



ERGOPONIC PROJECT

Hydroponic containers

Freight Farms Greenery™ Technology

What is a hydroponic technology



Hydroponics is more than just another way to grow plants - the technology has the potential to change the way we engage in food growing as a whole! For the first time since humans began tilling the land, modern hydroponic technology frees us from the soil beneath our feet, allowing us to bring food production indoors where we can layer on additional climate and lighting controls. The result is the ability to grow food permanently, anywhere in the world.

The project to develop a hydroponic/bioponic farm is one of the agricultural production solutions of the future. It is clean, healthy, sustainable and profitable to meet the needs of an ever more pressing and demanding population on quality, choice, price, meeting the requirements of the short circuit, a reduced carbon footprint, pesticide-free, eco-responsible and innovative.

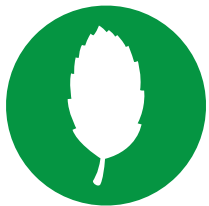
On the contrary of more traditional farming methods, plants grow vertically inside the container thanks to a plug and a constant supply in nutrients, water and LED lights. This independence enables the container farm to avoid the seasonality effect as it would produce under most conditions all year long.

The farm is today capable of producing the equivalent of 2.5 acres of crops grown in a conventional farm. This number would vary depending on the type of plant you would grow.

Summary



What can we grow?



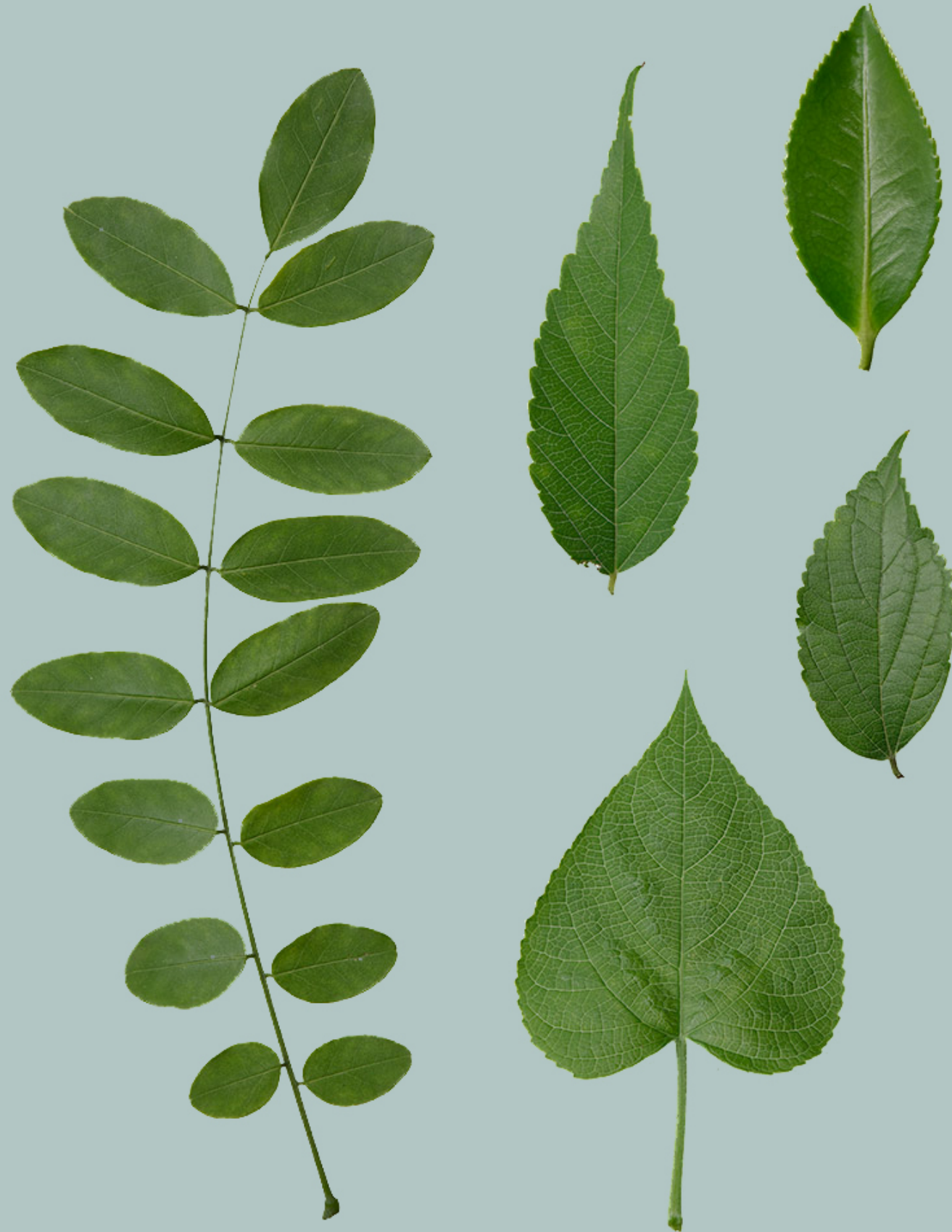
What is the production process?



What do you need to grow?

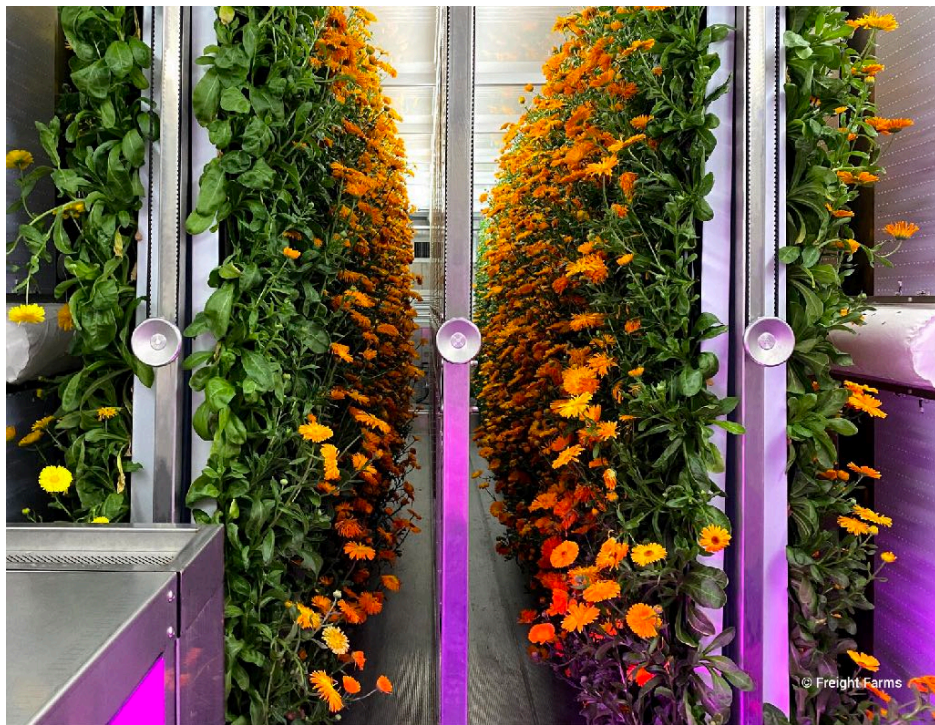
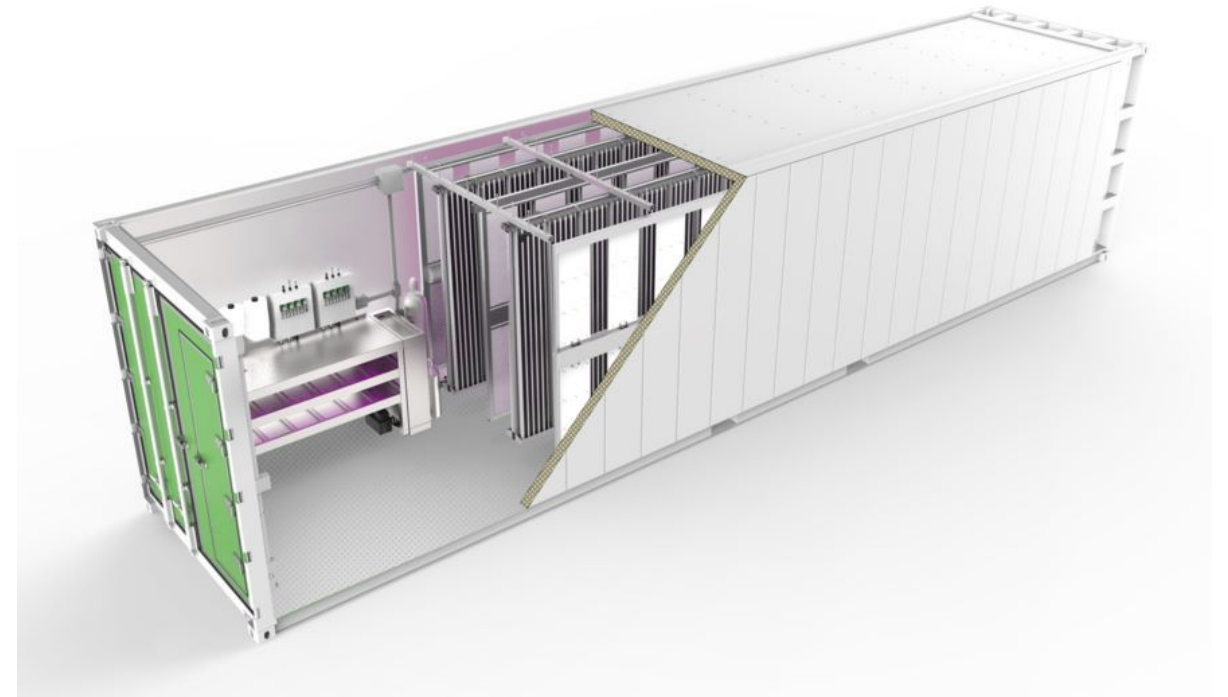


Future innovations



What can we grow?

The container can grow more than 500 different varieties of lettuces, aromatics, leafy-greens, ornament plants at a commercial scale. Certain fruits and flowers can also grow inside the farm such as strawberries, cherry tomatoes...



- ▶ Possible weekly harvesting calendar and production output:

Butterhead lettuce:

3 weeks grow*: 1,450 heads

4 weeks grow: 990 heads

5 weeks grow: 700 heads

*This an example of growing duration, the lettuce can be sold by heads or g/kg depending on your location. These projections are liable to local characteristics and are thus not a guaranteed performance.

- ▶ Other leafy greens

Arugula = 32 kg per week

Kale = 45kg per week

- ▶ Aromatics

Basil = 40kg per week

Chives= 25kg per week

Parsley = 40kg per week

- ▶ Flowers

Calendula, Celosia, Nasturtium, Nigella, Viola, Yarrow

Yarrow, Zinnia



What is the production process?

1- The nursery:

The cycle:

Seeding

The life cycle of the plant begins when the seeds are planted in peat clods. The peat itself does not provide nutrients to the seed. Instead, the pH-balanced plug acts as a sponge to absorb nutrient-rich water and, as the seedling matures, contains and supports the plant's developing root structure.

Sprouting

To activate germination, the seeds and clods require a one-time soaking in nutrient-rich water, after which they are covered with a moisture dome and left to grow. After a week, the seeds become sprouts, characterised by small roots, short stems and some immature leaves.

Seedling growth

Within two weeks, the shoots develop into seedlings - taller, more robust plants with a secure root system. During this time, the seedlings need constant access to water and light:

- ▶ Young plants automatically receive nutrient-rich water and direct light based on farmhand® programming to develop strong stems that support the weight of the plant later in its life cycle.





2- Growth

Transplanting

The seedlings are transplanted into the main growing area where they grow vertically. The roots (still in the peat growth plug) are wedged into the rigid foam of the plant panel, which provides firm support and access to nutrient rich water. The plants face outwards towards the LED arrays, exposing the leaves to the strong directional light and encouraging them to grow.

Leaf growth and harvest

Depending on the desired size and weight at harvest, the plants spend 2 to 5 weeks in the growing area of the container. During this time, the leaves acquire their rich green, purple, or red colour and identifying flavour. When the time comes, the plants can be harvested (remove the entire plant, including the roots) or pruned (cut off the mature leaves while the roots and small leaves remain).

Flower growth

All plants have a vegetative phase, at which point many are harvested. However, other plants may continue to grow and develop flowers, and even 'fruits' (these can be fruits, vegetables or berries). Flowering and fruiting crops can be grown in conjunction with greens using hand pollination techniques, or the greens operator can concentrate solely on flower and fruit production by switching to specialised nutrients that maximise yields.

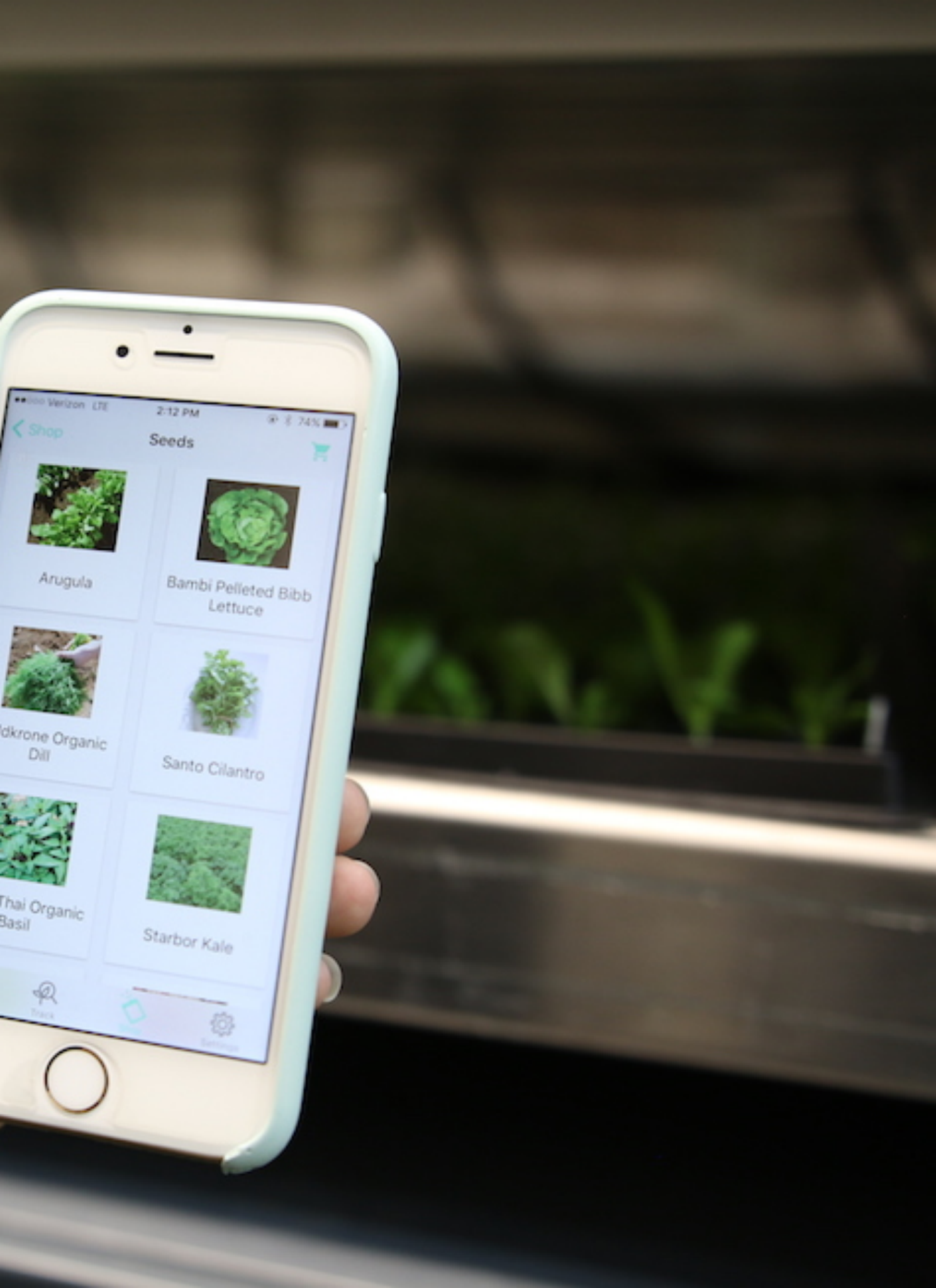


3- Lighting

Lighting up the room

Dotted with evenly spaced LEDs, the waterproof LED panels are reinforced by a rigid aluminium frame that focuses the light directly on the crops.

The container's 120 LED panels in total are deliberately designed to emit only selected wavelengths of red and blue light, the colours that plants are able to absorb most readily for photosynthesis. Each colour has a specific purpose. Red light is essential for stem and leaf growth. Blue light helps develop thick stems and dark green foliage while promoting chlorophyll production.



4- Farm control

Growth control

The crop controller is directly linked to farmhand®, compiling and transferring sensor data directly to the application. In addition, the crop controller functions as a control panel on the farm: operators can turn components on and off while performing farming, cleaning or maintenance activities.

Camera

Keep a watchful eye on the greenery with a camera connected to a farm worker. Use the camera for added security or stitch together photos to create time-lapse. Easily add additional cameras, available for purchase from the farmhand® Shop.

Farmhand®

Available for iOS and desktop, farmhand® allows the operator to remotely monitor and control the farm from anywhere in the world, ensuring that all Greenery's internal components are working properly.

Speakers

Create a pleasant working environment with ambient music from the container's two Dayton Audio IO525 high-end weatherproof Bluetooth® speakers. By creating small vibrations in the air, the music can stimulate plant growth and strengthen plant cells.



What is the consumption?

Electricity

The container requires a 100 amp, 120 volt split phase connection. (A three phase 120/208 volt connection is also acceptable).

Water

The container uses an average of 19 litres of water per day. The site should have access to water within 50 feet, and operators can schedule regular water deliveries.

Supplies

Operators can purchase supplies from any supplier or easily replenish them via the farmhand® Shop. Everyday consumables include peat moss plugs, seeds, nutrient solutions and cleaning products.

WIFI

A WiFi signal is required for farmhand® connectivity. Farmhand® will use approximately 1 GB per month per container.

Leafy Green Machine
DIAGRAM



SPECIFICATION OF THE GREENERY

Container Technical Data Sheet

Items	Description	
Container		
	Dimensions	40' x 8' x 9.5'
	Insulation	R-28 Department of Energy Insulation Rating
BARD Climate Control Unit		
	Air Conditioner	3 ton 36,000 BTU Max. Packaged unit with integrated dehumidifier & economizer
	Economizer Air Intake	1,100 CFM
	Moisture Reclamation	1.88 gal. / hour at 75oF, 65% relative humidity
	A/C Efficiency Rating	11.0 EER
	A/C Refrigerant	R-410A
	A/C Certifications	AHRI, ETL
	A/C Coil Style	Aluminum-finned copper
Fans		
	Exhaust Air Speed	141 CFM
	Air Exchange Rate	Up to 6 exchanges/hour
	Overhead Fan Ventilation	880 CFM
	Ducted Fans Ventilation	473 CFM
	Ducted Fans Diameter	8 in.
CO₂ Regulator		
	Regulator	Precision Regulator with Heavy-Duty Solenoid Valve

Items	Description	
LEDs		
Overview		
	Red LED Photosynthetic Wavelength	660nm
	Blue LED Photosynthetic Wavelength	450nm
	LED Board Waterproof Rating	IP65
	LED Diode Blended Efficiency	2.7 $\mu\text{mol/joule}$
Nursery Station		
	Number of LED Boards	8
	LED Boards Dimensions	4.3 in x 43.3 in
	LED Array Intensity	200 $\mu\text{mol/m}^2\text{s}$ average
	LED Array Ratio	4:1 red / blue
	LED Wattage	164W per trough, 328W per station
Cultivation Area		
	Number of LED boards	112
	Number of LED Arrays	4
	LED Boards Dimensions	38.5 in x 13.75 in
	LED Array Intensity	250 $\mu\text{mol/m}^2\text{s}$ average
	LED Array Ratio	5:1 red / blue
	LED Wattage	2,030W per array, 8,120W total
Worktable & Nursery Station		
Nursery Station		
	Seedling Capacity	Up to 4,608

Items	Description	
	Seedling Tray Capacity	16 200 or 288-cell trays
	Number of Seedling Troughs	Two full-width seedling troughs
Worktable		
	Table Dimensions	90 in x 27 in x 43 in
	Table Construction	TIG-welded stainless steel
Hydroponics		
Irrigation		
	Circulation Pump Filtration	6 Nylon Monofilament Meshes
	Aeration System	793 gal. / hr. fluid oxygenator
	Mesh Rating	75 micron
	Number of Peristaltic Dosing Pumps	8
	Peristaltic Dosing Pumps Flow Rate	50 mL/min
Nursery Station		
	Hydroponic System	Ebb and flow configuration
	Seedling Tank Capacity	38 gal.
Cultivation Area		
	Hydroponic System	Overhead drip configuration
	Main Tank Capacity	110 gal.
	Plumbing	NSF61 PVC
	Drip Emitters	Self-flushing, clog-resistant

Items	Description	
	Drip Emitter Flow Rate	2 gallons/hour
Plant Panels & Adjustable Rows		
Plant Panel		
	Plant Panel Design	5-channel
	Plant Panel Construction	High impact polystyrene
	Plant Panel Growing Medium	Inert reticulated foam
	Total Number of Panels	88
	Total Number of Channels	440
	Combined Linear Growing Space	36,960 in/ 3,080 ft/ 3.6 acres
Adjustable Rows		
	Number of Grow Rows	4
	Adjustment System	Rack and pinion
	Rack System Load-bearing Capacity	1,300 lbs max.
	Number of Frames	3
	Frame Construction	Aluminum
	Track Construction	Anodized aluminum
	Carriage Construction	Anodized aluminum, rubber-coated wheels
Tech		
Grow Controller		
	Number of Controlled Outputs	32
	Number of Spare Outputs	1

Items	Description	
	Number of Controlled Inputs	8
	Number of Spare Inputs	6
	Zones & Sensors	2 Hydro zones (pH, EC, and temperature sensors) 1 Climate zone (Temp, RH%, CO ₂) 2 Water level sensors (Nursery Station Tank, Cultivation Area Tank)
farmhand®-Connected Camera		
	Number of Cameras	1 Amcrest ProHD Shield Wireless IP Security Camera
	Camera Data Storage	MicroSD and Cloud Storage
	Camera Resolution	960P 1.3 Megapixel (1280*960P) 140° Viewing Angle Digital Zoom & Night Vision
Bluetooth® Speakers		
	Number of Speaker	2 Dayton Audio IO525 Speakers
	Speaker Connection	Bluetooth®-connected
	Speaker Construction	Weather resistant ABS plastic enclosure and aluminum grills Polypropylene 5-1/4” woofer Metalized Mylar 1” dome tweeter