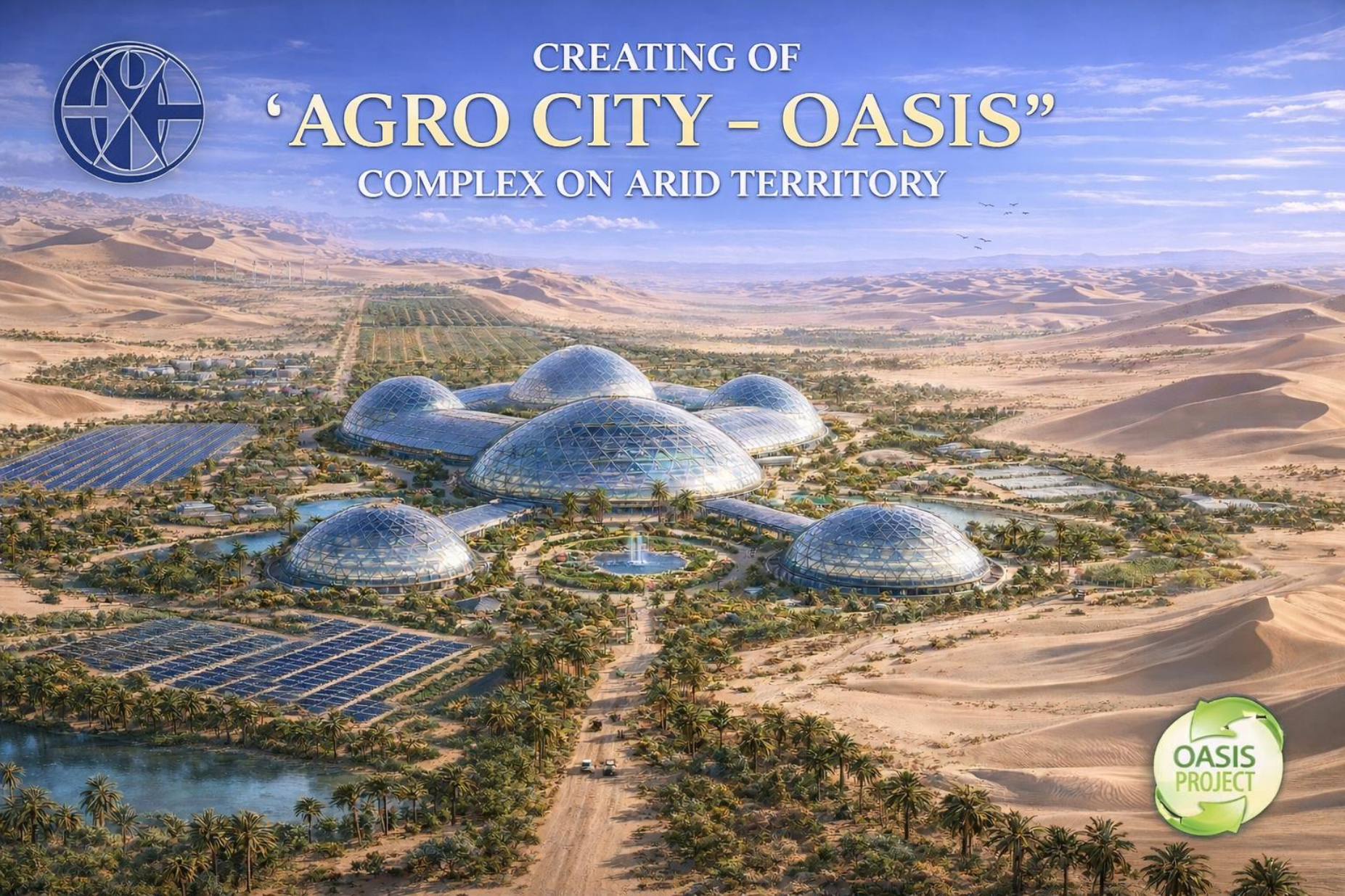

CREATING OF
‘AGRO CITY – OASIS”
COMPLEX ON ARID TERRITORY
OASIS
PROJECT

CONCEPT PROJECT DESIGN

INTERNATIONAL RESEARCH INSTITUTE FOR ADVANCED SYSTEMS,
‘OASIS HOLDING MANAGEMENT COMPANY”
AND INTERNATIONAL PARTNERS
ARE CREATING THE DESIGN OF UNIVERSAL COMPLEX

‘AGRO CITY”

INTRODUCTION

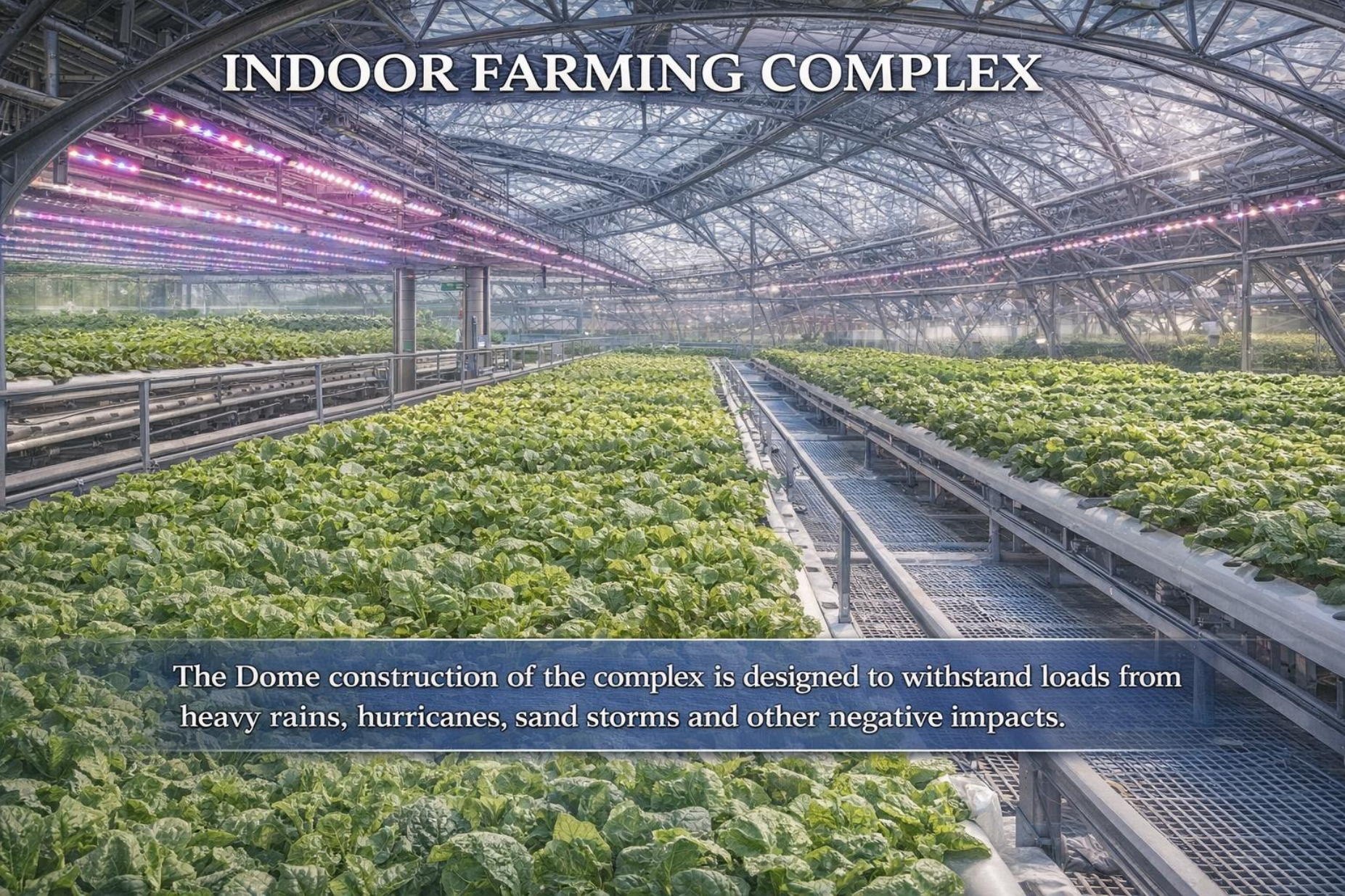
World agricultural practice has accumulated vast experience in creating ideal conditions for growing plants, large and small livestock, poultry, various types of mushrooms and aquaculture. However, due to unfavorable climatic and geographical conditions of specific territories that occupy a significant part of the continents, the issue of agricultural production and creating conditions for food security of countries, primarily the African continent, is one of the most important.

The development of industrial technologies and equipment make it possible to create systems for full local energy and water supply of agricultural comlexes, climate control (lighting, atmos-phere, soil composition, temperature, nutrient media, etc.), corresponding to the best quality and quantity of products required by the regional market. Improvement of greenhouse farming systems in the last 3-5 years has made it possible to create fully automated and very productive agricultural complexes, called "INDOOR FARMING".

The development of soil preparation and drip irrigation systems, the production of organo-mineral fertilizers, and the selection of plants resistant to negative climatic conditions have made it possible to create advanced "OUTDOOR FARMING" technologies.

All these areas of modern agricultural production have been combined in the designed "AGRO CITY – OASIS" complex based on dome structures.

INDOOR FARMING COMPLEX



The Dome construction of the complex is designed to withstand loads from heavy rains, hurricanes, sand storms and other negative impacts.

INDOOR FARMING COMPLEX

Structural Concept and Dimensions

OASIS PROJECT

Project Parameters

- Total territory area: **8 ha**
- Total area of Domes and Galleries
- **24,000 m²**

Central Exhibition Dome

Length: **102 m**
Width: **61 m**
Height: **15 m**

Main multifunctional dome for exhibitions, research and operational coordination.

Production Domes (1–4)

- Length: **60 m**
- Width: **60 m**
- Height: **20 m**

Indoor agricultural production domes.

Connecting Galleries (1–4)

- Length: **40 m**
- Width: **20 m**
- Height: **5 m**

Climate-controlled corridors linking domes, with the central exhibition dome.

ADVANTAGES OF THE MERO FRAME DESIGN

Structural Concept and Dimensions

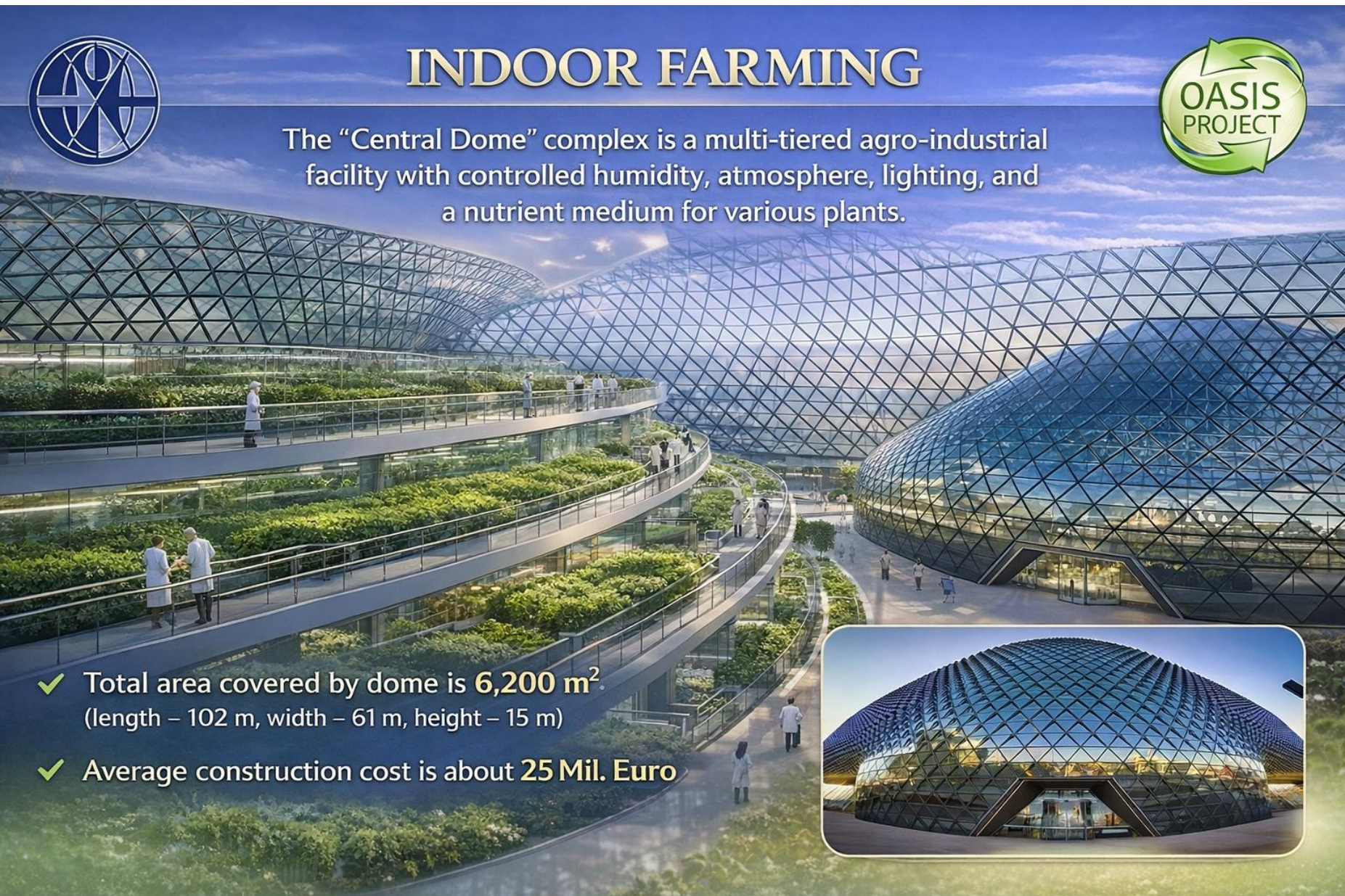
OASIS PROJECT

- Possibility of creating a roof or canopy of almost any shape, size and complexity
- Six main nodal connections depending on the design and load
- Absence of welded joints: weight is 2 times less than when using welded structures
- Minimum installation time
- Assembly takes place on the ground, minimum work at height
- Unique reliability of the structure due to guaranteed high-quality installation: tightening of connections occurs until a distinct click

INDOOR FARMING

OASIS PROJECT

The “Central Dome” complex is a multi-tiered agro-industrial facility with controlled humidity, atmosphere, lighting, and a nutrient medium for various plants.



- ✓ Total area covered by dome is **6,200 m²**.
  (length – 102 m, width – 61 m, height – 15 m)
- ✓ Average construction cost is about **25 Mil. Euro**

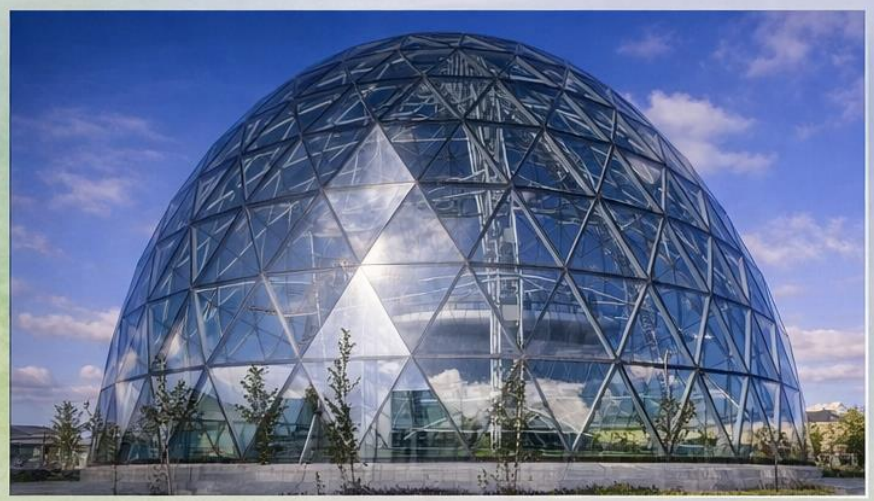
ARCHITECTURAL AND DESIGN SOLUTIONS
"DOME" AND "GALLERY"

OASIS PROJECT

The aim of the project is to create new technical means for the reproduction of bio resources and the cultivation of valuable aquaculture species and higher plants in isolated technical and biological systems of new generation.

Universal Agricultural Platform «DOME»

The universal agricultural platform «DOME» is a multifunctional system of reproduction of **bio resources** as the basis of **guaranteed** food products: fish, vegetables, berries, fruits, **flowers, biomass** and also genetically **pure planting material** and **seedlings**.



Universal Agricultural Platform «DOME»

DOME Farming

ADVANTAGES OF INDOOR FARMING

A Sustainable and Efficient Agricultural Platform

~90% WATER SAVING

Efficient water recycling with 90% less water usage

YEAR-ROUND PRODUCTION

Continuous crop yield 365 days a year

CLIMATE INDEPENDENCE

Controlled humidity, temperature and light levels

HIGH PRODUCTIVITY PER m^2

Maximal yield per m^2 of cultivated area

DOMES WITH PHOTOVOLTAIC PANELS

Placing **photovoltaic panels** on the surface of the **Domes and Galleries** allows the complex to generate a significant amount of renewable energy.

With an **average of 14 hours of solar illumination**, **the illuminated dome surface** (approximately 50% of the structure) can generate **20–40 MW of electricity** per day.

The exact energy output depends on the **geographical location**, **solar radiation levels** and installation configuration, therefore more precise calculations are required for each specific site.

ADVANTAGES OF "DOME" STRUCTURES

OASIS PROJECT

The structural characteristics of the **dome architecture connected by galleries** provide a number of important technollogical and operational advantages.

Key advantages

- Creation of a **closed system of structures** resistant to **adverse** external environmental **conditions**
- Development of an **autonomous local power supply system** with maximum use of **direct current** (DC), providing up to 30% **energy savings** for the entire complex
- Implementation of **closed-cycle** water circulation **systems**, induding water capture, purification and reuse
- Systems for CO_2 **capture** and **utlization** within the agricultural environment
- **Climate control systems** for **individual zones** and production areas
- Creation of **separate zones** and chambers for different plant species
- Microbiological protection **systems** through disinfection of production zones and common areas
- **Flexible expansion of the complex** through additional domes connected via the gallery system
- **Automated systems** for irrigation, fertilization, plant care and harvesting
- Reduction of **construction time**, **capital costs** and maintenance complexity

WHAT CAN BE PRODUCED IN AGRO CITY
AND WHAT CAN BE SOLD AS PRODUCT

Agro City represents a multi-sector bio-agricultural ecosystem capable of producing a wide range of high-value products for food, biotechnology, environmental and energy markets,

Agricultural Production

- Vegetables, berries and greens
- Melons (watermelons, melons, tomatoes, etc.)
- Cereals and grain crops
- Fruits and grapes

Plant Nurseries and Forestry

- Seedlings of vegetables, bushes and trees
- Paulownia and fruit tree plantations
- Bushes and trees for *desertification control and ecosystem restoration*

Livestock and Aquaculture

- Aquaculture: valuable fish *species*, *algae*, Gambusia, etc.
- Poultry production (*chicken, turkey*)
- Rabbits, sheep and other livestock

Biotechnology and Advanced Agriculture

- *Mycelium and special varieties of edible mushrooms*
- Medicinal, essential oil and exotic plants
  - Natural pharmeturical emulsions

PROGRAM «AGRO CITY»

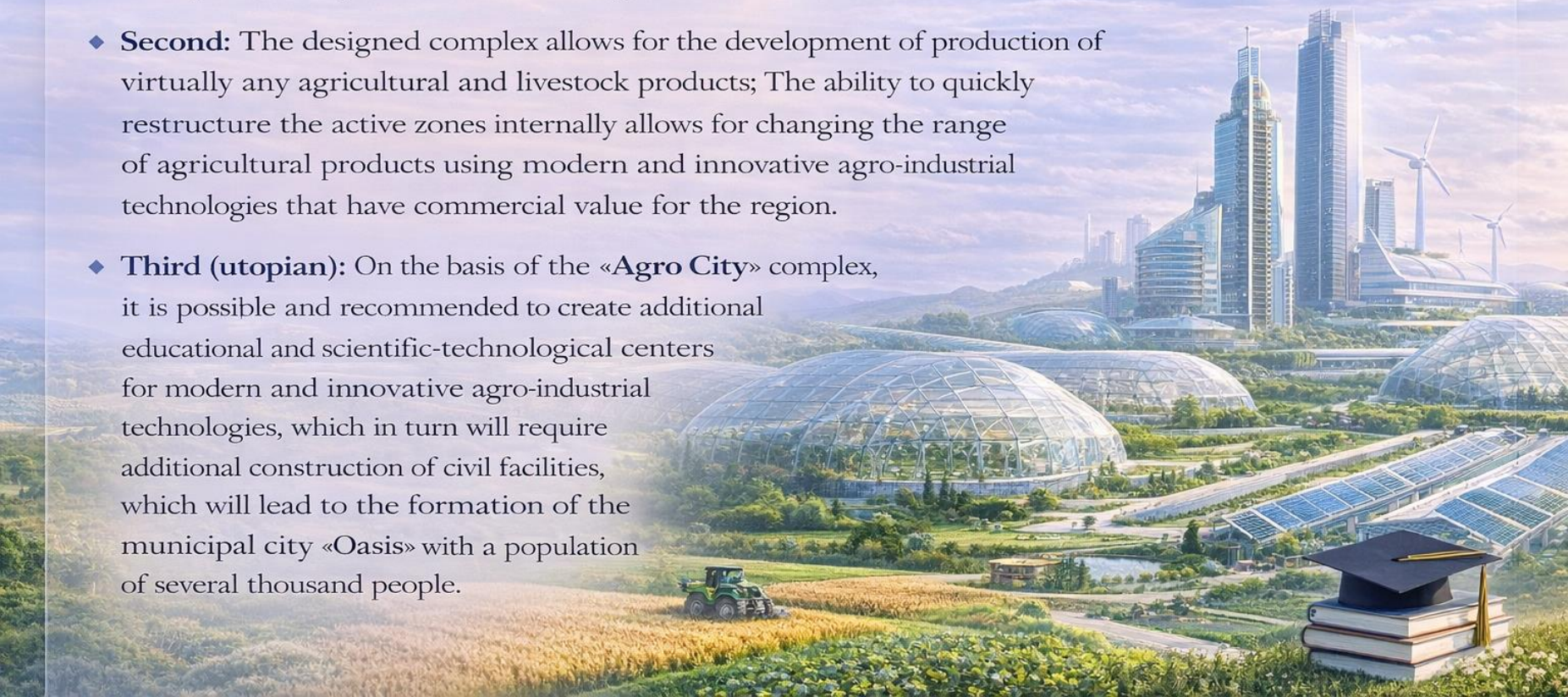
The development of the Program was based on agrotechnologies investigation for many years by the Research Institute for Soil Science, as well as a number of agrotehnologic organizations and companies participating in the Program.

The technologies were tested by long-term period in the different climate zones such as **Northern Europe, Central Asia, African and Gulf countries** and showing an impressive result.

The program is designed in such a way that it gives a possibility to use individual technological elements, reduce or increase space and areas, select the conditions for germination of selected plants to achieve maximum productivity.

PROJECT OBJECTIVE

- **First:** Creation of a complex of agro-technical production facilities that correspond to the best technologies and replicate climatic conditions, soil conditions, atmosphere, humidity, external influences to create optimal conditions for plant development, their productivity and resistance to negative influences;
- **Second:** The designed complex allows for the development of production of virtually any agricultural and livestock products; The ability to quickly restructure the active zones internally allows for changing the range of agricultural products using modern and innovative agro-industrial technologies that have commercial value for the region.
- **Third (utopian):** On the basis of the «**Agro City**» complex, it is possible and recommended to create additional educational and scientific-technological centers for modern and innovative agro-industrial technologies, which in turn will require additional construction of civil facilities, which will lead to the formation of the municipal city «Oasis» with a population of several thousand people.

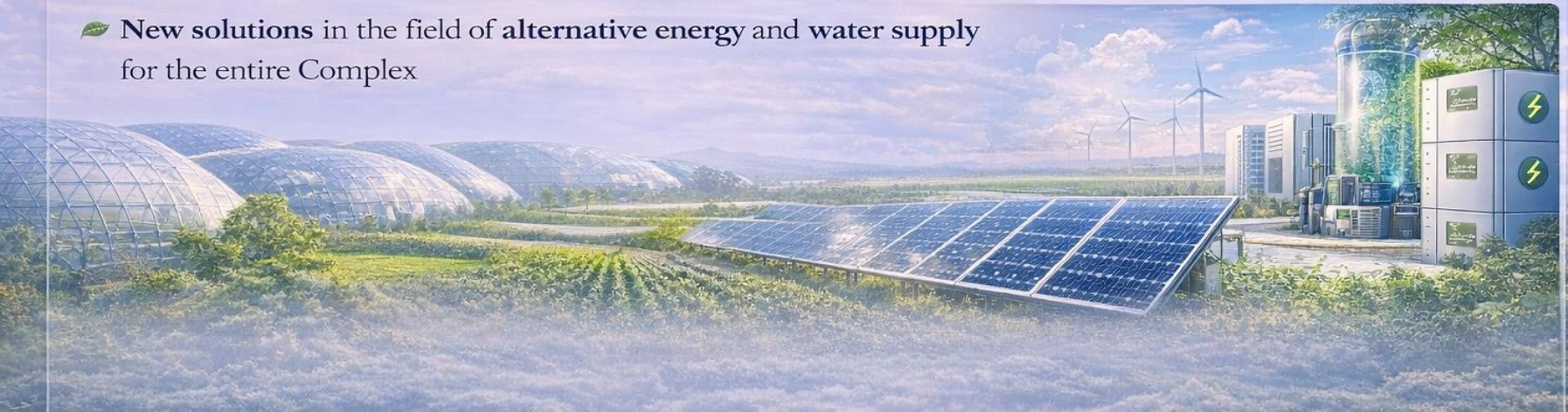


INNOVATIVE TECHNOLOGIES
proposed for the implementation of the PROGRAM

- **Increasing soil fertility** with integrated organo-mineral fertilizers (IOMF) and active nutrition of shrubs and trees using the APION growth activator

- **Creating controlled nutrient media** for **INDOOR farming**
- **Managing all parameters** of climatic conditions for the most effective plant growth and fertility in isolated artificial zones including the use of artificial intelligence

- **Production** of **highly effective** emulsions of **biologically active** components from sprouts of medicinal plants to improve human health
- **New solutions** in the field of **alternative energy** and **water supply** for the entire Complex



MAIN ENGINEERING SYSTEMS OF INDOOR FARMING

- **Gas supply** and **preparation** of the composition of **gas environments** and **humidity**;
- **Water supply** and **preparation** of water environments separately for groups of plants and aquacultures;
- **Separate lighting**, selection of **spectral composition** for groups of plants by time zones;
- **Preparation** of **nutrient media** for groups of plants by their origin and optimization of the soil environment and nutrient solutions;
- **Regulation** of **temperature conditions** for individual groups of plants by time zones;
- **Disinfection** of the atmosphere, water and **soil**, antiseptic treatment of products for long-term storage;
- **Utilization** of **biological waste** from agricultural production.

AGRO BLOCK (GALLERY) FOR “PAULOWNIA” SEEDLINGS,

as **a genus of angiosperm trees,** and one of the **fastest growing trees in the world**

INDUSTRIAL COMPLEX

Growing seedlings and sprouts for medicinal emulsions

- the **A.Vogel Keimgerat bioSnacky** sprouter one will always have **sprouted grains**, regardless of the weather or time of year.
- **The ventilation** system of the chambers and the **sprouter bowl create optimal conditions** for **seed growth.**
- The seeds **germinate** as if they were in a **small greenhouse.**

The plant called "Amaranth" (Amaranthus)

has received worldwide recognition – the UN Food Commission has awarded it the prestigious status of **"Crop of the 21st Century"**, which grants immortality.

"Silybum marianum"

The peculiarity of using sprouts as **raw material** is that they contain 40 **times** more natural enzymes than any other plant products.
Such a concentrated amount of useful elements is characteristic only of

"Silybum marianum"

The peculiarity of using **sprouts as raw material** is that they contain **40 times more natural enzymes** than any other plant products.
Such a concentrated amount of useful elements is characteristic only of **sprouting seeds** in the period from 5 to 12 days.

INDUSTRIAL COMPLEX

EMULSION MANUFACTURING INSTALLATION

- All equipment developed by the specialists of Research and Development firm “MASHGEO”, **Ltd. is high-performance.**
- The basic productivity of **one line is 5t / hour.**
- At present, the existing problems of the use of mineral and chemical fertilizers, as well as the problems of growing agricultural crops on desert and infertile soils, can be solved using an innovative soil-forming organic fertilizer (‘**Superhumate ECO-35DV**”, “**Vitahum**” trademark).
- EXTRACTS FROM SPROUTS are truly **unique, valuable** and **irreplaceable** in the **prevention** and **treatment of many human diseases,** as well as in maintaining our body in excellent shape.

Superhumate ECO-35DV

Vitahum trademark

INDOOR FARMING

By optimizing the main parameters of the impact on plants - soil, nutrition, stable temperature, certain spectra and lighting modes and etc. -
it becomes possible to grow ecologically frequent and high-quality agricultural products in a short time and with high specific productivity.

AVERAGE PRODUCTION OF AQUA AND AGRO BLOCKS FOR THE VALUABLE BIO RESOURCES:

PRODUCT	Mass/Quantity	Period
Sturgeon	200 tons	annually
Caviar	10 tons	annually
Telapia	600 tons	annually
Catfish	1500 tons	annually
Eel	250 tons	annually
Fry for reproduction	5 000 000	annually
Fry for sale	10 000 000	annually
Dill	10 kg/m2	monthly
Salads	8 kg/m2	annually
Tomatoes	160 kg/m2	annually
Eggplant	140 kg/m2	annually
Peppers	100 kg/m2	annually
Berries	5 kg/m2	monthly
Plant Seedlings	3000/m2	annually
Biomass	2000 tons	annually

NURSERY-GARDEN FOR SEEDLINGS

For the successful implementation of OASIS program, it is **necessary** to create a **nursery for growing** (breeding) various trees and shrubs, since plants brought from other regions do not take root well and have **to be re-planted**, which entails large financial costs.

MAIN ENGINEERING SYSTEMS OF THE AGRO CITY COMPLEX

During the period of research into agricultural technologies, **the most effective systems** influencing the yield, quality **and stability of plants** under various climatic conditions were identified. Such systems are designed for:

- **Gas supply** and preparation of the composition of gas environments and humidity;
- **Water supply** and preparation of water environments separately for groups of plants and aquacultures;
- **Separate lighting**, selection of spectral composition for groups of plants by time zones;
- **Preparation** of nutrient media for groups of plants by their origin and optimization of the soil environment and nutrient solutions;
- **Regulation of temperature conditions** for individual groups of plants by time zones;
- **Disinfection** of the atmosphere, water and soil, antiseptic treatment of products for long-term storage;
- **Utilization of** biological waste from agricultural production.

WATER FOR THE «AGRO CITY» PROGRAM

- Water from the water supply system if exist;
- Water extraction and production from aquifers under desert areas;
- Condensation of water vapor from exhaust gases;
- Water extraction from saline sea water;
- Creating an efficient water circulation system.

ENERGY SUPPLY FOR «AGRO CITY» PROGRAM

- Using LNG to generate electricity and cold, as well as to extract CO_2 and H_2O from exhaust gases;
- Using **PHOTOVOLTIC PANELS** and **SOLAR CONCENTRATOR** with the most efficient systems;
- Project "**BIOGAS**" for set up a complex for utilization of agricultural waste and producing biogas and bio humus for further use;
- **WIND** turbines;
- **WAVES** power station if near the ocean coast;
- TRANSFER OF MAXIMUM POSSIBLE ENERGY-CONSUMING INSTALLATIONS AND DEVICES FROM AC TO DC (SAVE UP TO 30 5Df POWER SUPPLY)

INTEGRATED ORGANIC-MINERAL FERTILIZERS (IOMF)

Complex of natural organic-mineral fertilizers consists of several natural components, which selected for soil composition, type of crops **aand** weather conditions. The application of IOMF provides the formation of a stable fertile layer, increasing productivity, growth rate and immunity of crops by 25-35%, reduce water consumption by 2-5 times and quantity of chemical fertilizers.

25-35% CROP YIELD & GROWTH

REDUCE WATER USE 2-5x

LESS CHEMICAL FERTILIZERS

OUTDOOR PLANTATIONS

Outdoor contra-desertification technologies are used to form a fertile layer in arid areas for growing cultivated trees and crops, creating “Green areas” in the desert.

SOIL PREPARATION

CREATING A FERTILE LAYER

PLANTING AND IRRIGATION

CREATED GREEN AREA IN THE DESERT

OUTDOOR PLANTATIONS

(see Attachment «Desertification»)

Desertification Technological part, which has been tested on different soils and many crops with positive results,
allows us to offer advanced technologies for wide use

SAND-CONSOLIDATING PLANTS SEEDLINGS ARE GROWING IN AGROBLOCK

There are shrubs and trees that can grow on sand; they are called psammophytes. A remarkable feature of these plants is their adaptability to life in the sand. Due to these features, psammophytes not only take root well on the sand, but also fix it, preventing movement. In addition to shrubs and trees, perennial and annual grasses are used to fix the sand: ryegrass, wheatgrass, aristides, kumarichiki, etc. Fixing the sand with vegetation is a long but reliable method that allows you to get rid of sand drifts and dust storms for a long time.

PERENNIAL & ANNUAL GRASSES

SHRUBS & TREES (PSAMMOPHYTES)

POSSIBLE INTEGRATION OF INDOOR AND OUTDOOR FARMING

INDICATIVE COSTS

- Construction of the Agro City complex – **USD 35 million;**
- Automatic control systems and provision of lighting, irrigation, nutrition, air conditioning – **USD 8 million;**
- Infrastructure systems of energy, water supply, sanitation, collection and storage of products, disinfection – **USD 20 million;**
- Indoor farming – cost depends on the production program – **not less than USD 10 million;**
- Industrial complex for the production of IOMF – **USD 3 million;**
- Industrial complex for the production of medicinal preparations – **USD 5 million;**
- Outdoor farming – cost depends on the area of plantings, but not less than **USD 3 million.**

Total approximately: **USD 84 million.**

CONCLUSIONS

IRIAS-OASIS Holding (site: irias76.eu)

- At the initiative of the Customer, this design project can be expanded or reduced, supplemented with individual **agricultural productions** with final products by agreement;
- The approximate number of jobs will be **500 people**, of which **women will occupy 300** places;
- The designed Complex will make maximum use of **solar energy** with **minimal greenhouse gas emissions**, waste and damage to the environment;
- The proposed complex will have a **service life of at least 30 years;**
- The Agro City Complex can become a center for civil **construction** of **residential buildings**, educational institutions, recreational areas and other municipal systems.


AGRO CITY AFTER 5 YEARS