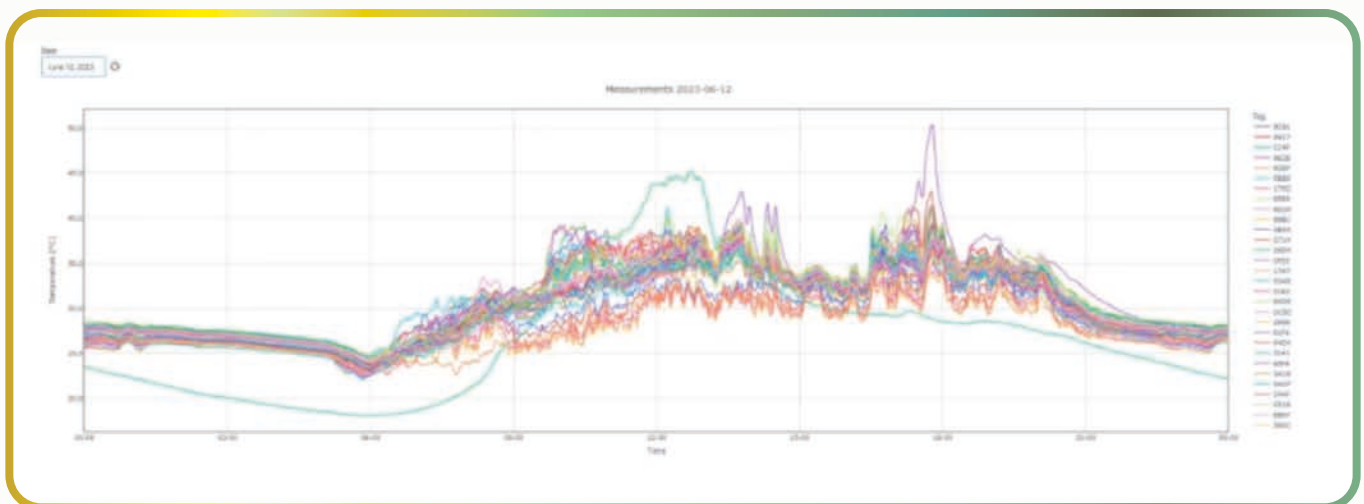
Based on real-time climate and sensor data, the energy screens and fog system are autonomously coordinated, allowing air mass layers to interact ideally. In addition, by reducing infrared radiation, leaf temperature is also specifically regulated, which protects plants from heat stress and ensures they remain within the optimal temperature range.

The result is a perfect climate at the cultivation level, without the need for energy for additional costly heating or cooling systems.



- Radiation-adaptive shading
- Temperature stabilization through IR reduction (30–45% at each level)
- Humidity regulation with autonomous fog system
- Air layer management for stable climate at cultivation level
- AI/Digital Twin control based on real-time sensor data
- IR minimization before leaf temperature overheats

This system was developed and validated in collaboration with German research partners Fraunhofer Umsicht, Center for Applied Energy Institute, and Block GmbH. It provides intelligent and energy-free climate control.



ENERGY EFFICIENCY VALIDATION: 300kWh/m² → 60 kWh/m²

Confirmed by data obtained from German engineering sciences and the Fraunhofer UMSICHT Institute:



Traditional Greenhouse Systems

~300 kWh/m²/year



3 Climate System

~60 kWh/m²/year

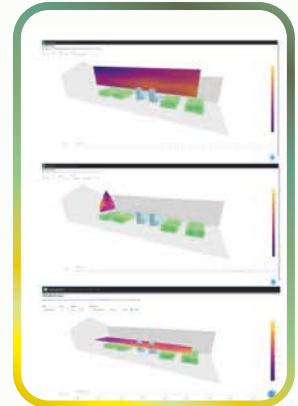


Reduction

80% less energy consumption

This proves that the 3 Climate System can stably maintain greenhouse climate conditions without the need for expensive heating and cooling devices, solely thanks to its own engineering design.

Thus, the system stands out as the first realistic and fundamental technology for Zero Energy Agriculture in all climate zones, including desert regions.



ZERO-ENERGY BALANCED GREENHOUSE CLIMATE CONTROL

The integration of thermoreflective coated ETFE film with the 3 Climate architecture transforms the greenhouse into an almost net-zero energy system:

- The need for high-cost active cooling systems is eliminated
- Heating requirements are significantly reduced
- Layered internal air layers continuously balance the microclimate with sensor-data-based automation
- Leaf temperature increase, which negatively affects plant physiology, is limited even under excessive solar radiation.
- Controlling leaf temperature and maintaining a high PAR level supports plant health and increases yield.



This approach creates a greenhouse system that relies on passive climate mechanisms instead of energy-intensive active cooling and heating, and increases yield; this innovation is made possible by the integration of these unparalleled technologies.

Result:

Stable and Predictable Microclimate

Significant Reduction in Operating Costs

Favorable Conditions for Year-Round Production

Suitable Climate Architecture for Global Food Security Initiatives

This configuration stands out as one of the most realistic approaches to net-zero agriculture in controlled environments in extreme climates.



CLIMATE ENGINEERING AND ECONOMIC VIABILITY

Every greenhouse project begins with a rigorous technical analysis:



Thermodynamic Modeling



Climate Simulation

Based on historical and projected climate models



Studies on PAR and UV Transmission



Water and Soil Resource Analysis



CAPEX / OPEX Risk Modulation



Yield Forecasting



ROI Scenarios for Investors

This scientific approach guarantees that every project ensures:

- profitable
- sustainable
- regionally optimized
- climate-resilient

Our engineering framework enables investors to receive transparent and evidence-based forecasts.



ETFE studies by AGC Company in Japan confirm significant improvements in plant performance and an increase in the annual production cycle compared to PE Nylon.



Actual data obtained from ETFE film trials in Japan.

Reasons for improved performance

- Improved UV penetration (violet and beyond rays)
- Higher photosynthetic light activation (PAR)
- Improved fruit pigmentation
- Reduced fungal pressure thanks to UV rays
- More stable indoor climate

These findings form the scientific basis for the use of ETFE, with its high transparency and UV transmittance, in premium horticulture.

TOMATO YIELD ESTIMATES (BAHRAIN)

These data compare typical tomato yields in conventional greenhouses in Bahrain with predicted yields obtained by combining 3-Climates systems with Hydroponics or BioPonics.

Conventional Greenhouses
20–30 kg/m²
per year

Main factors limiting performance in conventional systems:

- Excessive solar radiation (radiation load)
- High cooling costs
- Humidity imbalance
- Increased plant stress in summer months
- Temperatures exceeding 40 degrees in summer months.

With 3-Climate Greenhouse
60–80 kg/m²
per year

This performance increase is possible due to the following factors:

- Passive heat dissipation
- Stabilized humidity balance
- Optimized light distribution
- Minimized plant stress
- Consistent climate conditions throughout the year

This positions Bahrain as a potential hub for high-yield local vegetable production, reducing reliance on imports.



WATER MANAGEMENT (UP TO 95% SAVINGS)

Water scarcity is one of the biggest agricultural challenges of the 21st century.

Our integrated water systems include:

- BioPonics closed-loop systems
- Up to 95% water savings
- multi-stage filtration
- optional desalination systems
- Condensate water harvesting
- UV sterilization
- nutrient recycling systems

These solutions enable agriculture in regions without a reliable water source (including deserts, arid areas, and regions dependent on desalinated or brackish water).

This positions Green Dome Trading as a leading provider of water-efficient agricultural systems.

INTERNATIONAL CULTIVATION EXPERTISE

With the 3-Climate System, we offer support across a wide range of crops based on our experts' cultivation experiences. Here are some examples:



Controlled environment, ETFE light transmission, UV support, and stable humidity conditions lead to:

- enhanced fruit color
- higher sugar content and flavor quality
- stronger root development
- reduced plant stress
- improved shelf life
- more predictable harvest cycles

This makes the system suitable for premium markets and high-value export crops.

3-Climates GmbH works with a highly experienced cultivation team from Turkey, lead by Biyofidan bringing over 40 years of horticultural expertise to every project.

Our cultivation partners specialize in:

Soilless Cultivation (Hydroponics • Substrate • Biaponics)	Seedling Production	R&D Greenhouse & Trial Production
Vegetable & Fruit Production	Ornamental Plants & Flower Production	Medicinal & Aromatic Plants (MAP)
Agro-PV Solar Modules	Geothermal Greenhouse	Water Treatment & Reclamation

This expertise ensures that the 3-Climate model, whether geothermal or solar, is combined with a cultivation strategy tailored to the investor's region, market, and climate for each greenhouse.

We adapt cultivation methods according to:

- local radiation curves
- humidity patterns
- water availability
- input cost structures
- target yields
- plant selection

This integration of technology + agricultural science is crucial for achieving consistent and commercial production.



PROTOTYPE OVERVIEW (AHLEN, GERMANY)

To verify the system's performance in a temperate climate, a 10,000-acre greenhouse was built and commissioned in 2024 in Ahlen, Germany, as a full-scale prototype, in addition to Schulze-Eckel's existing 7-acre flower greenhouse facility.

Data obtained from this greenhouse:

Seasonal thermodynamic behavior

Reduced heating requirements in winter

Humidity stabilization

ETFE durability

Plant response to stable microclimates

Shortened harvest time

The greenhouse serves as a research environment for the following topics:

- Analysis of plant growth cycles
- Verification of energy-saving mechanisms

The prototype demonstrates that the 3-Climate system is not only designed for desert climates but also offers significant advantages in European climates.

PROTOTYPE RESULTS: FIVE HARVEST CYCLES



Traditional greenhouses in Europe typically achieve 4 flower harvest cycles per year.

The 3-Climates full-scale prototype in Ahlen made it possible to conduct a direct comparison with existing greenhouses at the same location and under the same operational conditions.

According to the results obtained, the annual number of harvest cycles increased to 5 due to the shortened harvest cycle duration.

Harvest cycles increasing from 4 to 5... 25% increase in annual production capacity

The reasons for this improvement are:

Reduced night heat loss

**Improved consistency
in rhizosphere
temperature**

**Minimizing stress
transitions**

Optimizing the light environment

Extended growing seasons

This confirms the system's potential to increase annual revenue without expanding the greenhouse footprint.



BRAZIL / PARTICIPATION IN COP30

Although no greenhouses have yet been built in Brazil, Green Dome Trading played an important role in Belém at COP30, introducing the company's technologies to international delegations. COP30 confirmed that 3-Climates are strategic technologies for Brazil's agricultural resilience agenda. See you at SERALINES in COP31 ANTALYA.

Key Takeaways:

→ Official Support from the Ministry of Agriculture (MAPA)

Secretary Luís Rangel

→ Positive Interaction with EMBRAPA

Brazil's most important agricultural research institute

→ Expressions of Interest for Future Pilot Facilities

- Amazon region (humid + low sunlight)
- Semi-arid Northeast (extreme heat + drought)

See you at COP31 Antalya 2026 — where we will come together as the
3 CLIMATES & BIYOFIDAN consortium.



3CLIMATES



INTERNATIONAL ENGINEERING EXPERTISE



German Engineering

- Climate Simulation
- Thermodynamic Modeling
- Material Innovation
- Sensor Integration



Turkish Horticultural Expertise

- Over 40 years of commercial greenhouse consulting
- Cultivation Strategy Optimization
- Hydroponics and BioPonics
- Plant Breeding Systems
- Climate-Adapted Cultivation



International Research Partners

- Climate Data Validation in cooperation with Fraunhofer
- Research on Optical and Infrared Materials
- Development of High-Resolution Sensors

TECHNICAL SPECIFICATIONS

Structural System

- Steel/Aluminum construction
- Regionally calculated wind and snow load
- Multi-layer air damping
- ETFE solar panel roof options

Foil Technology (3-Climate)

- 94% visible light
- 83% UV transmittance
- 45% IR reduction
- Anti-condensation effect (No-Drip)
- 20-year warranty

Climate Systems

- AI-controlled curtains
- Climate modeling with digital twin
- Temperature, humidity, CO₂ sensors
- Spectral monitoring PAR, UV, IR

Water Systems

- Closed BioPonics cycle
- Filtration and desalination
- Condensate recovery
- Up to 95% water saving



Sennefelder Street 4
48284 Emsdetten
GERMANY

Email: info@3-climates.com

Website: www.3-climates.com

Phone: +49 2572 92 389

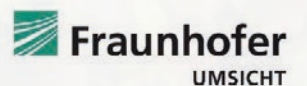
Phone: +49 177 2497414



E-posta: contact@green-dome-trading.com



AGROMINI®



www.green-dome-trading.com

