EVERGREEN FARM OY
FEEDING THE WORLD

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www.evergreenfarm.fi

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WORLD'S HIGHEST CROP PRODUCTION PER M²AND M³

Project Information

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Evergreen Farm Oy is an agricultural technology company that produces the most advanced and efficient climate-controlled vertical farming system, known as **Grow360™**. The Grow360™ unit offers a reliable yield throughout the whole year, as well as the ability to grow in-demand non-native vegetables, fruit and flowers at extremely affordable prices.

The Grow360™ system is not only cost-effective, saves land area and manpower, but also maximizes production and improves produce quality. Learn more about the Grow360™ system here.

Under development:
- Grain growing unit (Grain365™)
- Ultra efficient lighting technology
- Renewable energy source

Evergreen Farm – Core Values

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Mission

The mission of Evergreen Farm Oy is to fundamentally transform agriculture by implementing the Grow360™ system throughout the world. Thus, improving crop production while encouraging responsible, innovative farming methods that protect the environment and educate the community.

Objective

Our aim is to make fresh, healthy, delicious, pesticide-free, and non-GMO food accessible to everyone. While doing so, we aim to improve the quality of life of local communities by providing job opportunities, and a platform for growth and education.
We aspire to impact the world market to make non-GMO and pesticide-free food the new norm.

Near Term Goals

To expand the use of this technology to produce other crops including grains and cereals, which are equally important in the food chain. This will create an even bigger impact on resolving world's food crisis.

The Impact of Disaster in Agriculture

"Droughts, floods, storms, and other disasters triggered by climate change have risen in frequency and severity over the last three decades, increasing the damage caused to the agricultural sectors of many developing countries and putting them at risk of growing food insecurity"

-ReliefWeb (Digital service of UN OCHA) based on "The Impact of Disasters in Agriculture and Food Security" 2015 report by the FAO.

Impact of Disasters in Agriculture

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Key points from "The Impact of Disasters in Agriculture and Food Security" 2015 report by the FAO:

- Between 2003 and 2013, natural disasters caused USD 1.5 trillion in economic damage worldwide. These disasters affected 2 billion people in developing countries.

- Agriculture is the main source of livelihoods and food security for many of the must vulnerable countries. These disasters undermine the efforts to eradicate hunger, and build prosperity.

"The number of climate-induced disasters has increased significantly over the last decade."

Feeding the World

Evergreen Farm is addressing the food crises through the implementation of the following technologies:

|	
Grow360™ System	• Produces a wide variety of fruit and vegetables with highest yield per square meter and ultra high efficient usage of water, energy and nutrients.
AIGrow™ Software	• Optimizing harvesting schedule based on market needs, ensuring plants health, overseeing resources utilization and guiding farmers.
Grain365™ (in development)	• Produce cereals and grain indoors, and minimize land usage and resources.
Lighting Technology (in development)	• 400 % less energy usage.
Renewable Energy (in development)	• 100% electric grid independence with our solar and wind collector.

Grow360 Specifications

Cylinder

Grow360 Unit's Dimensions

2160 plants in 9m²

240 plants/m²

1,5 M

6 M

2,5 M

One cylinder holds 144 plants.
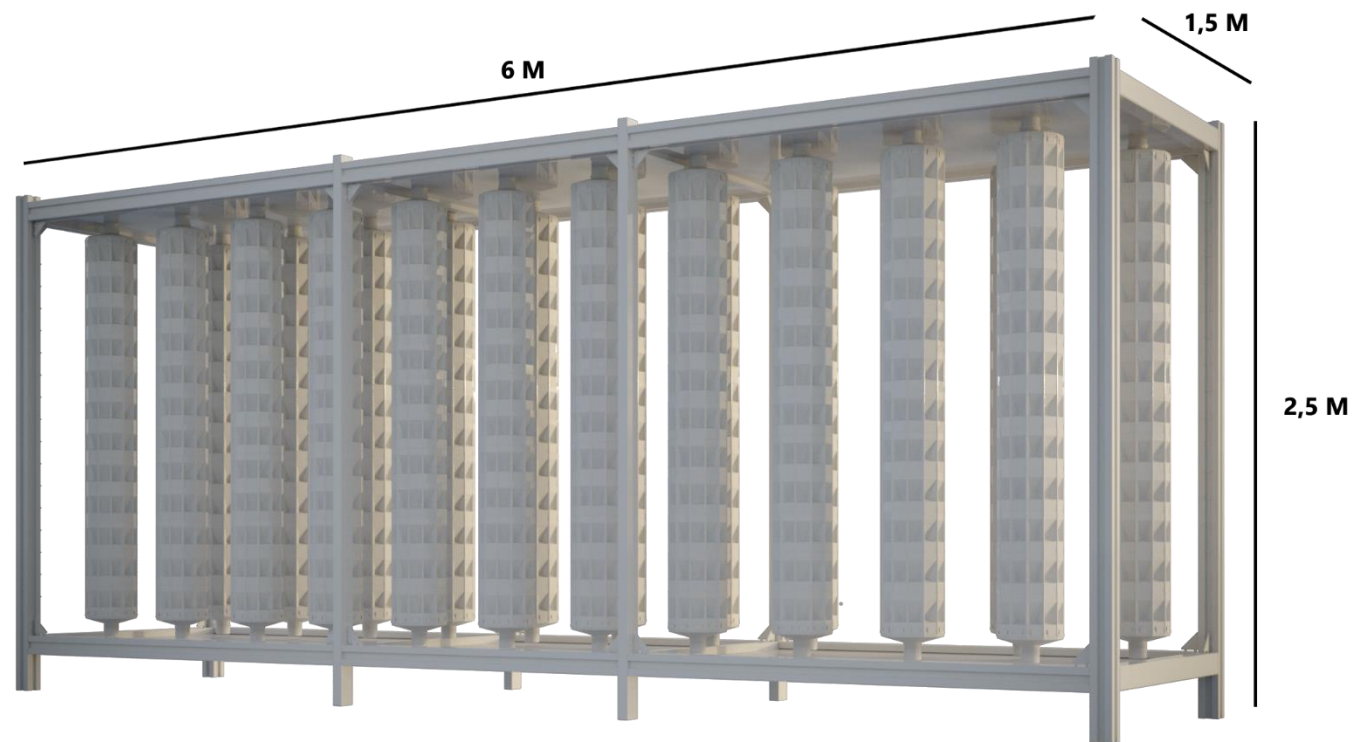
Each Grow360™ unit contains 15 towers.
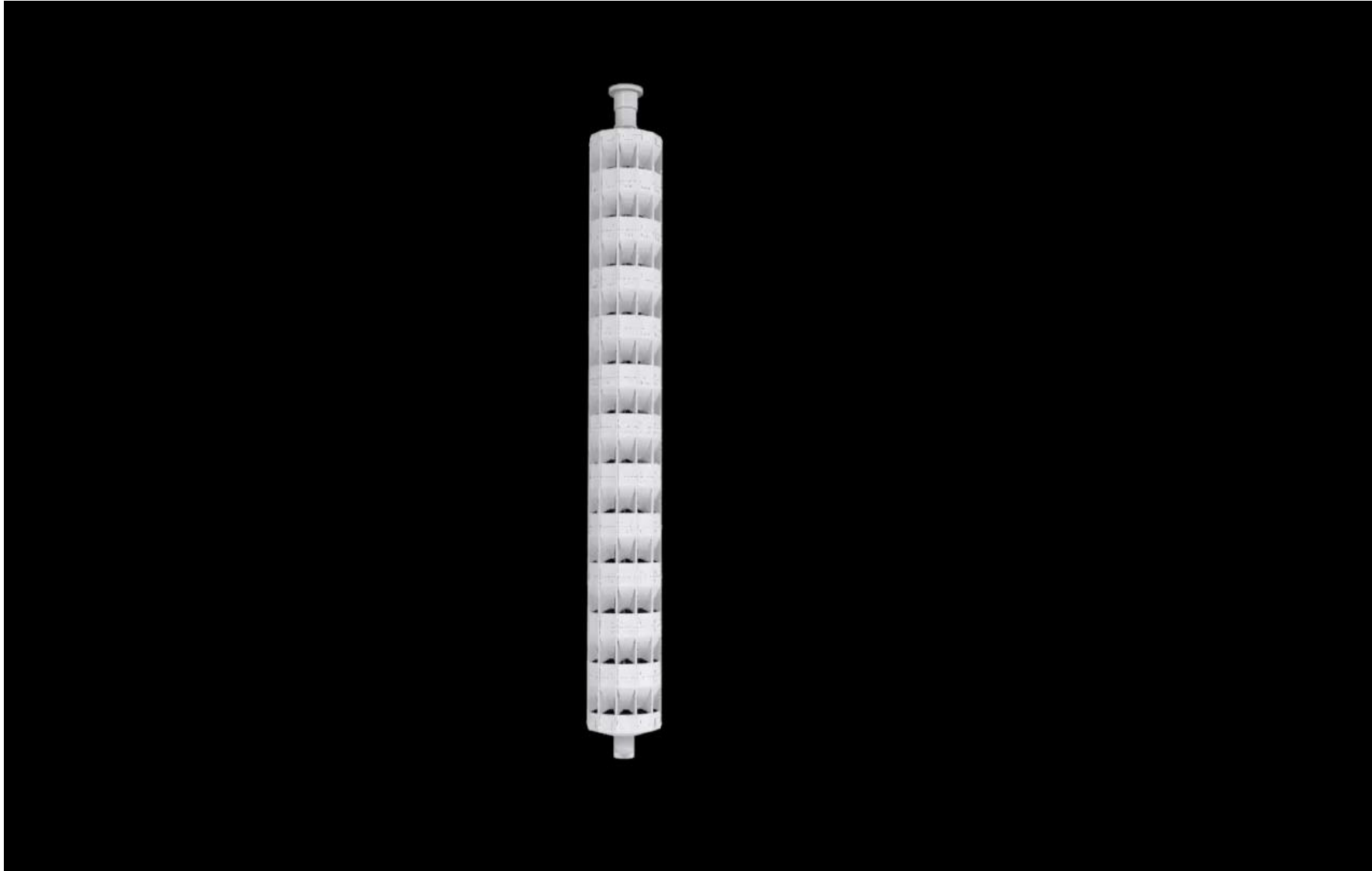
Grow360 vs Soil – Land Area Comparison

20160 Plants Land's Usage

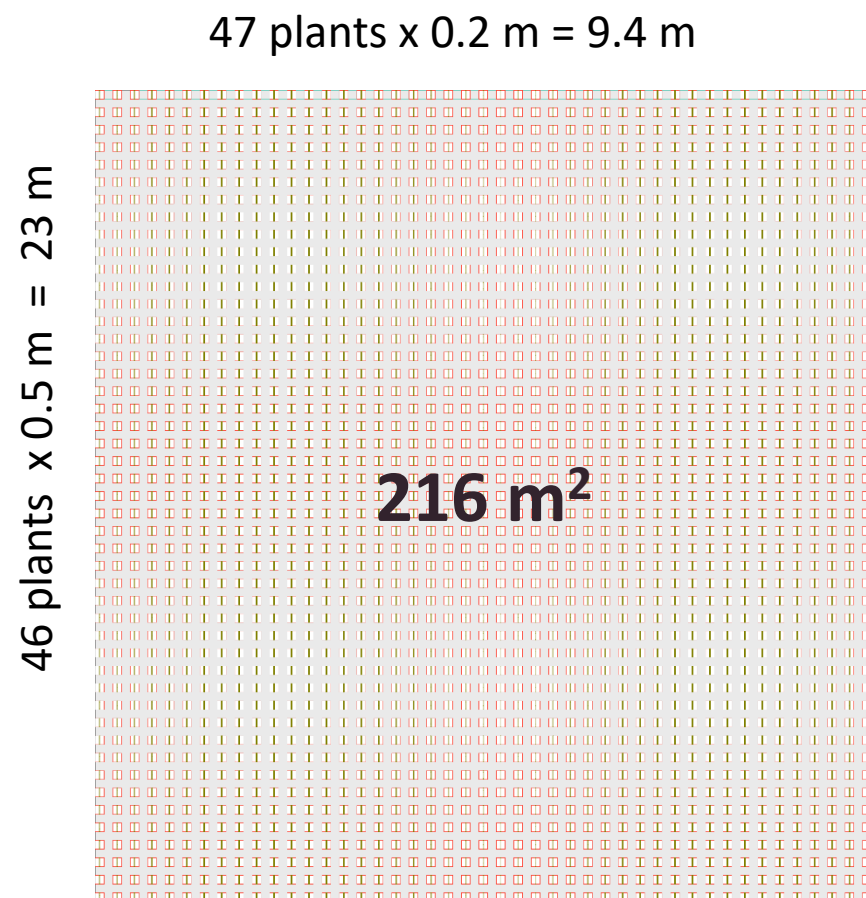For soil strawberries (min. requirement):
- 20 cm spacing in between plats
- 50 cm spacing in between rows

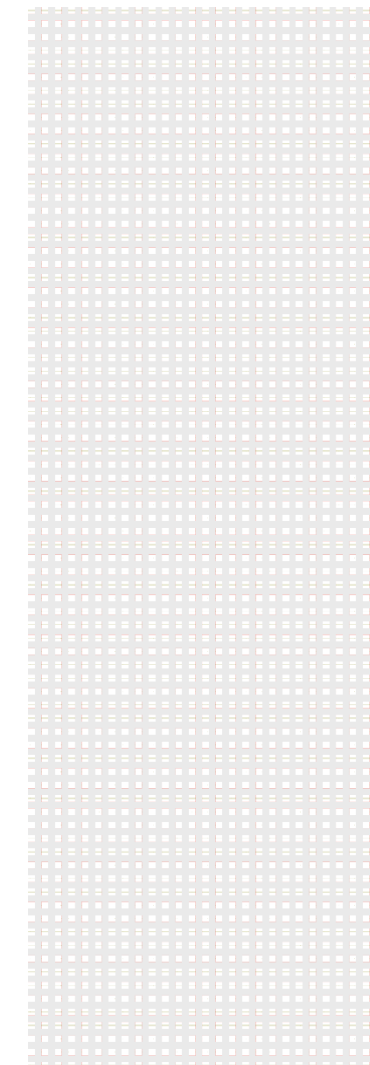46 rows of 47 plants each would have 2162 plants.

That would be an area 216 m^2.

Grow360 → 2160 plants in 9 m^2

Grow360 uses 24 times less land than soil.

47 plants x 0.2 m = 9.4 m

46 plants x 0.5 m = 23 m

216 m^2

Strawberry

Lettuce

Grow360 Production and Comparison

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1 Grow360 Unit

System's Area* [m^2]	# Plants in system	# Plants/m^2	# Harvests/year	Annual yield per m^2 [kg/m^2]**
9	2,160	240	18	1080

Company	Annual Yield per Meter^2 [Kg/m^2]	Energy per Day [kWh/day]	Energy per Kg [kWh/kg]
Evergreen Farm	1080*	55 kWh/day in 9 m^2	2.07
Bright Agrotech	230*	300 kWh/day in 10 m^2	47.61
Freight Farms	100	125 kwh/day in 30 m^2	15.21

* Facility space not included
**Weight per harvested crop is estimated from a combination of herbs, leafy greens, and heads of lettuce with an average weight of 250 g per plant and 18 harvests per year.

Vertical Farm Facility - Example

Grow360 in only 1 Level

Land area: 40 m x 40 m = 1,600 m^2

Level 1: over 100 Grow360 Units

100 Units x 2,160 plants = 216,000 plants

Stacking multiple Grow360 units

Height: 30 m

10 levels of Grow360 units = 1,000 units

1,000 Units x 2,160 plants = 2,160,000 plants
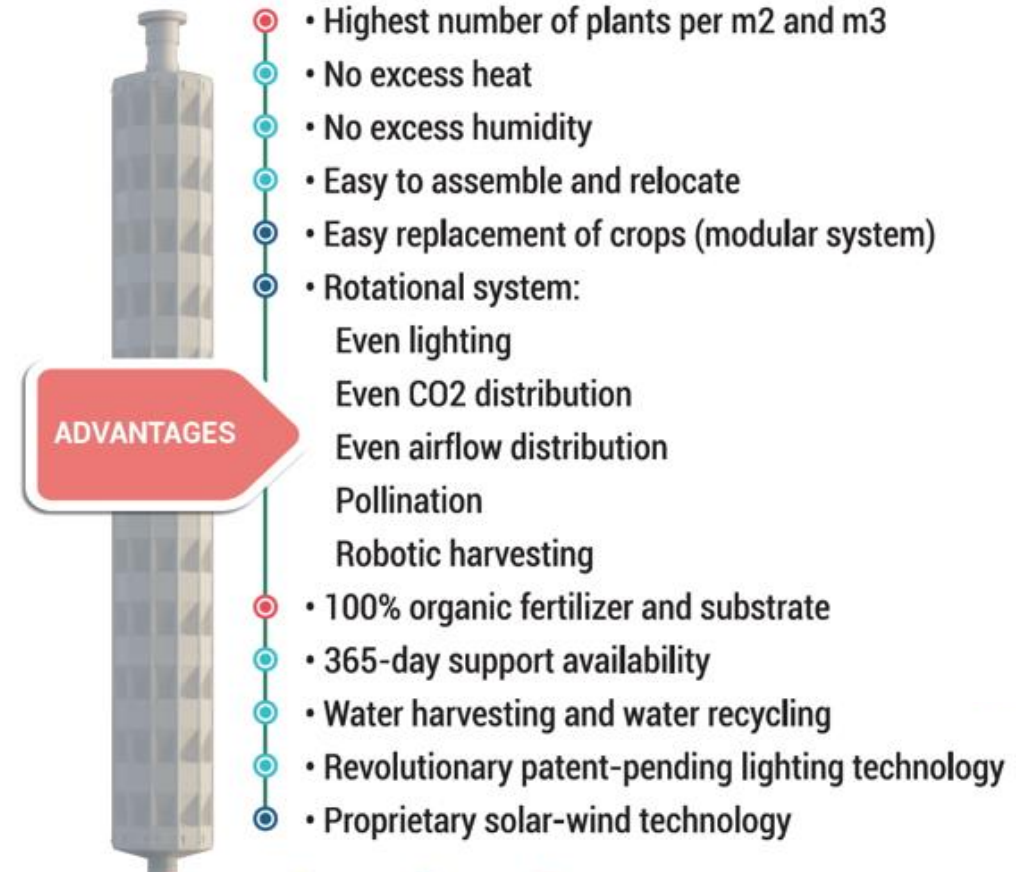
9,720,000 kg per year**

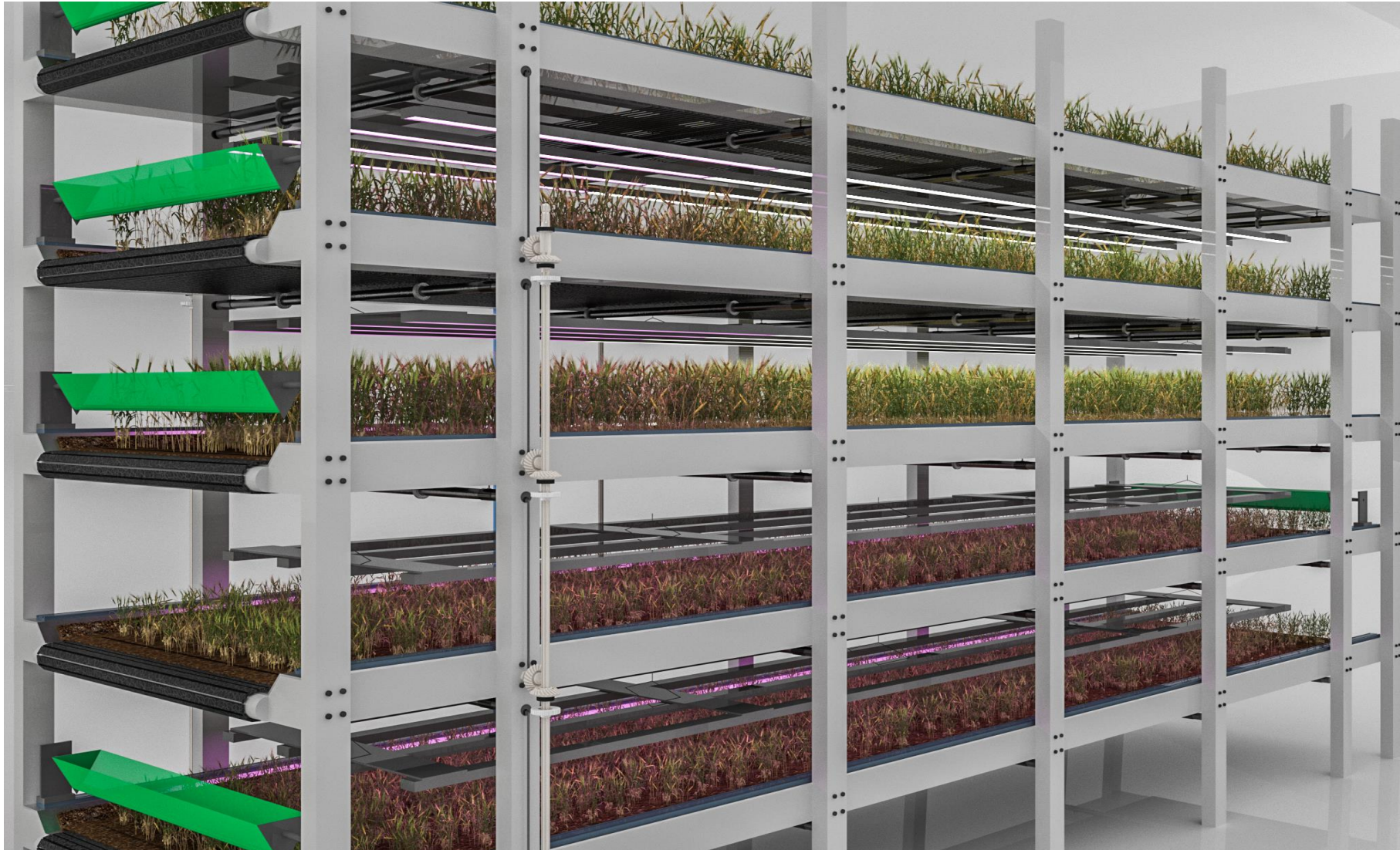## 9,720,000 kg per year

World's Largest Vertical Farm Production

Reasons for High Yield

Increased Growing Area	Wavelength Specific Lighting
Nutrients' Quality	Temperature Control
Humidity Control	Even Distribution of Resources
Pollination	No Pests

World's highest crop yield per m² and m³

ADVANTAGES

- Highest number of plants per m2 and m3
- No excess heat
- No excess humidity
- Easy to assemble and relocate
- Easy replacement of crops (modular system)
- Rotational system:
  - Even lighting
  - Even CO2 distribution
  - Even airflow distribution
  - Pollination
  - Robotic harvesting
- 100% organic fertilizer and substrate
- 365-day support availability
- Water harvesting and water recycling
- Revolutionary patent-pending lighting technology
- Proprietary solar-wind technology

Grain365 Specifications

The Grain365^{TM} unit dimensions:
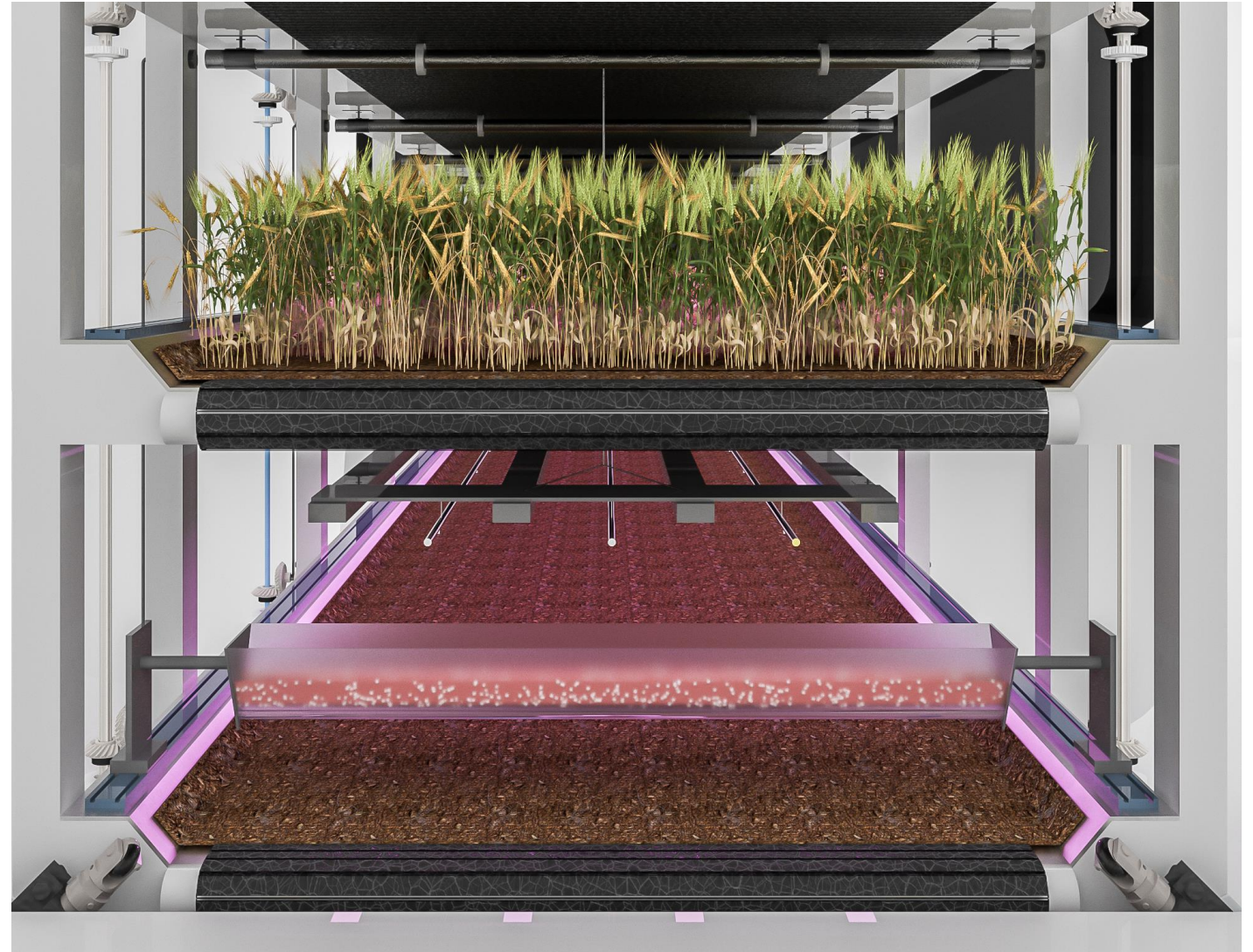- 10 x 2.5 x 0.8 meters

It also offers the ability to stack units on top of each other.

Grain365

Next steps:

- Production of Grain365 Prototype.
- Experimentation with a variety of dwarf species.
- Can grow anything from Microgreens to Corn. Eg. Potatoes, forage, rice, wheat, oat, saffron, flowers….
- Automated harvester design and development.
- Resource utilization measurements.
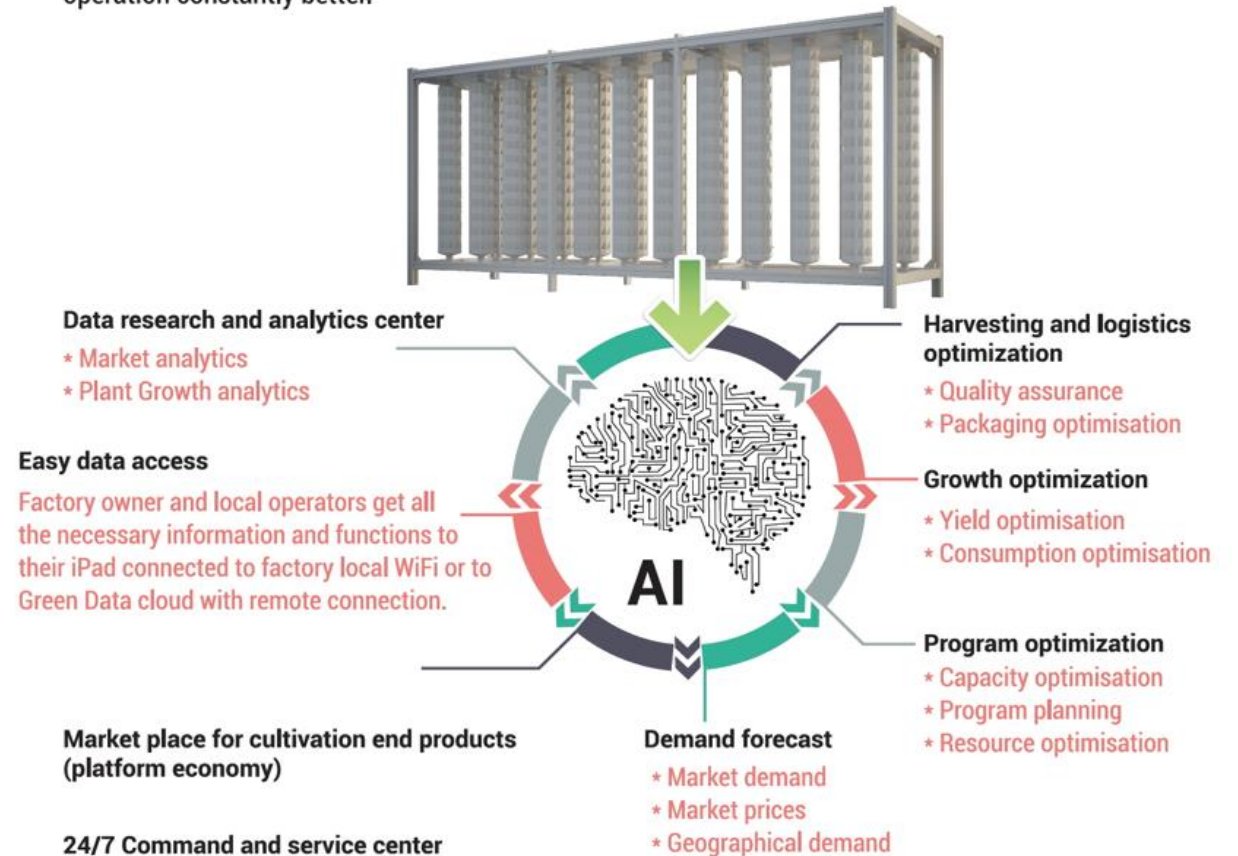
Artificial Intelligence

Optimization Software

With the aid of machine learning, a "branch" of artificial intelligence, our proprietary software, AIGrow™, utilizes data from current market prices, plant's growth patterns, resources usage, logistics processes and more, to determine and design an optimal crop planting schedule that maximizes financial gain.

In addition, our software reduces the learning curve of an inexperienced farmer.

ARTIFICIAL INTELLIGENCE BASED SYSTEM

Artificial Intelligence platform uses that data to train machine learning algorithms to make the operation constantly better.

Data research and analytics center
* Market analytics
* Plant Growth analytics

Easy data access
Factory owner and local operators get all the necessary information and functions to their iPad connected to factory local WiFi or to Green Data cloud with remote connection.

Market place for cultivation end products (platform economy)

24/7 Command and service center

Harvesting and logistics optimization
* Quality assurance
* Packaging optimisation

Growth optimization
* Yield optimisation
* Consumption optimisation

Program optimization
* Capacity optimisation
* Program planning
* Resource optimisation

Demand forecast
* Market demand
* Market prices
* Geographical demand

Automation

Proprietary software monitors and controls over 20 sensors and actuators, including:

Air
- CO_2
- Oxygen (O2)
- Ozone (O)
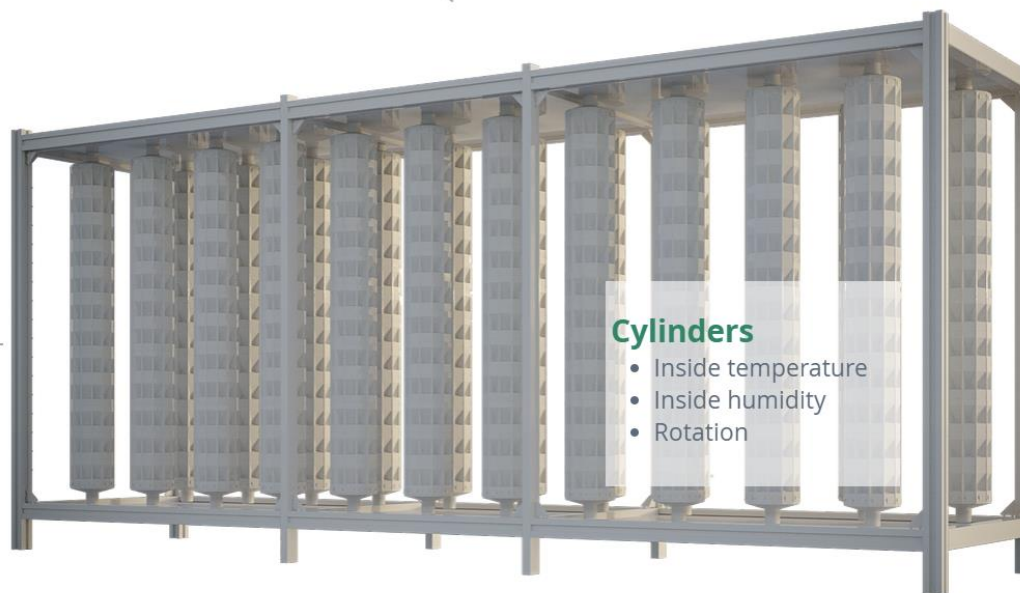- Temperature
- Humidity

Visual view of plants
- Green area index
- Growth status
- Diseases

Water
- Nutrition level
- Ph
- Flow
- Temperature
- Oxygen
- Consumption

Cylinders
- Inside temperature
- Inside humidity
- Rotation

Light
- Light wave lengths
- Illuminance
- Consumption

Harvesting
- Yield mass
- Quality
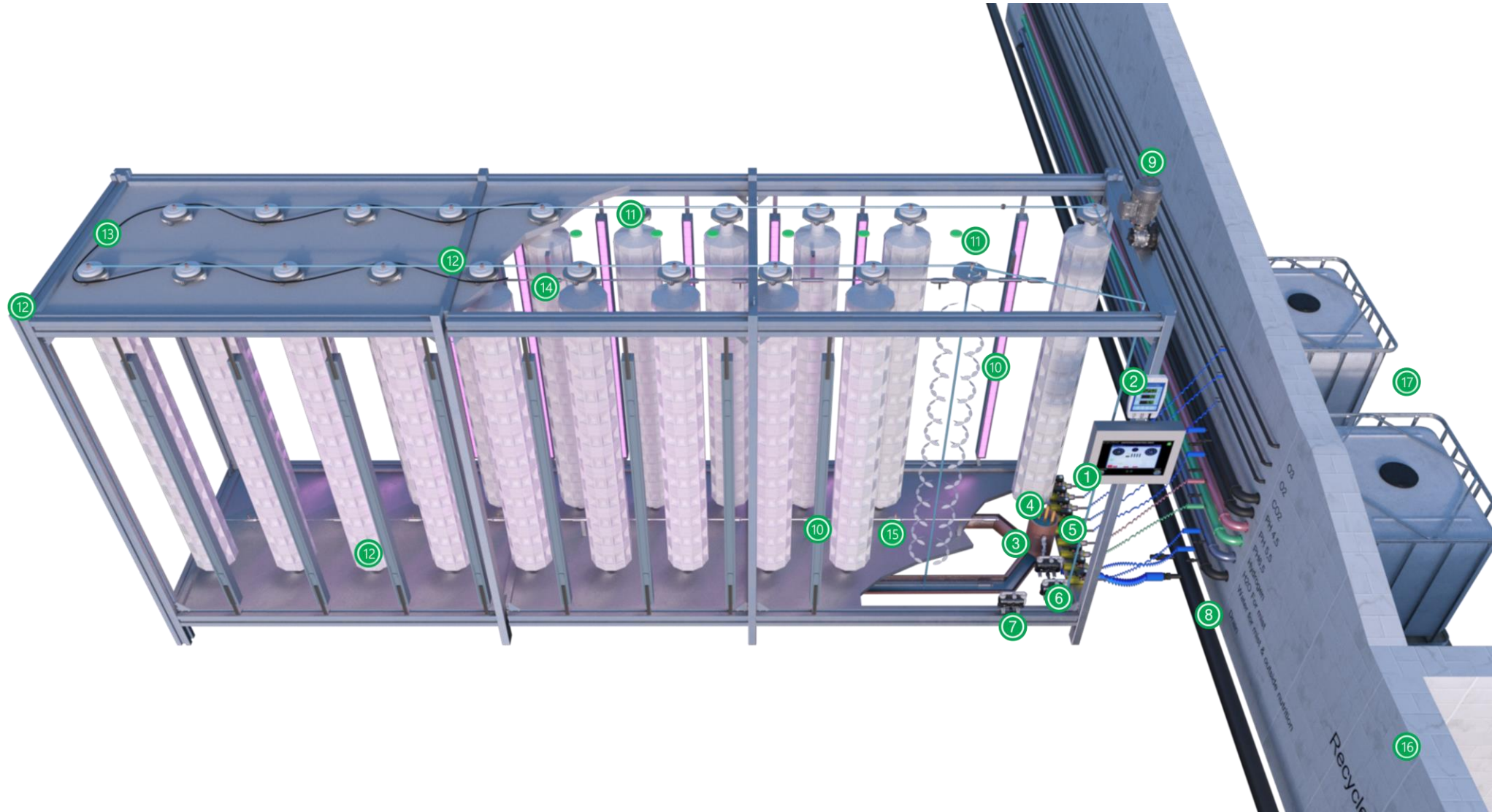
Automation

Robotic harvesting

Full system control

Proprietary software monitors and controls over 20 sensors

ROBOTIC SYSTEM / MAINTAIN, HARVEST, REPLANT

Robotic Harvester

Next steps:
- Adaptation of industrial robots.
- Experimentation with different end -effectors depending on crop.

Evergreen Farm - Sustainability

OUR COMMITMENT TO SUSTAINABILITY

Given that achieving sustainability is at the core of Evergreen Farm's values, detailed consideration was given to resources utilization e.g. energy consumption, water recycling, nutrients lifecycle analysis, and overall system's efficiency.

Growing Medium	• Sustainably harvested peat, moss, and biochar mix are used as the growing substrate as it combines many physical, chemical, and biological characteristics that makes them outstanding growing mediums.
Nutrients	• Our organically certified fertilizers are obtained from recycled and recovered organic material.
Zero-Waste	• The recovered biomass will be fed into a bio digester for the production of methane. The organic nutrients and leftover mulch will be used to produce organic baskets, eliminating the need for plastic ones, therefore reducing fossil fuel dependency, GHG emission, and waste.
Energy Efficiency	• A revolutionary patent-pending lighting technology with no heat production will provide illumination with the most appropriate wavelengths for each specific crop. This highly efficient technology consumes 400 times less energy than conventional LED Systems.
Renewable Energy	• 100% electric grid independence can be achieved through the use of our patented cost-effective solar & wind technology. Our solar and wind collector brilliantly integrates solar thermal, solar PV, and wind energy in a single compact, and efficient structure to provide renewable and clean energy, for electricity and water heating.

Lighting Technology

Current technology:
- Each Grow360 unit uses 17 fixtures of 190W each. (for up to 18hrs/day)

Specification of LED fixture:
- 1.756 m
- 190 W

17 fixtures x 1.756 m = **29.85 m of LED fixtures**
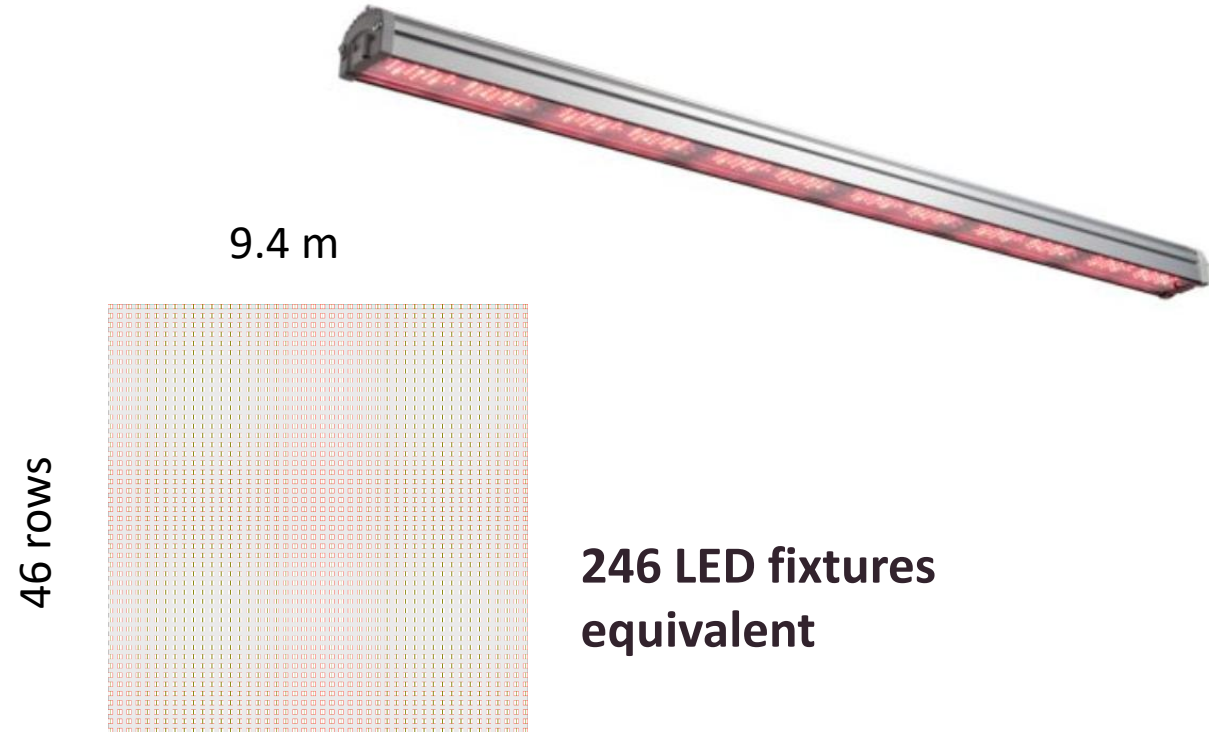
17 x 190 w = 3.2 Kw

Comparing with other layouts:
- 9.4 m of fixtures in one row (46 plants)
- 46 rows

9.4 x 46 = **432 m of LED fixtures**

246 x 190 w = 47 Kw
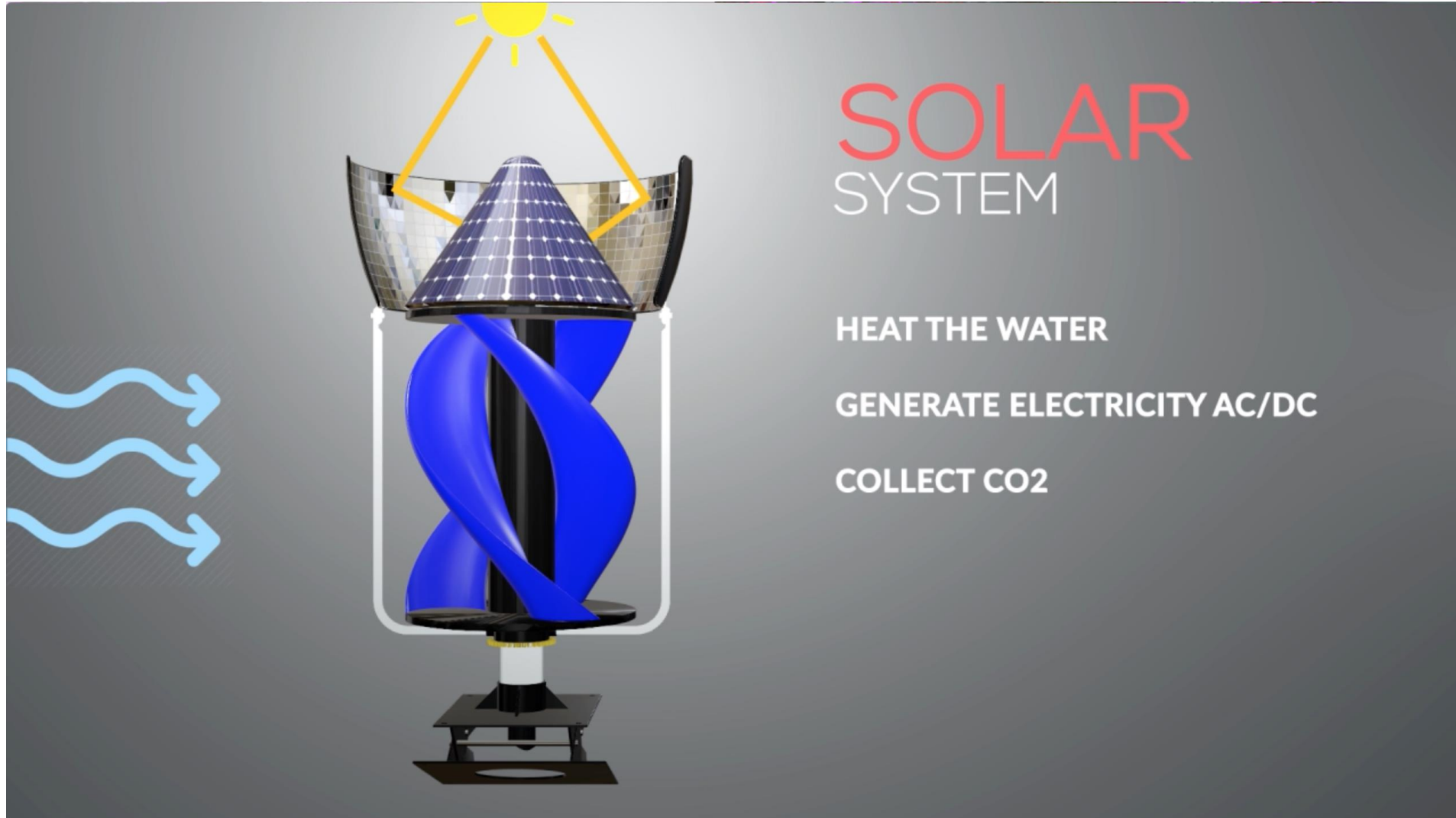
9.4 m

46 rows

246 LED fixtures equivalent

Grow360 uses 15 times less energy than greenhouse.

New Technology Under Development
Development of our new Light Technology with collaboration of Tampere University of Technology is underway.

Solar Wind Collector

Is Vertical Farming Sustainable?

Sustainable

- Energy Efficient
- Renewable Energy
- Organic Nutrients and Substrate

Non-Sustainable

- Energy Intensive
- Non-Renewable Energy
- Synthetic Nutrients
  - Hydrocarbons
  - (or Mining)

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Evergreen Farm - Sustainability

Ecosystem Restoration
- 100% organic fertilizer and substrate.
- 100% electric grid independence through the use of cost-effective solar & wind technology.
- Revolutionary patent-pending lighting technology.

Highest Yields
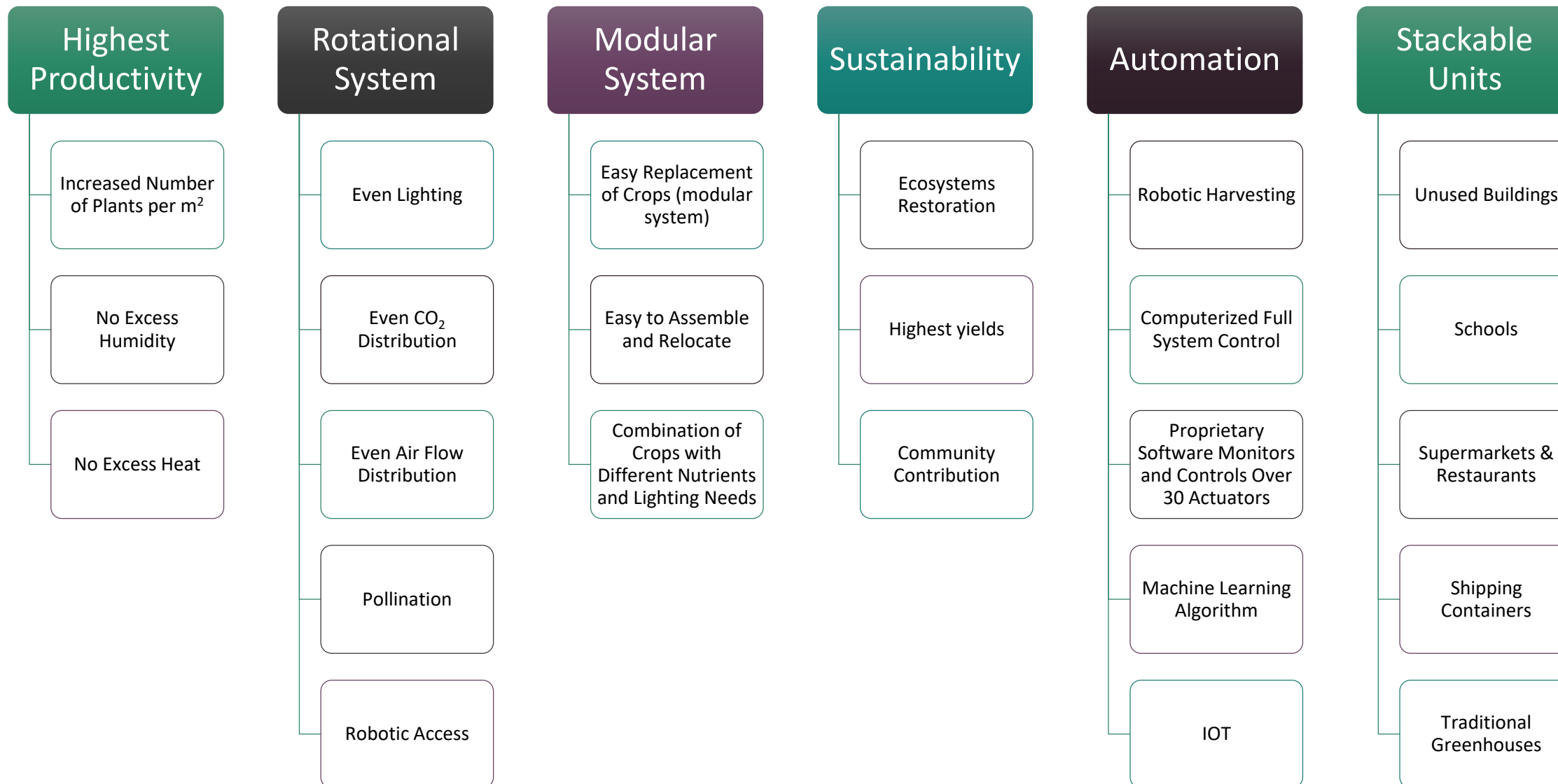- Increased number of plants and productivity per m^2.
- 4 times more productive than the most efficient vertical farm system.
- Over 20 times more productive than traditional hydroponics in just one layer.

Community Contribution
- Nutritious, healthy, and delicious food.
- Affordable and accessible food.
- Dignifying and meaningful jobs.
- Education and growth.

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Grow360– The Future of Farming

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Highest Productivity
- Increased Number of Plants per m²
- No Excess Humidity
- No Excess Heat

Rotational System
- Even Lighting
- Even CO₂ Distribution
- Even Air Flow Distribution
- Pollination
- Robotic Access

Modular System
- Easy Replacement of Crops (modular system)
- Easy to Assemble and Relocate
- Combination of Crops with Different Nutrients and Lighting Needs

Sustainability
- Ecosystems Restoration
- Highest yields
- Community Contribution

Automation
- Robotic Harvesting
- Computerized Full System Control
- Proprietary Software Monitors and Controls Over 30 Actuators
- Machine Learning Algorithm
- IOT

Stackable Units
- Unused Buildings
- Schools
- Supermarkets & Restaurants
- Shipping Containers
- Traditional Greenhouses

Evergreen Farm's 2018 Achievements

Evergreen Farm's Achievements

- Received a congratulations e-mail from the office of Mr. President Sauli Niinistö.

- Won "Best Indoor Farming Innovation" award during the Global Forum for Innovations in Agriculture (GFIA) between 600 worldwide companies, issued by the Minister of State for Food Security of the United Arab Emirates.

- Nominated and moved to short list in United Nation World Summit Award.

Evergreen Farm's 2018 Achievements

- Multiple individuals and organizations throughout the world (e.g. Turkey, Kingdom of Saudi Arabia, Kuwait, Mexico, Egypt, India, and France) have expressed keen interest in the Grow360 system. Negotiations are already in place with some of them.

Community Engagement

Leveraging Farming Facilities

Evergreen Farm also aims to actively engage with the community through a series of activities, such as:

- Scheduled tours of the state-of-the-art facilities.
- Weekly produce sold directly to consumer (farm-to-consumer).
- Children engagement through school programs.
- Sustainability and farming education.

These will help break the current paradigm that disconnects farming with high technology.
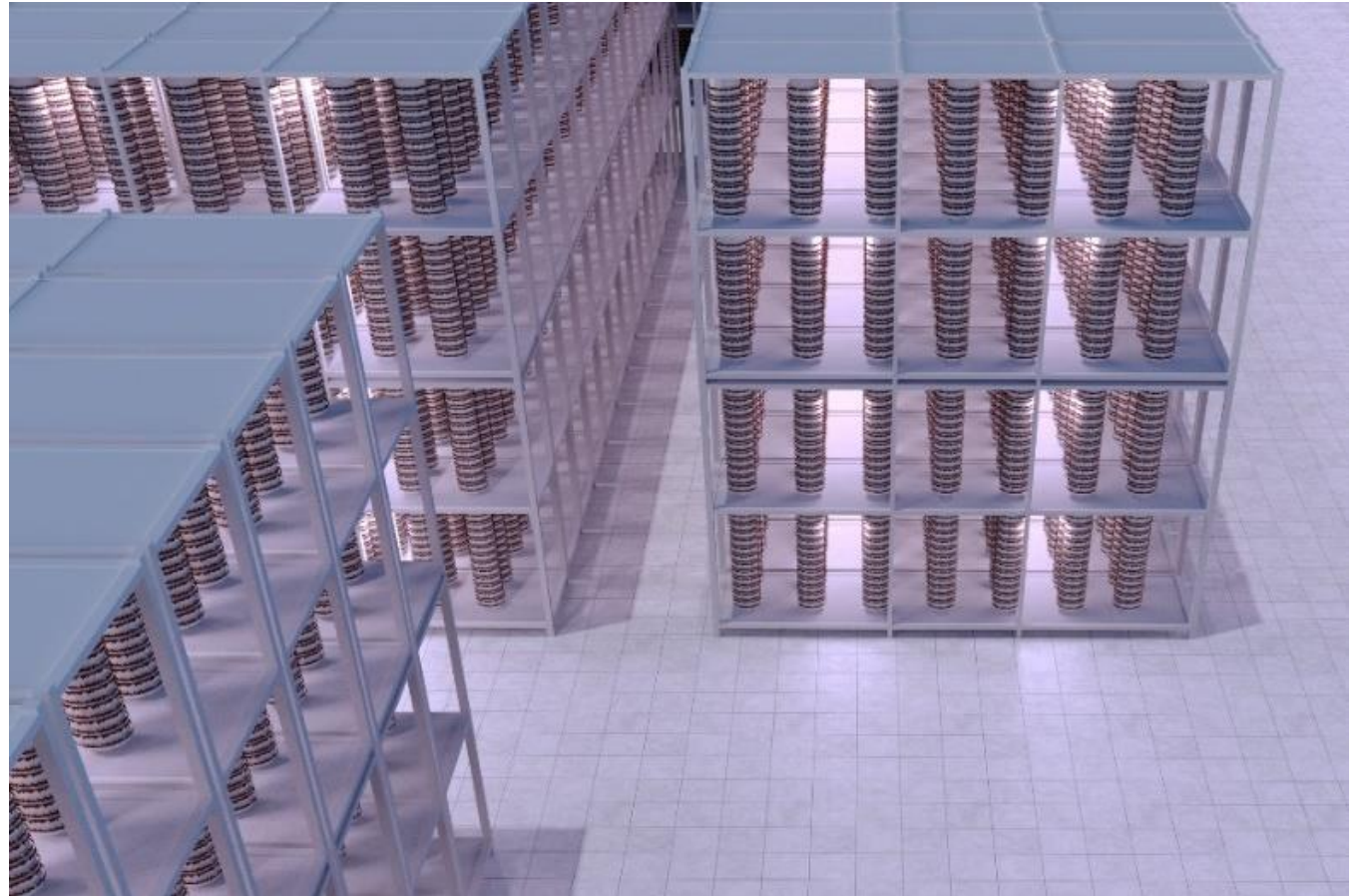
Evergreen Farm's as a Community Hub

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Lively Community Hubs

Evergreen Farm facilities can act as community hubs and food production centers to help produce lively community environments.

Sustainable food production plays a key role within any vision of a sustainable community. As such, we aim to produce local, fresh, organic, healthy, and delicious fruits, vegetables, and flowers to meet the demand of local inhabitants. By doing so we will ignite the generation of dignifying jobs, new business, and pleasant environments.

Dignifying Jobs	• Employment generated by sustainable vertical farms will have the added value of being meaningful. People will be directly contributing to the wellbeing of the community, eradicating hunger and mitigating climate change.
Emerging Business	• We envision community members that are inspired to start businesses and projects around the farm, such as juice bars, organic restaurants or coffee shops (leveraging on the farm-to-table movement), farmer's markets, permaculture outdoor farms, community gardens, green roofs and walls, etc.
Pleasant Environment	• All of these will not only make the vertical farm surroundings more pleasant for humans, but they will also provide habitat and nourishment for a variety of wildlife, making the overall area even more appealing.

Smart Cities

Evergreen Farm's objectives support the development of smart cities:

Sustainable and Intelligent District
- Evergreen Farm produces food locally, recycles its own water and waste, utilizes other industries' waste, and generates employment.
- School programs where teachers can show students not just how to grow food but also about technological aspects. Students and staff will also benefit from fresh and healthy produce, and in the case of surplus, sales and marketing can be learned hands-on.
- Evergreen Farm uses IOT for controlling and receiving input from the multiple subsystems, as well as from other farms and markets.

**Attractive Business Environment and Desirable Environment**
- Through community engagement programs it will support the emergence of other local businesses and the concentration of groups and events. This will stimulate the generation of employment and the organization of community events, thus creating a safe and desirable neighborhood with a blend of a nature and urban character.

Circular Economy

Circular Economy – Leading by Example

Evergreen farm supports the circular economy model by demonstration. Due to our deep commitment to sustainability, almost every aspect of our production processes follows a basic principle: **"what is waste for one part of the process is a nutrient to another part of the process".** This maybe within Evergreen Farm facilities or in cooperation with our partners.

We hope that by educating the community by example, this will become the prevalent paradigm, which will result in more companies designing with the end of their products in mind (design for recycling), the emergence of more recycling facilities, and the development of product reclaiming infrastructure.

Image: European Parliament

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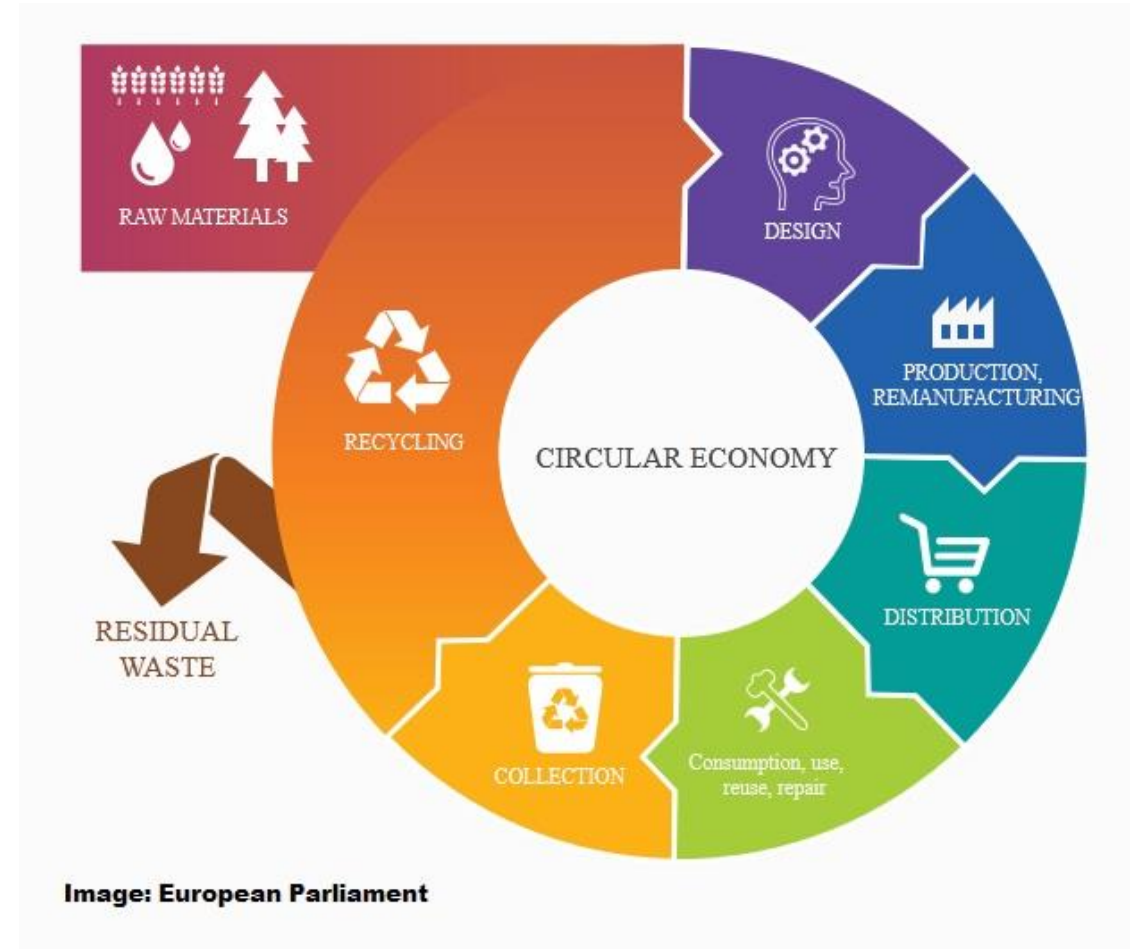
Volunteering

Multiple opportunities for volunteering will be available. Volunteer will not only gain valuable skills but they will also be able to participate and become part of a community.

Training

Evergreen Farm will offer high quality training in usage, operation, and maintenance of our multiple systems, as well as farming techniques, and trainers' training.

Evergreen Farm is an equal-opportunity employee that supports vulnerable communities and at-risk youth. Offering green pathways out of poverty through education and "green-collar jobs".