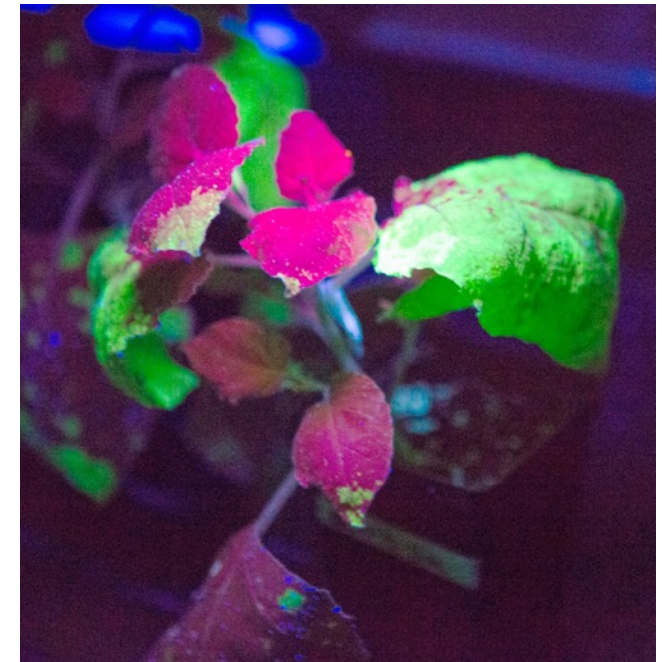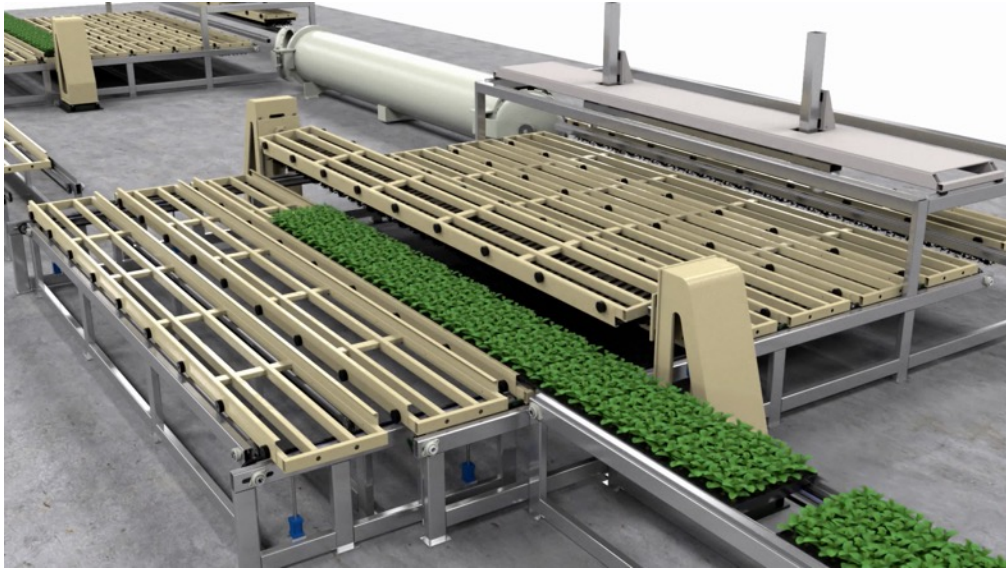# Partnership with PlantForm Corporation
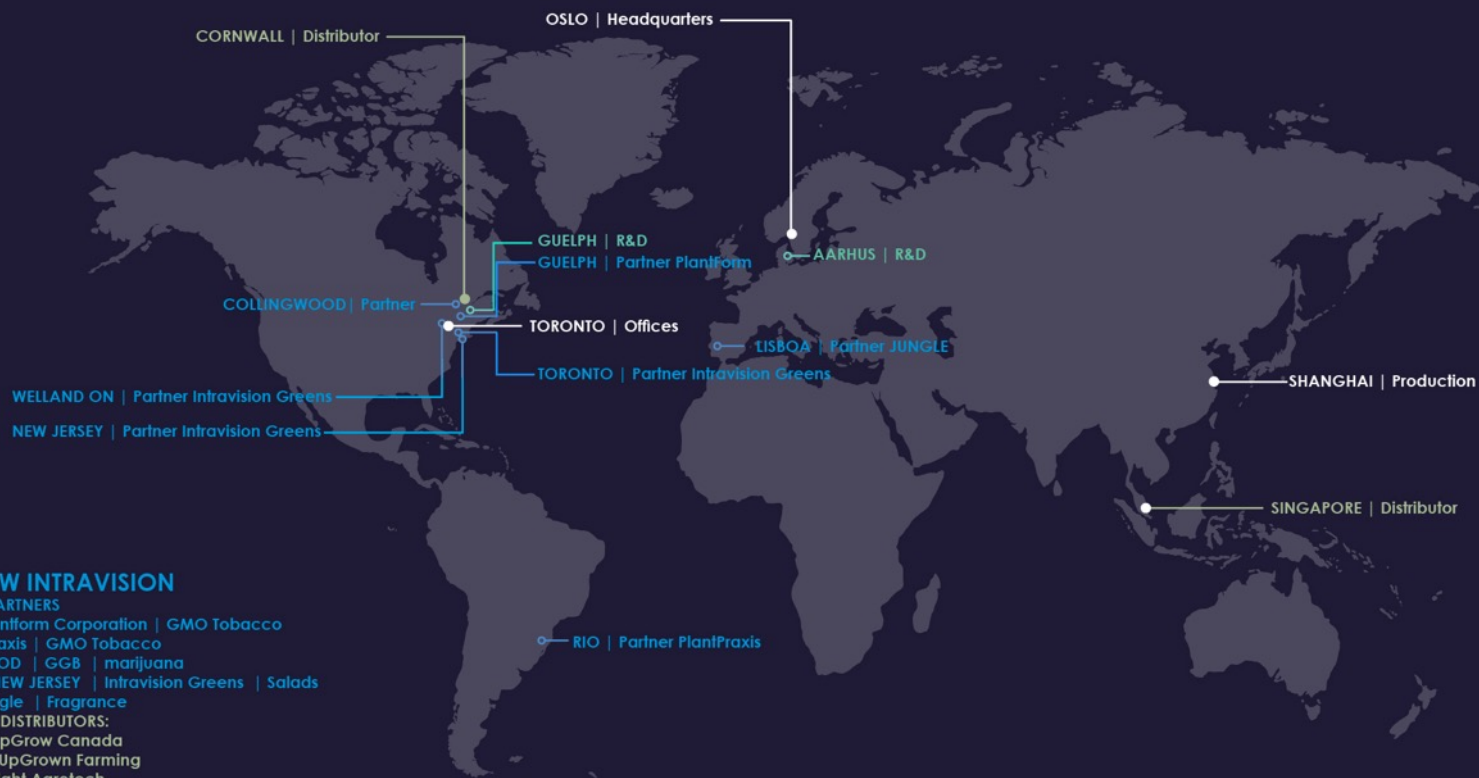# MOLECULAR FACTORY: GRAVITYFLOW

2015 Starting point:

PlantForm Corporation: Canadian biotech company producing biosimilar drugs and vaccines through GMO agrobacteria infiltration of the tobacco plant *Nicotiana Benthamiana.*

Intravision patent: Vacuum infiltration of transgenic tobacco

PlantForm patent: Biosimilar Herceptin in transgenic tobacco plant.

CORNWALL | Distributor

OSLO | Headquarters

GUELPH | R&D
GUELPH | Partner PlantForm

AARHUS | R&D

COLLINGWOOD | Partner

TORONTO | Offices

LISBOA | Partner JUNGLE

WELLAND ON | Partner Intravision Greens

TORONTO | Partner Intravision Greens

NEW JERSEY | Partner Intravision Greens

SHANGHAI | Production

SINGAPORE | Distributor

RIO | Partner PlantPraxis

OVERVIEW INTRAVISION
STRATEGIC PARTNERS
GUELPH | Plantform Corporation | GMO Tobacco
RIO | PlantPraxis | GMO Tobacco
COLLINGWOOD | GGB | marijuana
TORONTO - NEW JERSEY | Intravision Greens | Salads
LISBOA | Jungle | Fragrance
AGENTS and DISTRIBUTORS:
Cornwall | ZipGrow Canada
Singapore | UpGrown Farming
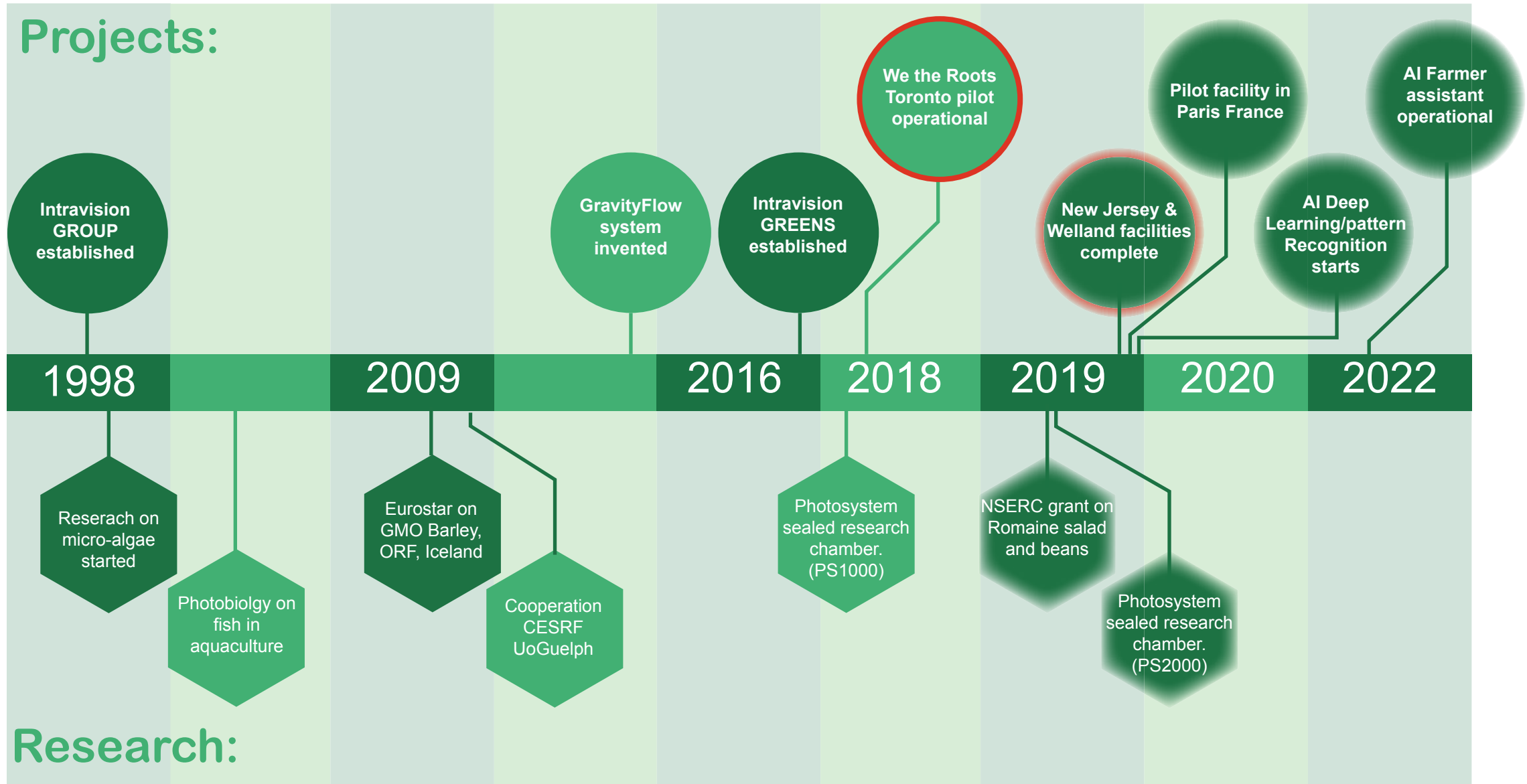Laramie | Bright Agrotech

RESERACH PARTNERS
GUELPH | R&D
AARHUS | R&D

INTRAVISION

The GravityFlow system - a "high-tech/ low-tech"

The Intravision Timeline:

INTRAVISION

Projects:

- **Intravision GROUP established** — 1998
- **GravityFlow system invented** — 2016
- **Intravision GREENS established** — 2016
- **We the Roots Toronto pilot operational** — 2018
- **New Jersey & Welland facilities complete** — 2019
- **Pilot facility in Paris France** — 2020
- **AI Deep Learning/pattern Recognition starts** — 2020
- **AI Farmer assistant operational** — 2022

Timeline years: 1998 · 2009 · 2016 · 2018 · 2019 · 2020 · 2022

Research:

- Reserach on micro-algae started
- Photobiolgy on fish in aquaculture
- Eurostar on GMO Barley, ORF, Iceland
- Cooperation CESRF UoGuelph
- Photosystem sealed research chamber. (PS1000)
- NSERC grant on Romaine salad and beans
- Photosystem sealed research chamber. (PS2000)

Tech-transfer Space Research:

2010 Intravision and CESRF cooperation.

The hypobaric Guelph Blue-Box plant chambers developed to understand if terrestrial food-plants can be grown in low atmospheric pressures / smaller planets than Earth like on Mars or on the Moon.

CESRF Hypobaric Research
- Vacuum down to 10% of Mars atmospheric pressure
- Online reading of gas exchange at a resolution of 1 PPM

Built to answer the question:
Is it possible to grow food in low atmospheric pressure ?

University of Guelph, Canada
Controlled Environment Systems
Research Facility (CESRF)
Food production for manned space travel;
NASA and ESA, Professor Dr. Mike Dixon

Evolution of Intravision Technology:

Snapshots from the development of plant research LED-lighting and research-chambers.

2009: ORF Genetics, Iceland.
GMO barely for production of cytokines
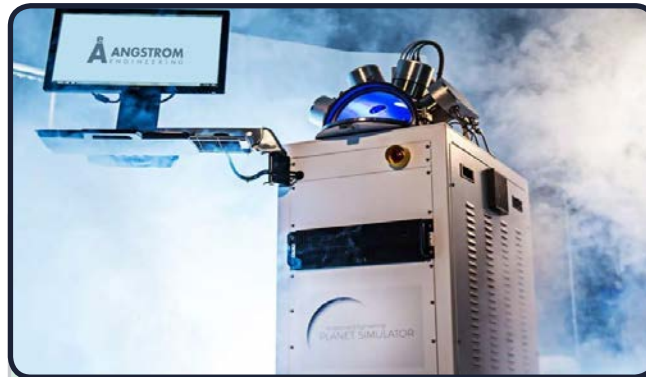EUROSTAR research funding.
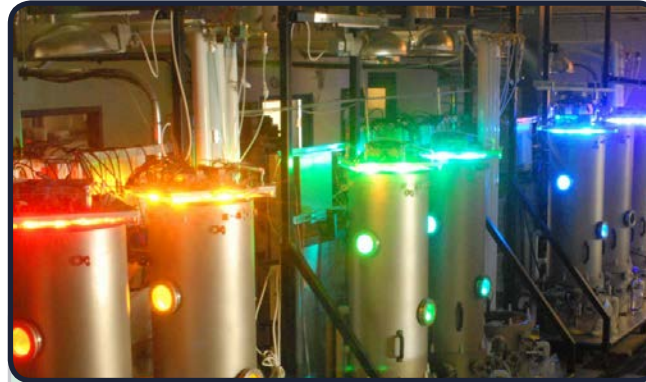
2011: INTICE, with CESRF UoGuelph.
Production of food for manned space
travel. Canadian Space Agency funding.

2015: MAPS, with CESRF UoGuelph.
Food production prototype for KISR,
Kuwait Institute of Scientific Research

2016: PhotoSystem; CESRF UoGuelph.
Sealed Plant Research chamber, prototype,
Internal development project

2018: Planet Simulator, McMaster U.
Simulate environment on a planet - prior
to the establishment of an athmosphere.

2019: MELISSA photo-bioreactor,
LED retrofit of photo-bioreactor,
European Space Agency funding.

The Research Background
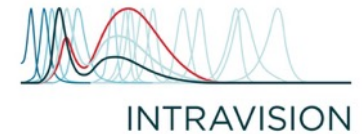
Tech-Transfer from space research!
Photo-System 1000 research chamber

CESRF   INTRAVISION GROUP AS   CONVIRON®

The PhotoSystem chamber:

A sealed environment chamber

The sealed PhotoSystem chambers are developed in a tech-transfer from CESRF, UoGuelph to Intravision.

With an 9-band LED-light system including UVC, UVB and UVA light, these chambers are unique in creating new understanding and photo-recipes for both food- and medicinal plants.

For development of an AI these chambers are a precision tool to better study plant physiological responses to environment manipulation under multiple parameters including:

- Temperature
- Humidity
- Carbon dioxide
- Oxygen (higher or lower)
- Light (quantity, quality)
- Nutrients
- Plant water status
- Insect predation
- Pathogen application/response

The PhotoSystem chamber:

The potential of photobiology!

• We use colored LED's to interact with the plants light-sensory mechanismens.

• Use designed broadband light spectrums to direct plant growth and to impact the plants secondary metabolites; apperacne, texture, taste, human nutrition content.

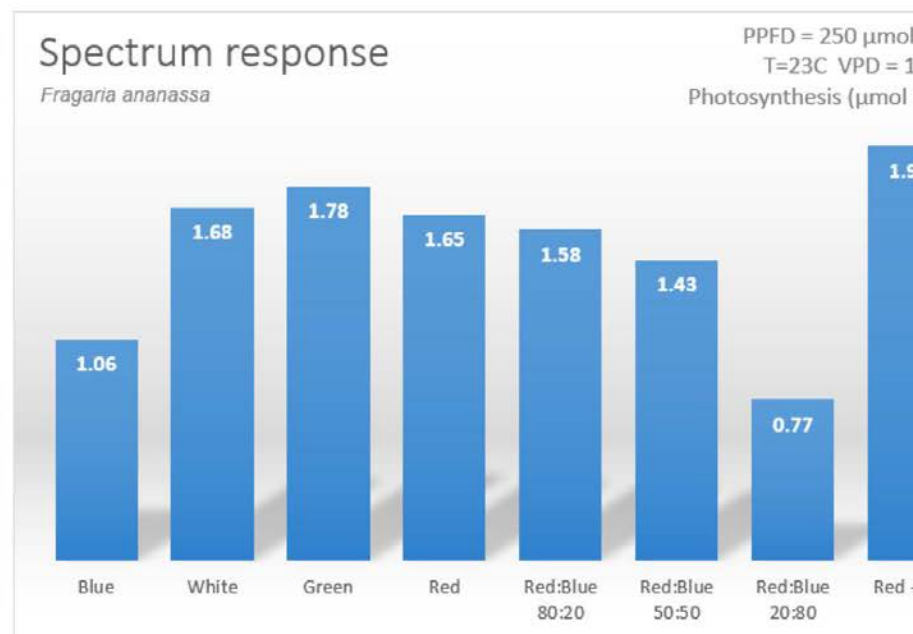• Spectrum variable LEDs to optimize different production phases.

WHITE   RED   BLUE
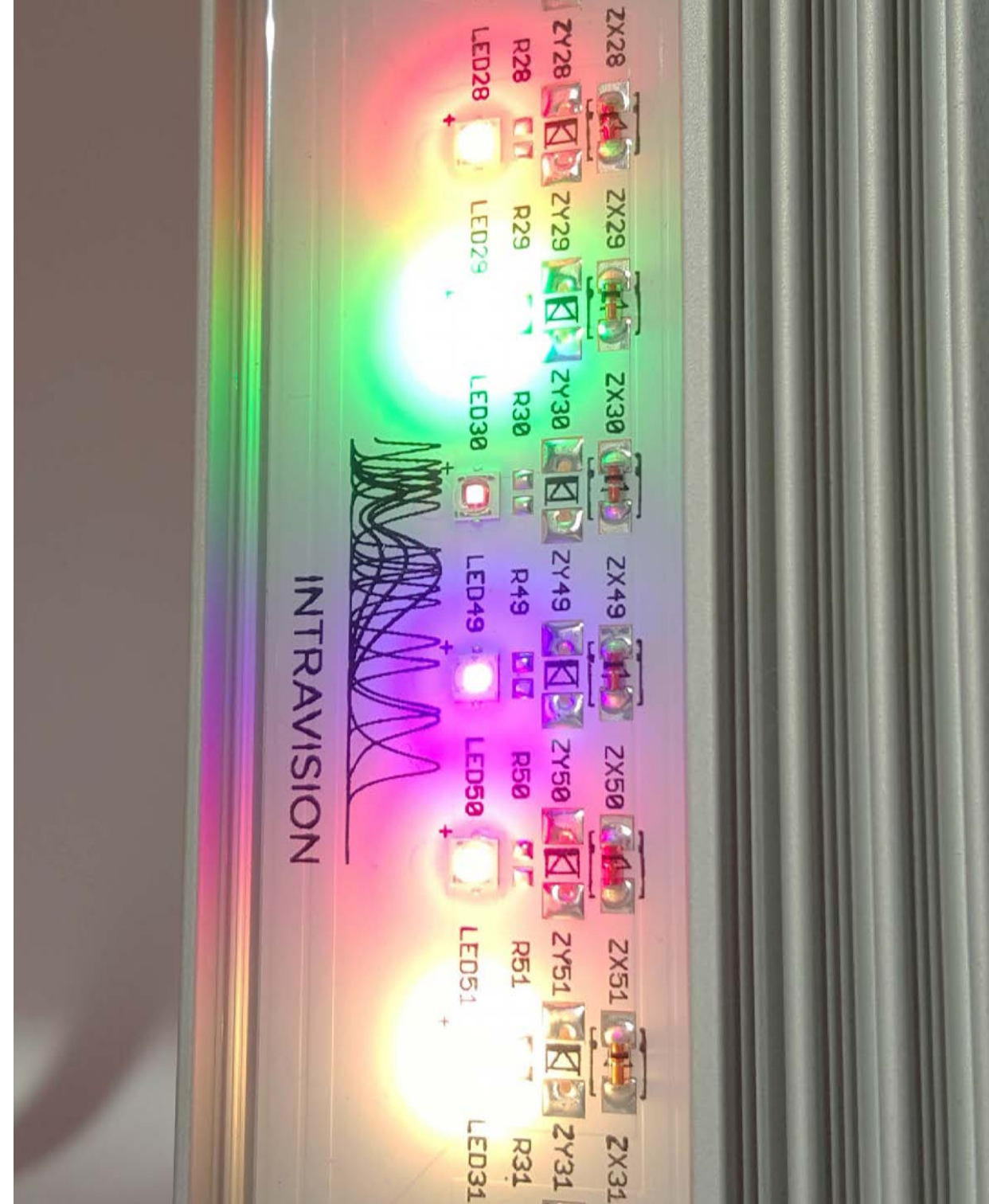
The PhotoSystem chamber:

A sealed growth environment

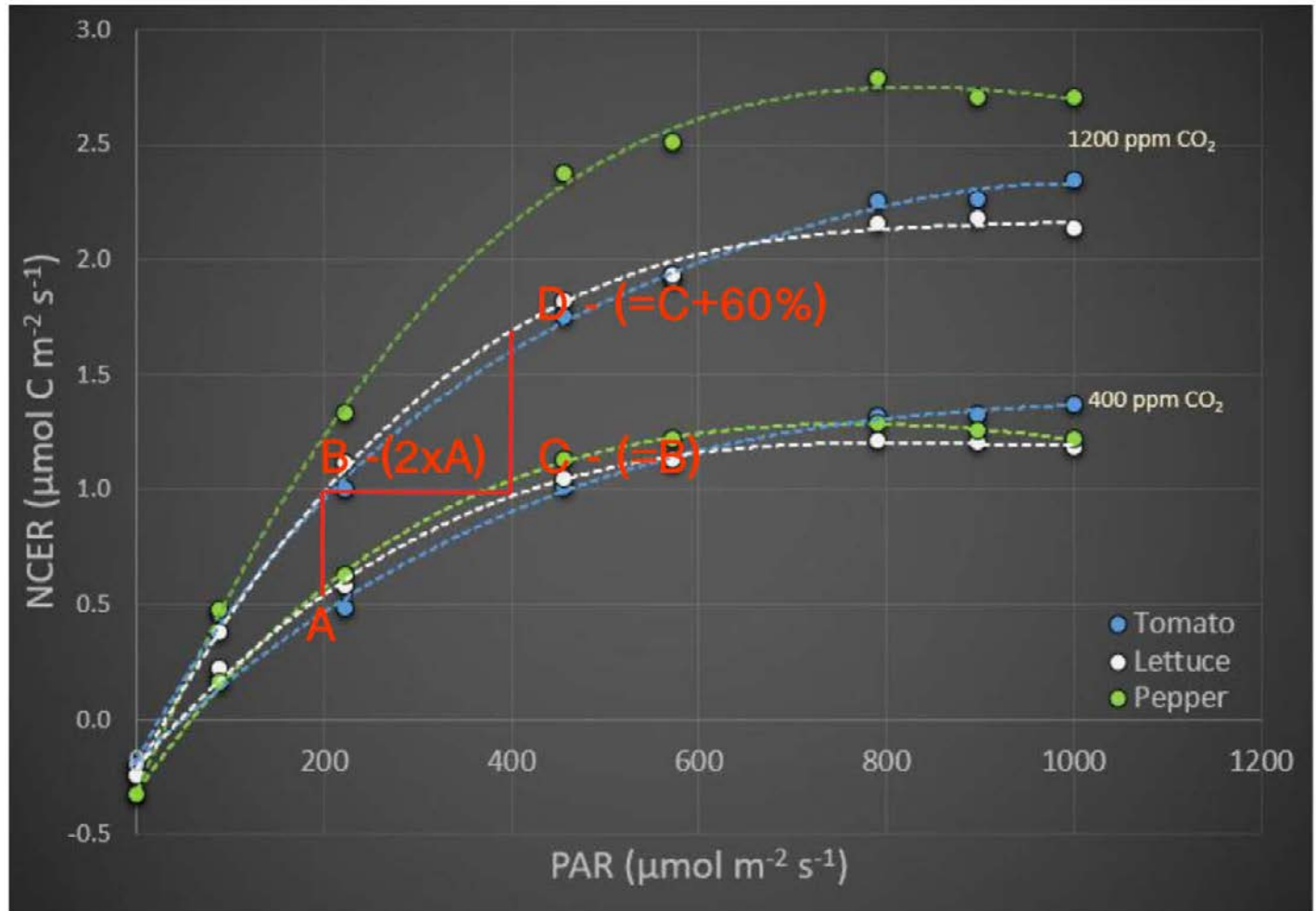**Light spectrums on strawberries in vegetative phase.**

PS 1000 chamber testing

Spectrum response
Fragaria ananassa

PPFD = 250 μmol
T=23C VPD = 1
Photosynthesis (μmol

Blue	White	Green	Red	Red:Blue 80:20	Red:Blue 50:50	Red:Blue 20:80	Red
1.06	1.68	1.78	1.65	1.58	1.43	0.77	1.9

PS 1000 chamber testing

The PhotoSystem chamber:

A sealed growth environment

Correlation between light intensity and CO_2 consentrations of:

• 400ppm CO_2 (normal air)
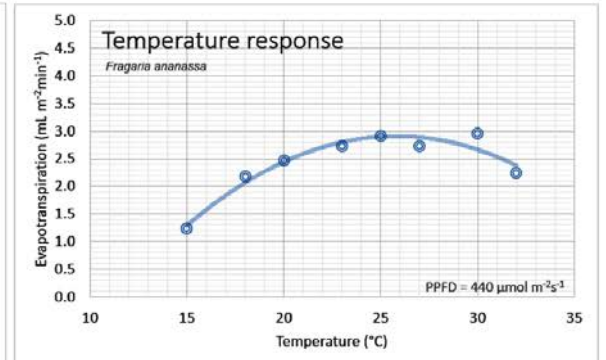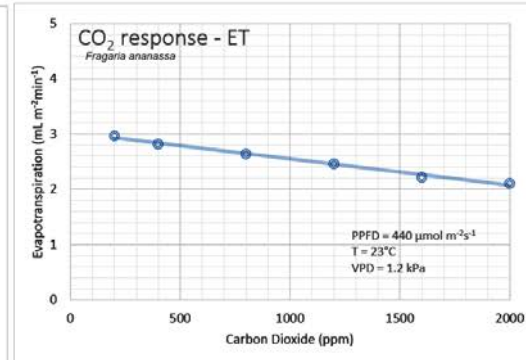• 1200ppm CO_2

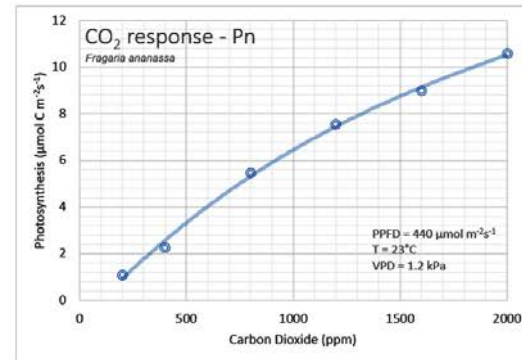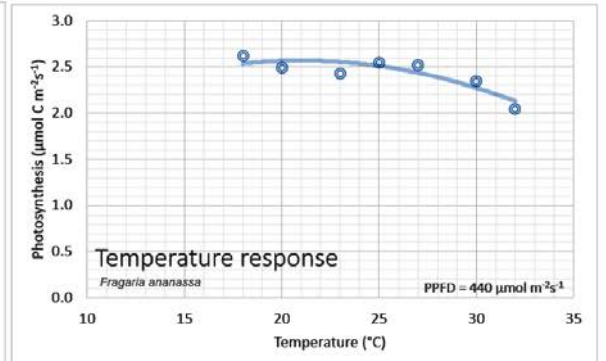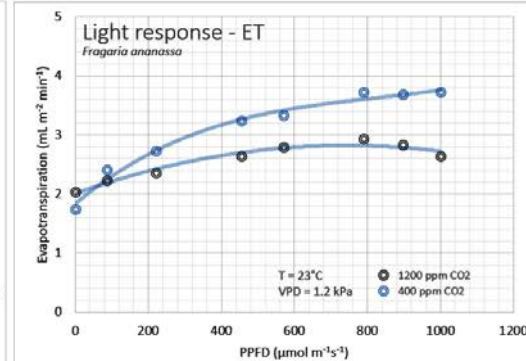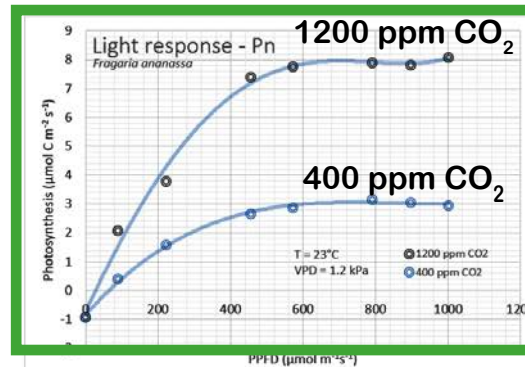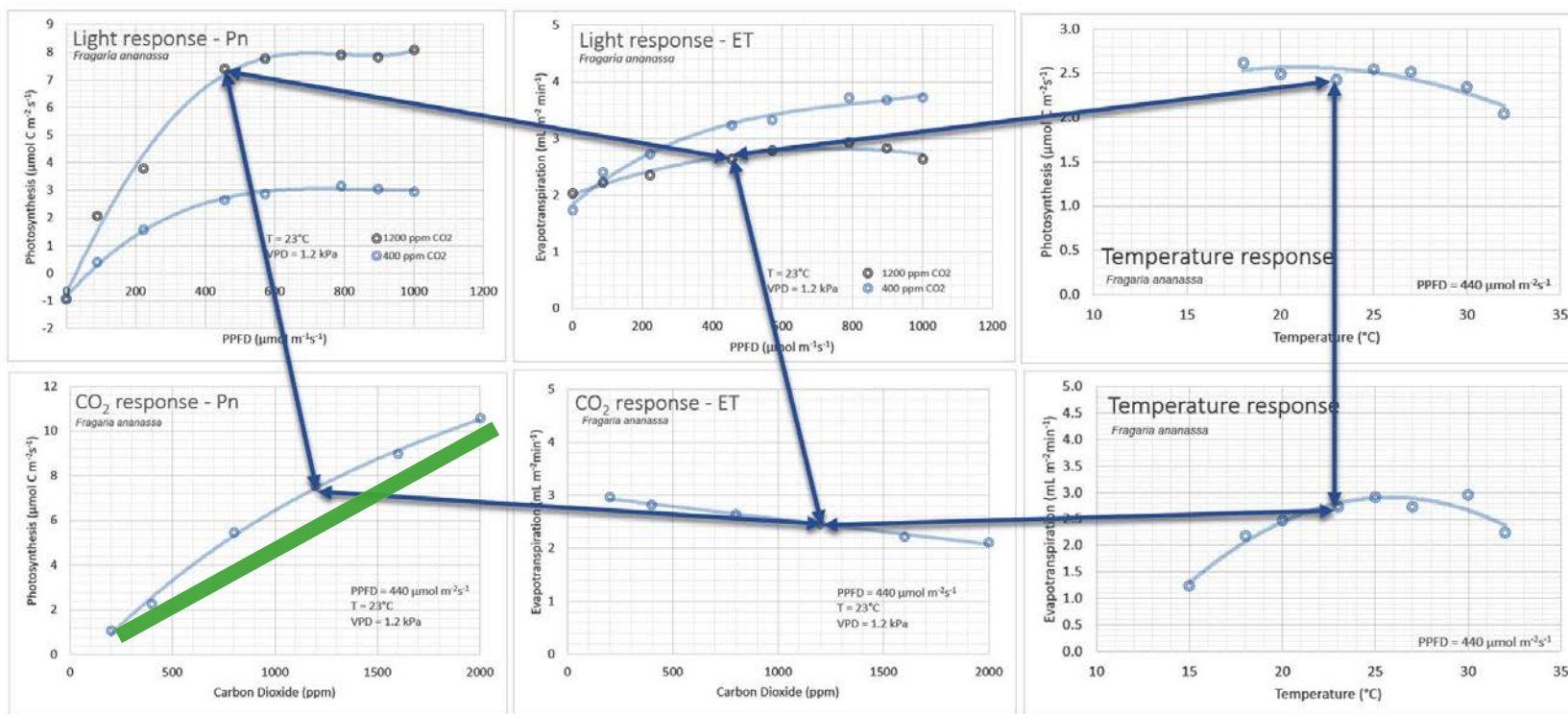NetCarbonExchangeRate light response

The PhotoSystem chamber:

A sealed growth environment

Impact of light spectrums on strawberries in vegetative phase.

The PhotoSystem chamber:
A sealed growth environment

Impact of light spectrums on strawberries in vegetative phase.
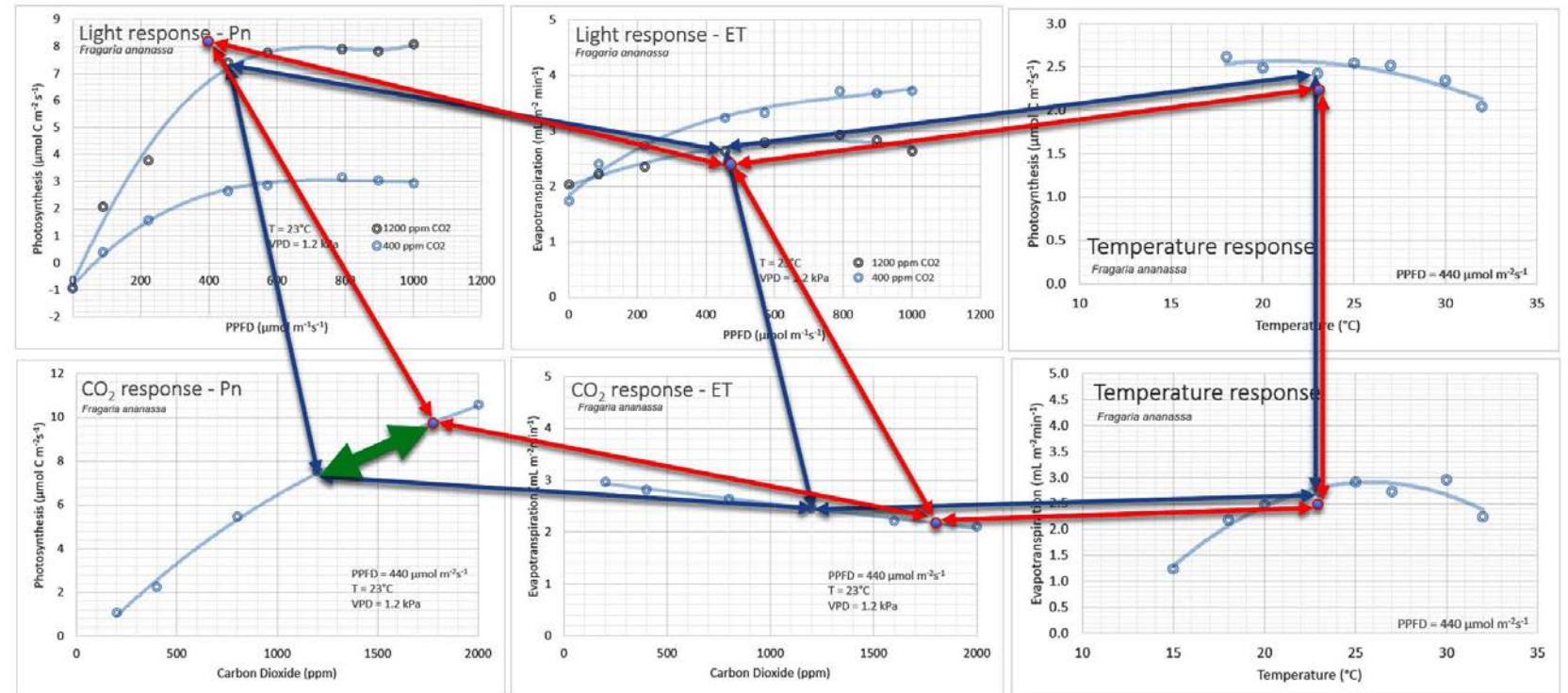
The PhotoSystem chamber:

A sealed growth environment

Impact of light spectrums on strawberries in vegetative phase.

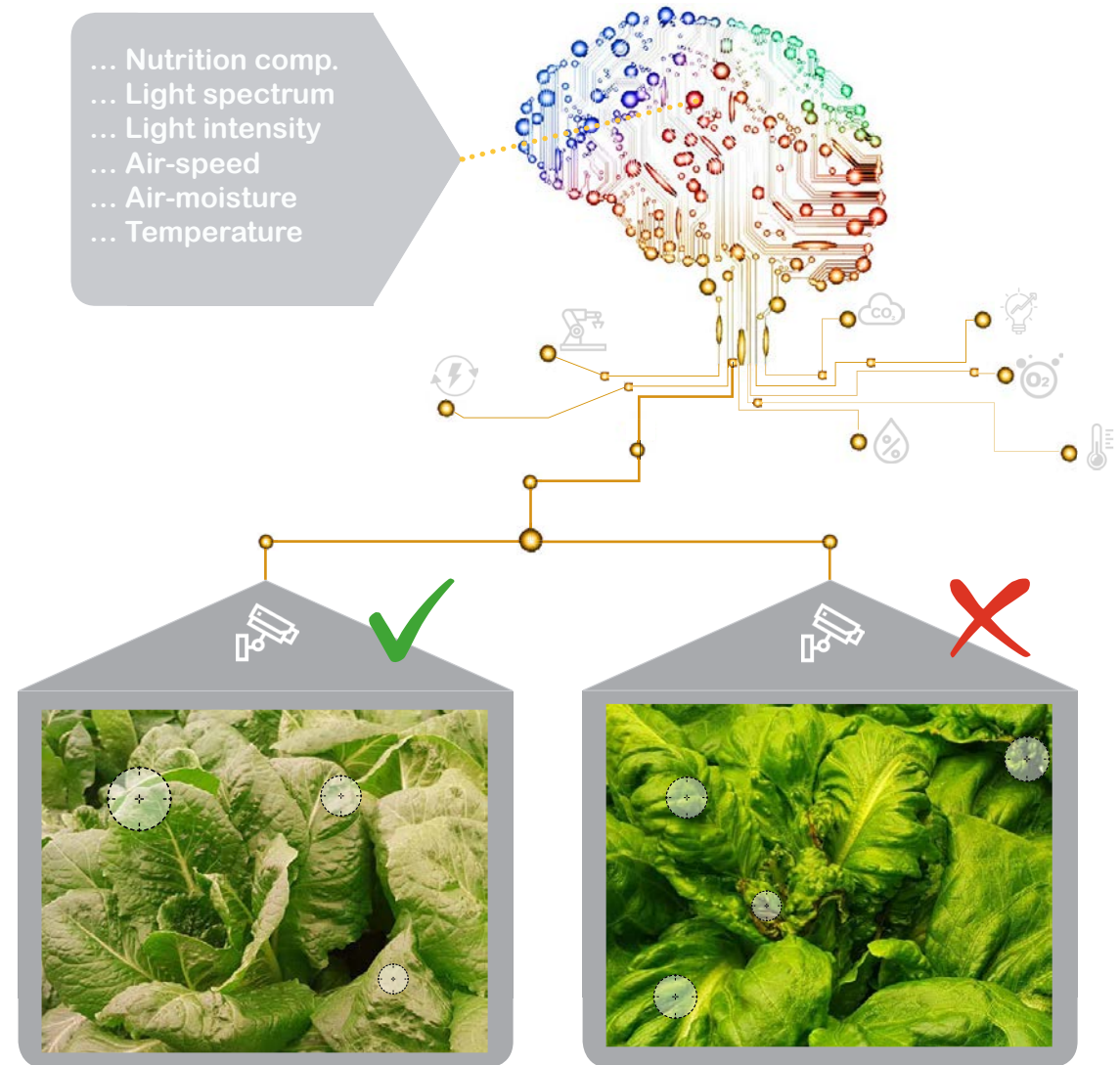# Building an AI-platform:

A "smart" farmers assistant!

The understanding of the correlations between a specific plant-genetics biology and growth environment in the PhotoSystem chambers, becomes the INPUT defining the range of environmental regulations needed in a commercial GravityFlow system.

The data harvest from the PhotoSystem chambers are then further built on and developed by the AI in the GravityFlow systems.

Currently we are engaged in the first step of this process, building an image database, and establishing the-rules for pattern recognition.

Monitoring plant status and applying image pattern recognition with deep learning combined with multi-variable analysis and weighted decision-making - optimizing environment in polynomial time.

DEVELOPING A PLATFORM FOR DEEP LEARNING AND AI

... Nutrition comp.
... Light spectrum
... Light intensity
... Air-speed
... Air-moisture
... Temperature

INTRAVISION Greens approach in the USA:

Proven ability to produce and compete at large scale with commodity price level:

US$0.78

Cost for INTRAVISION to produce and deliver one head of romaine lettuce to NYC*

* Based on current NJ facility with 12,000 sq. ft of grow space, operating 52/7 at current prices for water and power and other inputs.
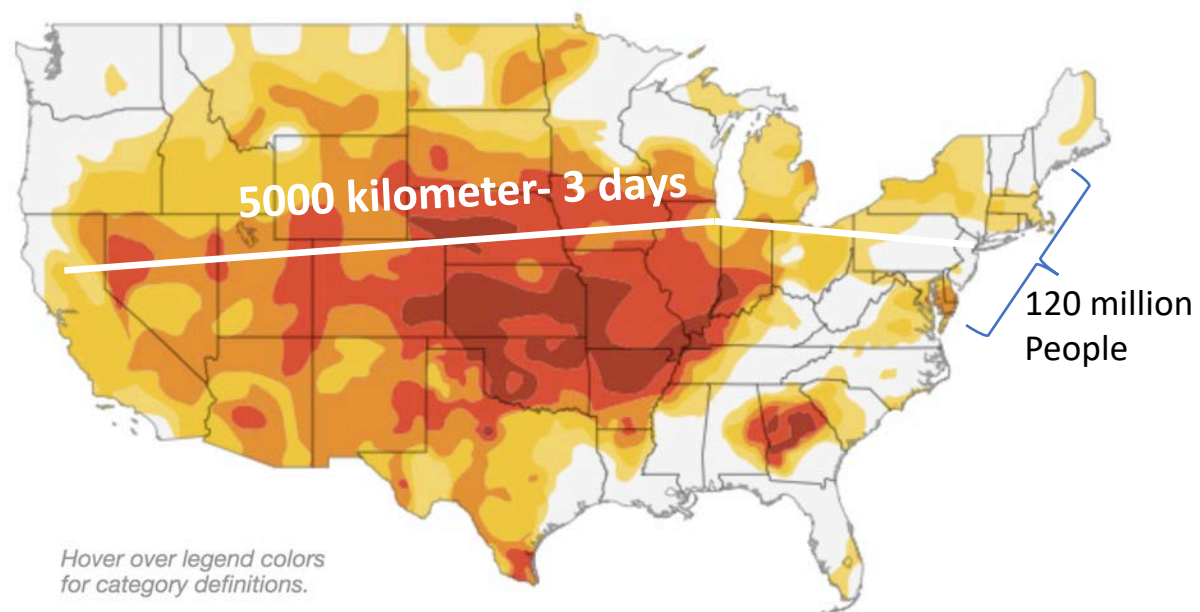
US$2.12

2017 Peak annualized retail prices advertised by large grocery chains*

* www.producerpriceindex.com

The US Opportunity

August 21, 2012

5000 kilometer- 3 days

120 million People

Hover over legend colors for category definitions.

Abnormally Dry • Moderate Drought • Severe Drought • Extreme Drought • Exceptional Drought

Area Experiencing Dry or Drought Conditions, 2000 to 2012
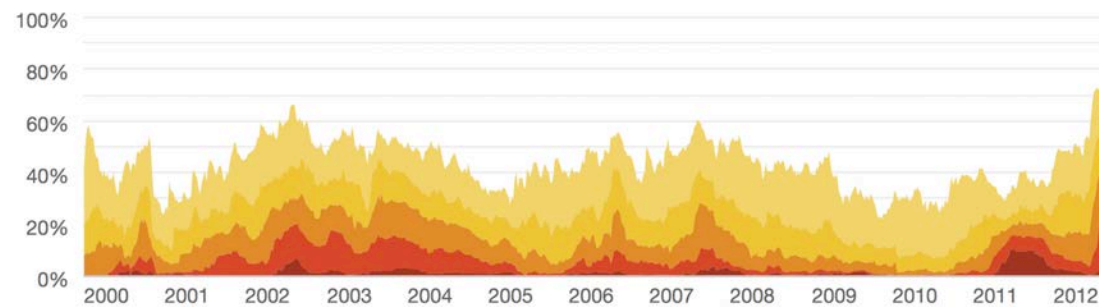
Starting point: The US opportunity

Romani salad, by far the biggest commodity in the USA
Field grown in California and Arizona and trucked 5000km to New York
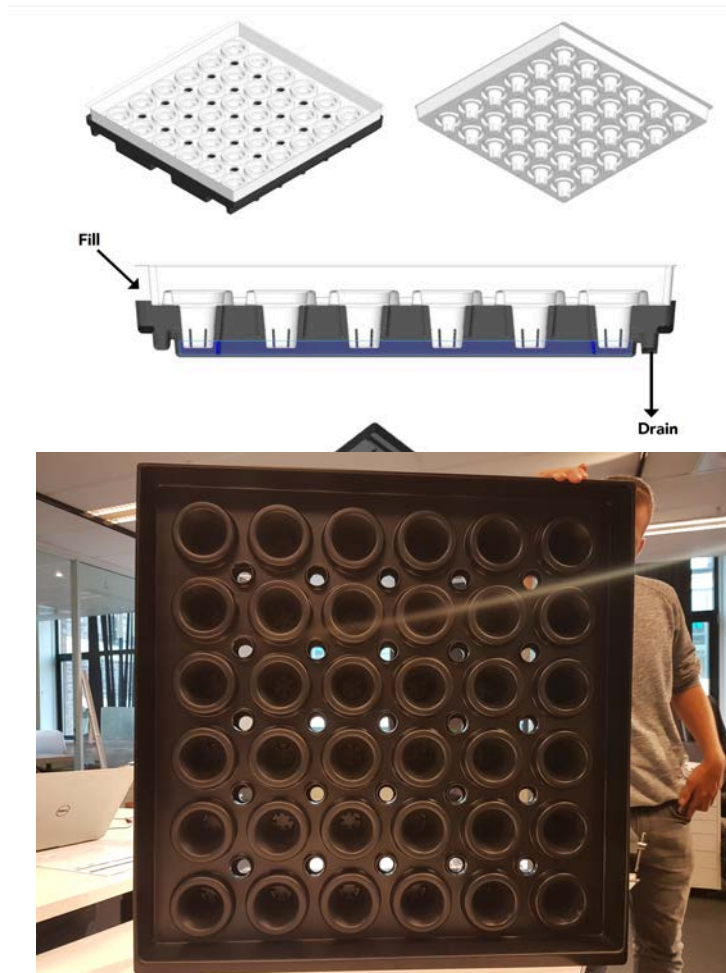
Re-Inventing production of food plants
Romaine salad

- From field grown 6 to 9 plants m^2 in GravityFlow
- From 12 to 9 weeks production time
- 10 tier tall this equals 90 plants m^2 the last 4-weeks.
- Using 1-2% of freshwater compared to field.

Re-Inventing production of food plants
Romani salad

Plant research and GravityFlow optimization

- NSERC funded proejct at UoGuelph.

- The commercially most important leafy green in the US marketplace; "the Caesar Salad".

- MSc student #1 - researching romaine salad for production in a GravityFlow mulitlayer system.

- MSc student #2 - researching use of excess biomass.

- Work includes developing an image-database for deep machine learning applications.

Plant research and GravityFlow optimization

- NSERC funded proejct at UoGuelph.

- PhD student researching beans for production in a GravityFlow mulitlayer system.

- Beans being an important source of protein, cornerstone in vegan diets.

- Work includes developing an image-database for deep machine learning applications.

The Global Challenge:

How do we feed 10 Billion People?
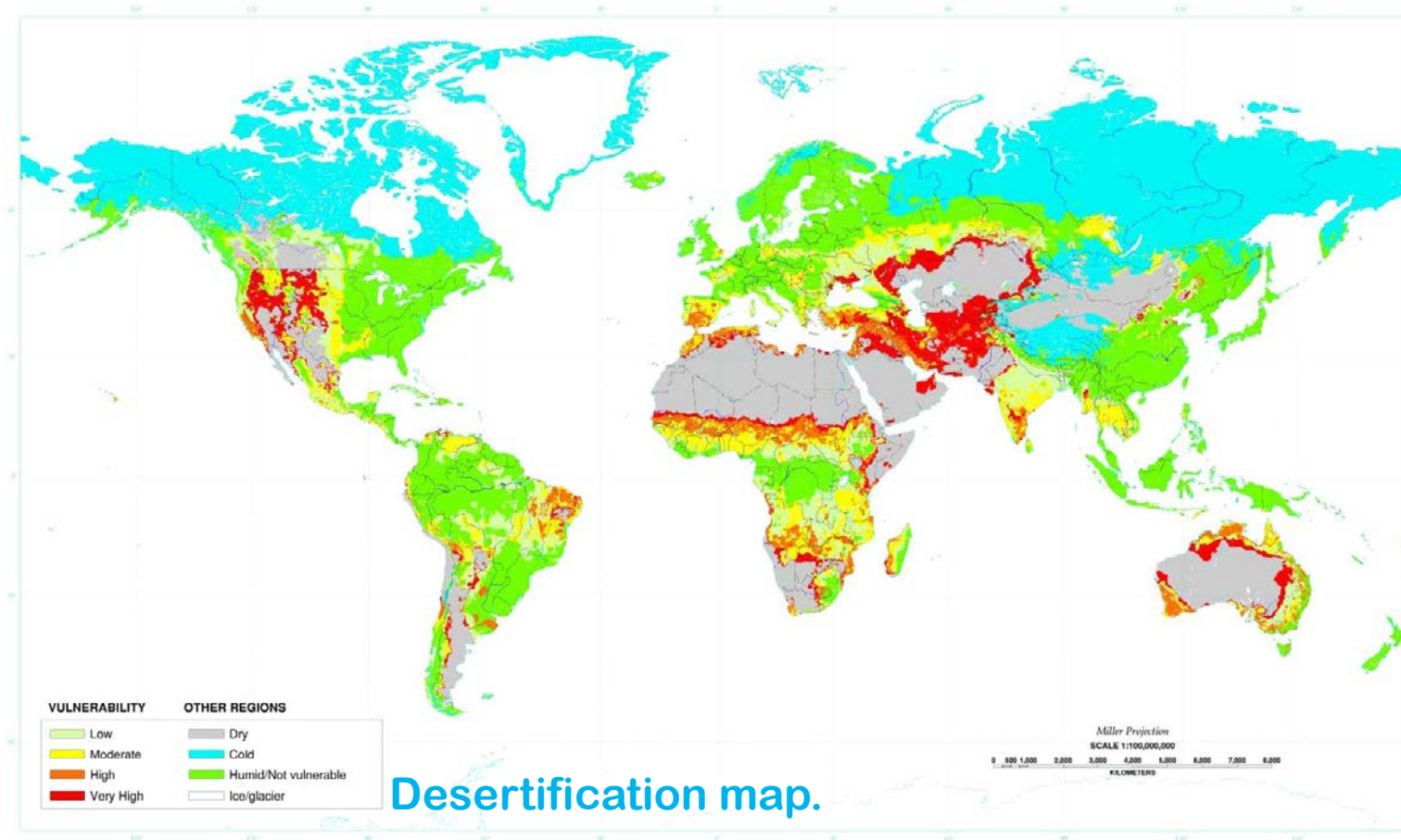
- Global increase of living standards

- Desertification of arable land

- Lack of clean water - the #1. challenge

- Pollution of water, air and ground

- Rapidly growing urbanisation

- Increasing global population

VULNERABILITY | **OTHER REGIONS**
- Low | Dry
- Moderate | Cold
- High | Humid/Not vulnerable
- Very High | Ice/glacier

Miller Projection
SCALE 1:100,000,000

Desertification map.

The Pressure of feeding the world has coincided with the reduction in production cost of **LED** lighting technology, creating an Ag/tech revolution as an alternative sustainable option to feed the worlds growing demand. Vertical farming is forecast to grow at 23% CAGR

The GravityFlow IMPACT:

Large scale food production system suited for any environmental condition

- Building 550m x 220m - 9HA
- Approximately 96.000 ton of green produce
- 32 MW electrical power to lights + energy for dehumification
- 1200m3 water daily recycled from air
- 9 MW solar capacity on roof

INTRAVISION
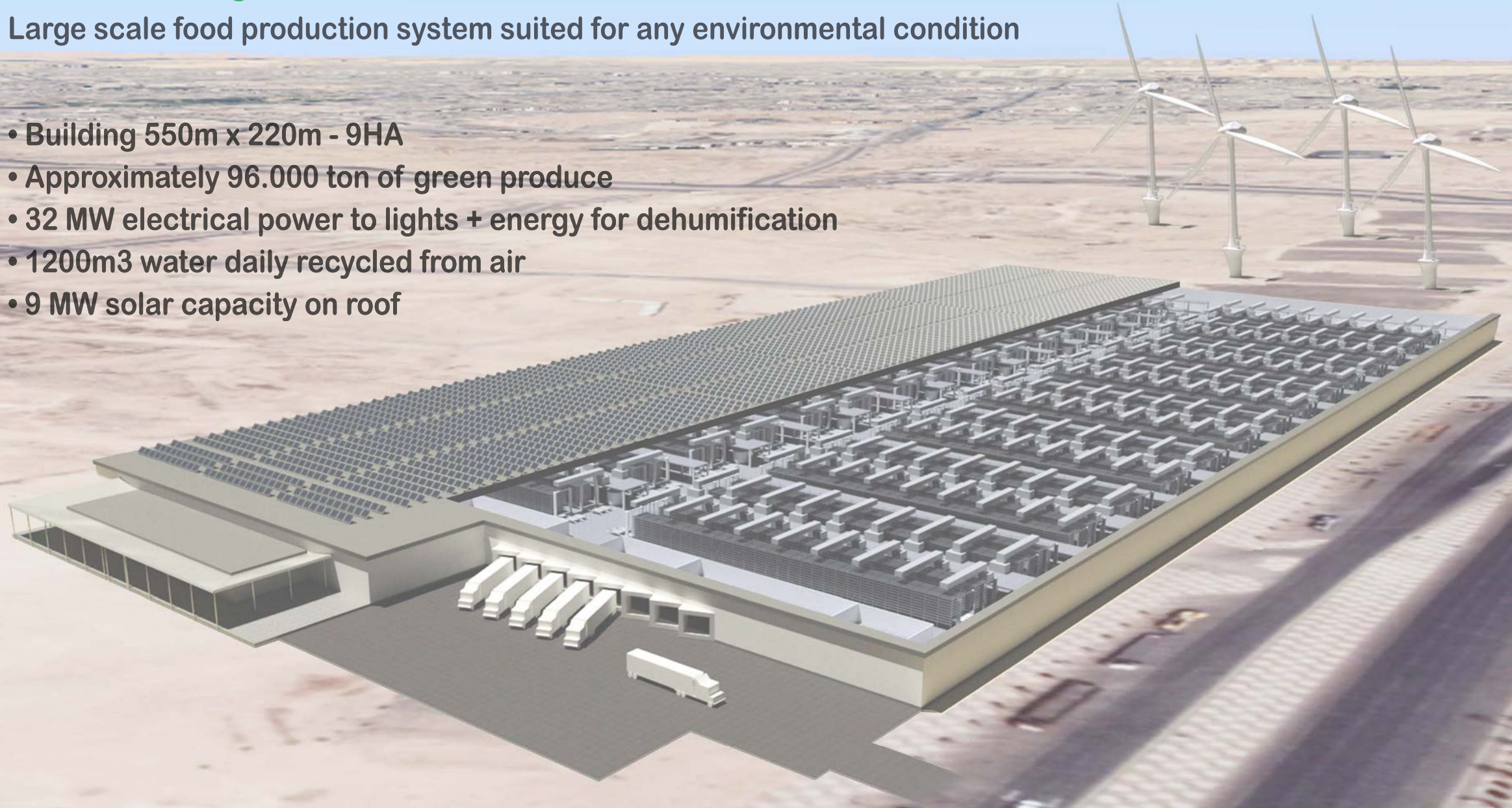
The large-scale automated plant factory!

INTRAVISION

No pesticides / herbicides

Over 95% less water consumption

Year-round local supply

Blockchain security

Consistent high-quality product

Lower and less volatile production costs

The Atmospheric Cycle

Monitors, regulates and optimises the environmental atmospheric condition within the closed system as to insure the best results.

Dehumidification system returns distilled water to nutrient cycle

Direct delivery system of airflow to plants from both above and below.

Infusion of CO2 into system for accelerated growth cycles

Regulation of temperature, humidity and O2 levels
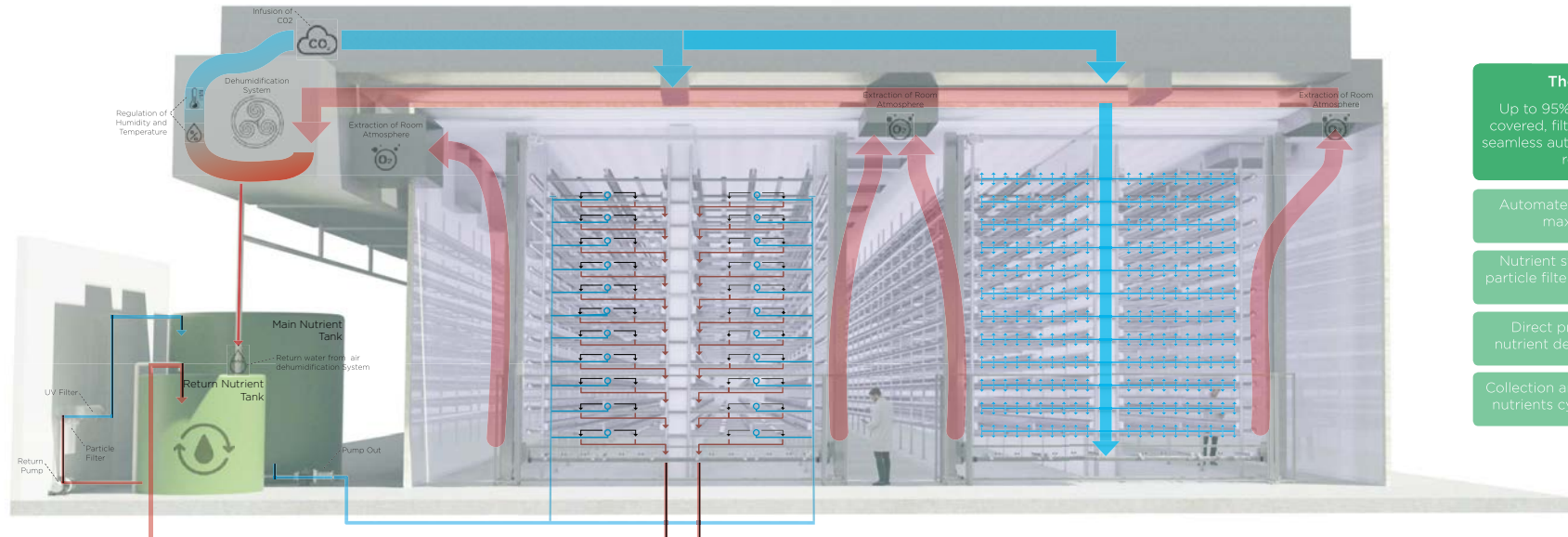
The Nutrient Cycle

Up to 95% of the water usage is re-covered, filtered and reused through a seamless automated nutrient deliver and recovery system.

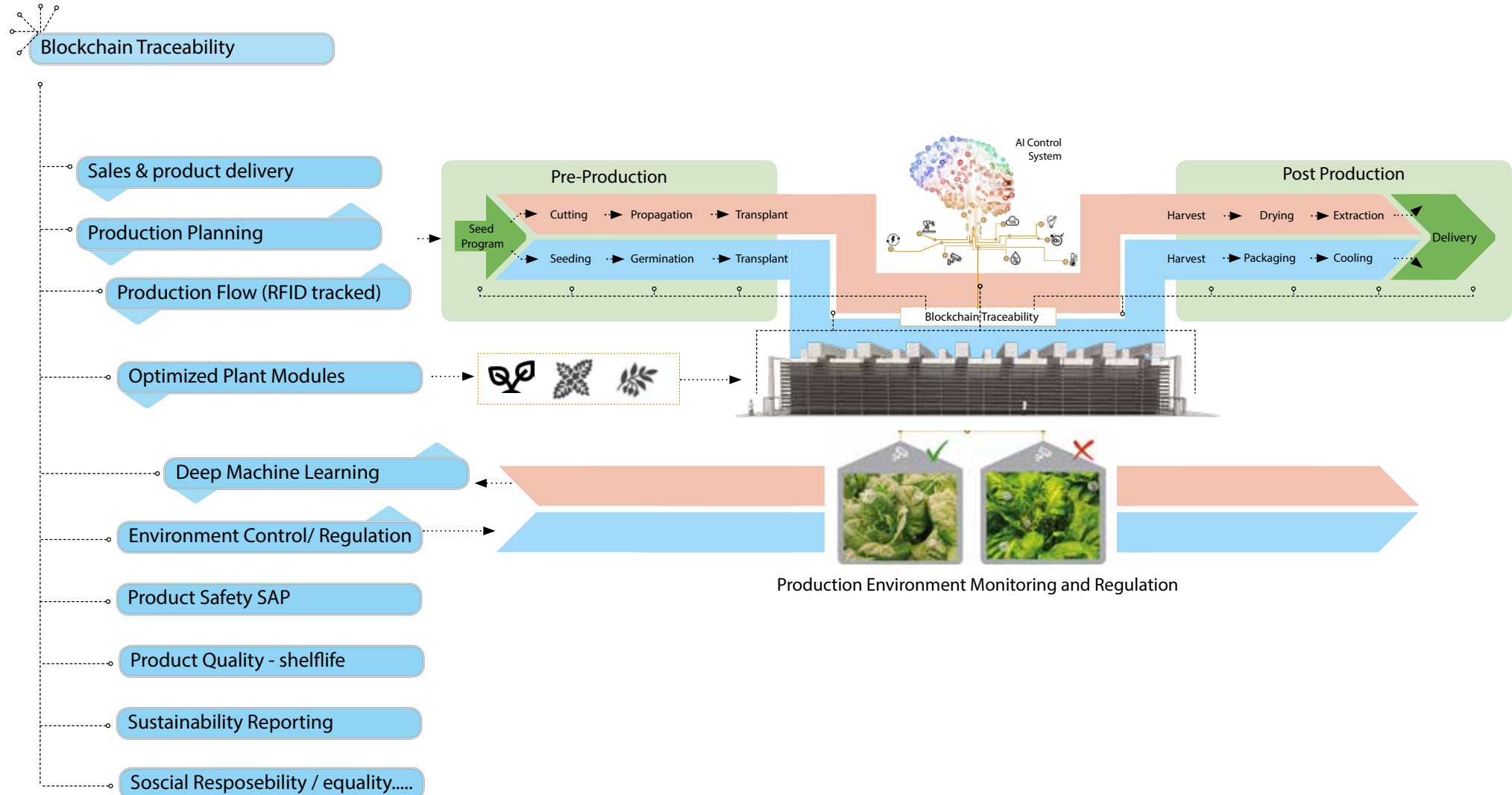Automated and optimised for maximum results

Nutrient station with UV and particle filters between main and return

Direct pressure regulated nutrient delivery to each plant tray

Collection and removal of excess nutrients cycled back to return tank

Infusion of CO2

Dehumidification System

Regulation of Humidity and Temperature

Extraction of Room Atmosphere

Extraction of Room Atmosphere

Extraction of Room Atmosphere

Main Nutrient Tank

Return water from air dehumidification System

Return Nutrient Tank

UV Filter

Particle Filter

Return Pump

Pump Out

Intravision Greens / Software & AI

Digitalisation

INTRAVISION

Blockchain Traceability

- Sales & product delivery
- Production Planning
- Production Flow (RFID tracked)
- Optimized Plant Modules
- Deep Machine Learning
- Environment Control/ Regulation
- Product Safety SAP
- Product Quality - shelflife
- Sustainability Reporting
- Soscial Resposebility / equality.....

Pre-Production

Seed Program

Cutting → Propagation → Transplant

Seeding → Germination → Transplant

AI Control System

Blockchain Traceability

Post Production

Harvest → Drying → Extraction

Harvest → Packaging → Cooling

Delivery

Production Environment Monitoring and Regulation

Focused   Sleepy

Symptoms

Anxious   Dry eyes   Headache

Dizzy   Dry mouth   Paranoid

Conditions

ADD/ADHD   Fatigue   Nausea

Alzheimer's   Fibromyalgia   PMS

Anorexia   Gastrointestinal disorder   PTSD

Anxiety   Glaucoma   Pain

Arthritis   HIV/AIDS   Parkinson's

Asthma   Headaches   Phantom limb pain

Bipolar disorder   Hypertension   Seizures

Cachexia   Inflammation   Spasticity

Cancer   Insomnia   Spinal cord injury

Cramps   Lack of appetite   Stress

Crohn's disease   Migraines   Tinnitus

Depression   Multiple sclerosis   Tourette's syndrome

Epilepsy   Muscle spasms

Eye pressure   Muscular dystrophy

INTRAVISION

INTRAVISION MedTech

Combining photobiology
with controlled environent
tech and atuomation...
in marijuana production
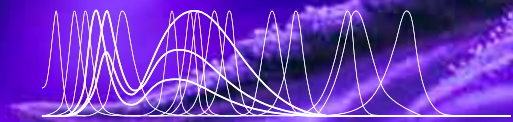
INTRAVISION

Vegetation Phase

The basis for the Intravision grow-lights lies in our vegetation spectrums, which are optimized for speed of biomass production, mainly composed by red, green and either white or purple LEDs. However, the cannabis plant need a sufficiently sturdy stem to suppoert the biomass in the late stages, so a certain level of blue light needs to be included in the vegetation phase to secure optimum plant morphology development.

Early Bloom Phase

The standard approach for blooming cannabis plants is through the light/dark rythm shift from 18:6 hours to 12:12 hours. Flowering of plants are however also regulated by the red to far-red light ratio, so Intravision has included far-red light into all flower plants to assist in boosting large flowers.

Developed Bloom Phase

Plants do not produce chemicals for fun! During the last weeks of the bloom phase Intravision propose light stress induced by UVA and/or UVB LED's.

Compact plants with strong stem, wide leaves and good roots.

Bigger flowers

Denser biomass, bigger flowers,increased chrystals.
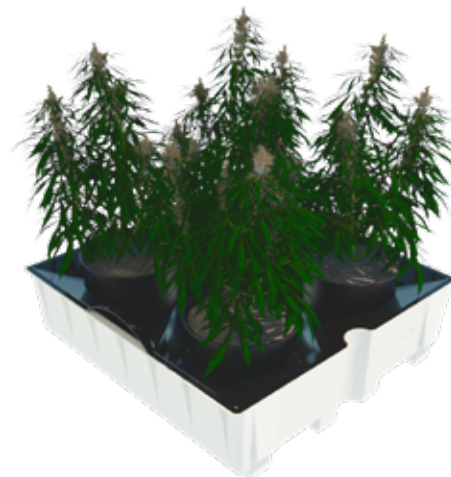
INTRAVISION

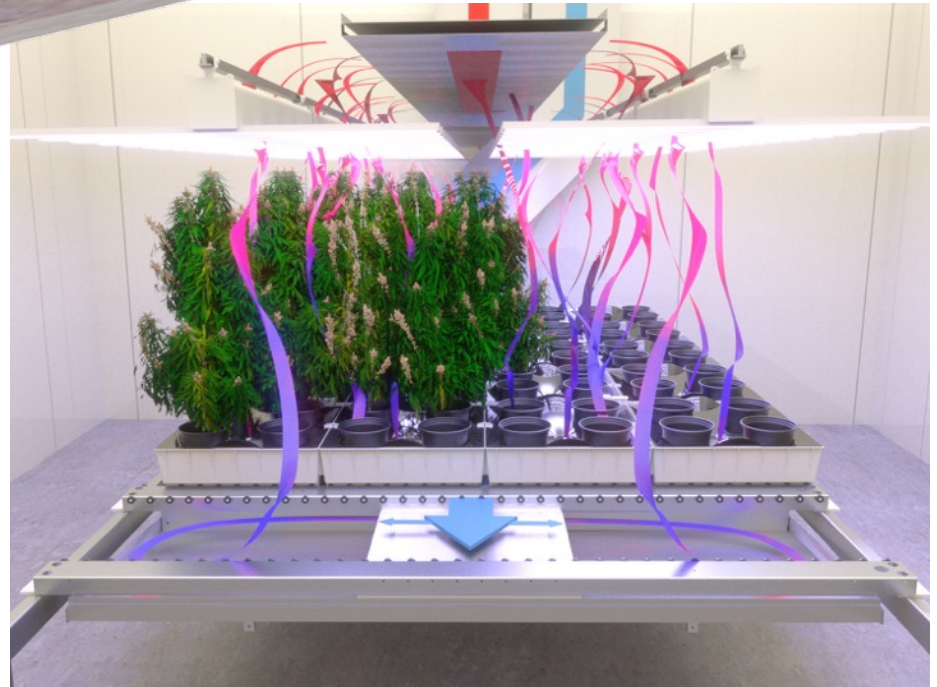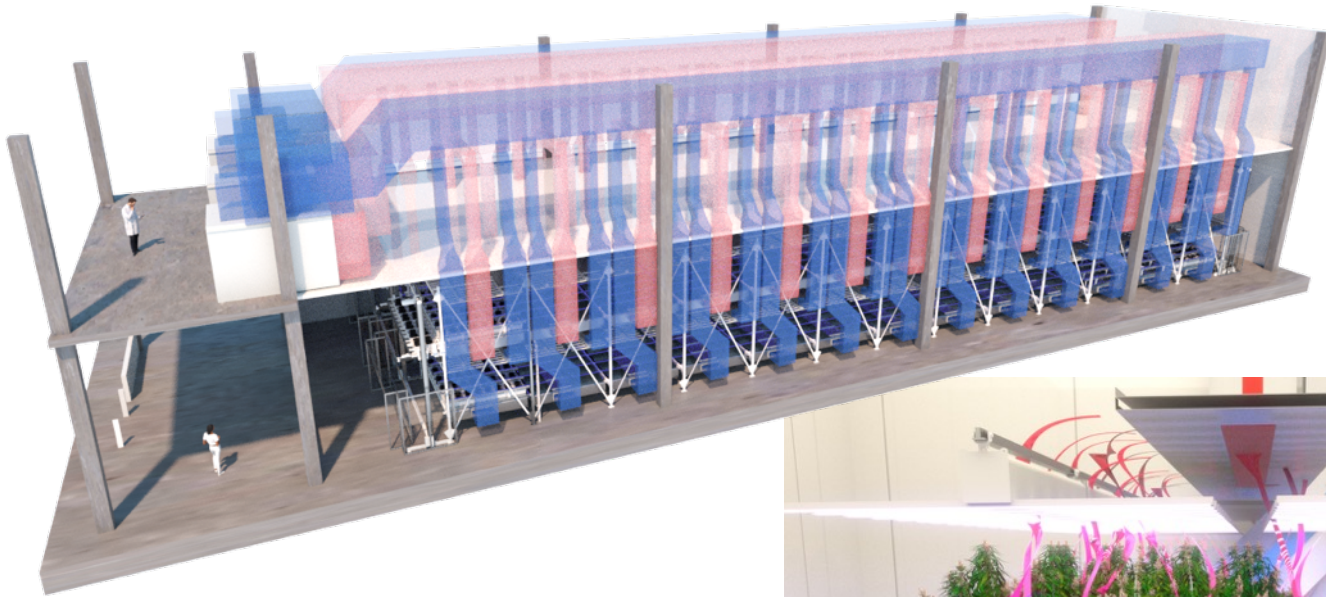# Intravision / Cannabis Approach & Technologies

The Automated Factory

Intravision has adapted the patent applied GravityFlow System towards both cannabis vegetation and Flower Rooms.

The fundament of our approach is the use of moving GrowBoxes that are being fed with nutrients in our hybrid hydroponic solution, where we keep a certain reservoir of nutrients inside each GrowBox in-between the fillings.
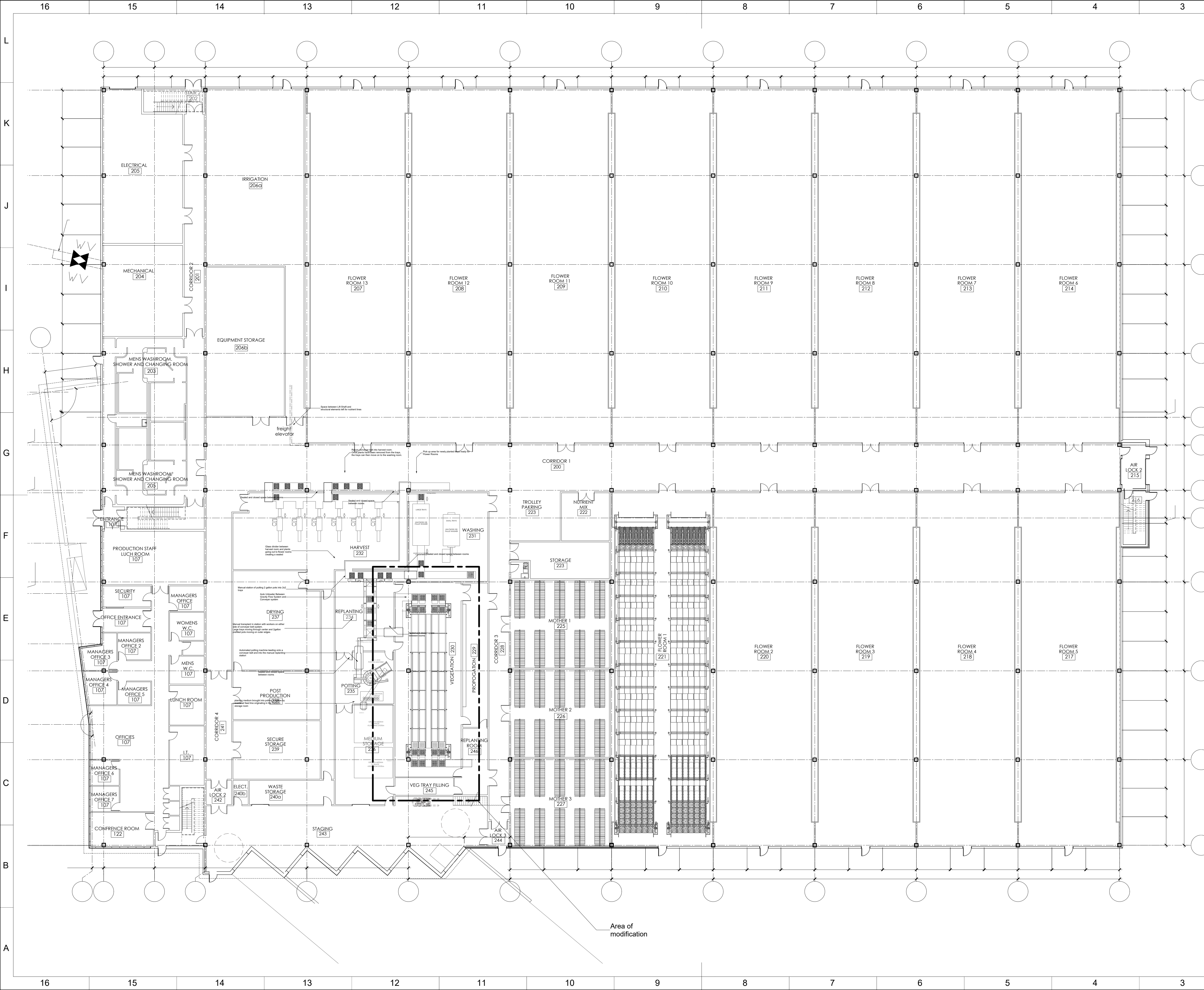
The flower room GrowBoxes has space for 4 large plants produced in standard 2-gallon pots that are dropped into the larger carrier.

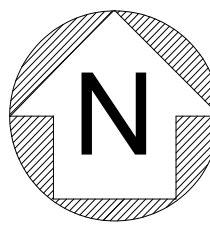# The GRAVITYFLOW system for tall flowering plants

Floor plan labels (left to right, top to bottom):

ELECTRICAL 205
IRRIGATION 206a
MECHANICAL 204
CORRIDOR 2 201
EQUIPMENT STORAGE 206b
MENS WASHROOM SHOWER AND CHANGING ROOM 203
MENS WASHROOM SHOWER AND CHANGING ROOM 205
ENTRANCE 107
PRODUCTION STAFF LUCH ROOM 107
SECURITY 107
OFFICE ENTRANCE 107
MANAGERS OFFICE 107
WOMENS W.C. 107
MANAGERS OFFICE 2 107
MANAGERS OFFICE 4 107
MANAGERS OFFICE 5 107
MENS W.C. 107
LUNCH ROOM 107
OFFICIES 107
I.T. 107
MANAGERS OFFICE 6 107
MANAGERS OFFICE 7 107
CONFRENCE ROOM 122
AIR LOCK 2 242
ELECT. 240b
WASTE STORAGE 240a
SECURE STORAGE 239
MEDIUM STORAGE 238
POTTING 235
POST PRODUCTION 236
DRYING 237
REPLANTING 234
HARVEST 232
WASHING 231
VEG TRAY FILLING 245
STAGING 243
AIR LOCK 3 244
REPLANTING ROOM 246
VEGETATION 230
PROPOGATION 229
CORRIDOR 3 228
TROLLEY PARKING 223
NUTRIENT MIX 222
STORAGE 223
MOTHER 1 225
MOTHER 2 226
MOTHER 3 227
FLOWER ROOM 1 221
FLOWER ROOM 2 220
FLOWER ROOM 3 219
FLOWER ROOM 4 218
FLOWER ROOM 5 217
FLOWER ROOM 6 214
FLOWER ROOM 7 213
FLOWER ROOM 8 212
FLOWER ROOM 9 211
FLOWER ROOM 10 210
FLOWER ROOM 11 209
FLOWER ROOM 12 208
FLOWER ROOM 13 207
CORRIDOR 1 200
CORRIDOR 4 241
STAIR 2 202
AIR LOCK 2 215
216

Area of modification

Title block:

Project Title:
Georgian Bay Biomed

Address
Collingwood Ontario

N

Drawing name
Project Overview

| Revision 1 | Drawn by Morgan Patterson |
| Date 17-Jan-19 | Reviewed by Per Lysaa |

Reason for issue
Issued for REVIEW

Drawing Description
Flow Diagram

Notes on drawing details:
This drawing dose not take into consideration the most recent design changes. Only to be used as a flow diagram
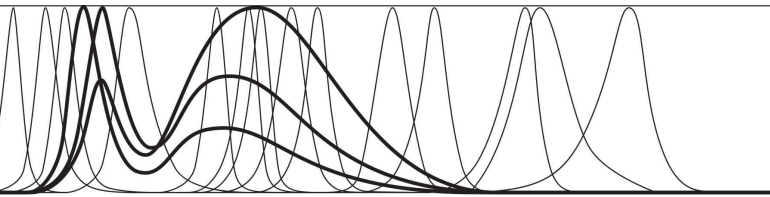
General notes

REVISIONS

REV.	DESCRIPTION	DATE
1	Project Overview	04-sep-18
2	Updated Floor plan	17-Jan-19

Tolerances:
Except where otherwise stated all measurement are in mm

LINEAR		ANGULAR	
X	+/- 0,50	X	+/-0,50
X,X	+/- 0,20	X,X	+/-0,20
X,XX	+/- 0,10	X,XX	+/- 0,10
X,XXX	+/- 0,05	X,XXX	+/- 0,05

Dwg. Nr.
IVG-GGB-Diagram-1

INTRAVISION
www.intravisiongroup.com
© Intravision Group AS   Ph: (+46) 0733661128

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They are issued in strict confidence and shall not be reproduced, copied, or used
as the basis manufacturing or sale of apparatus without written permission.
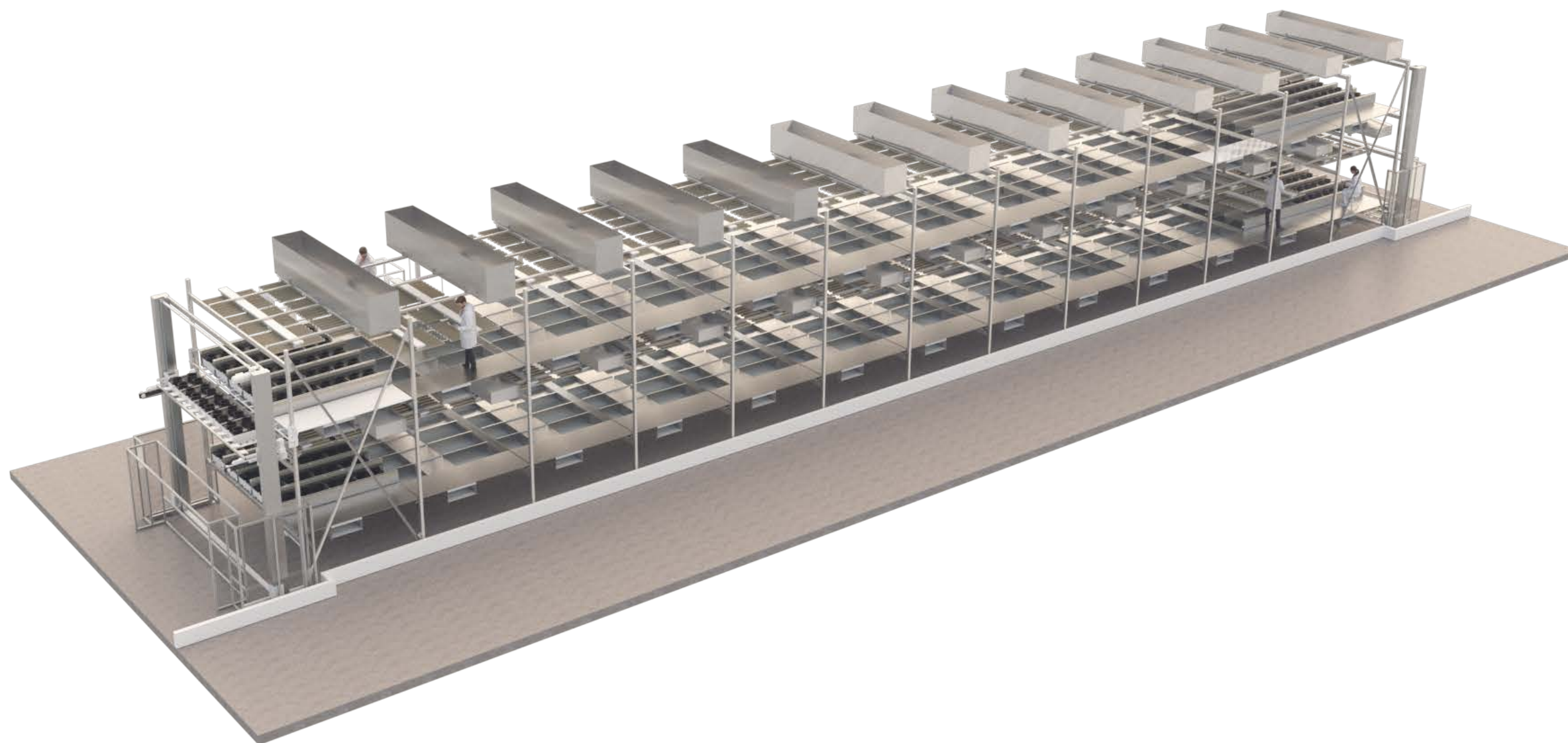
Projection
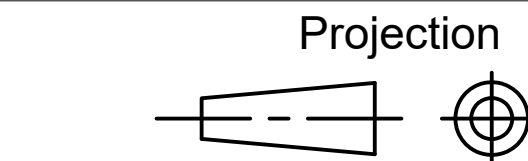
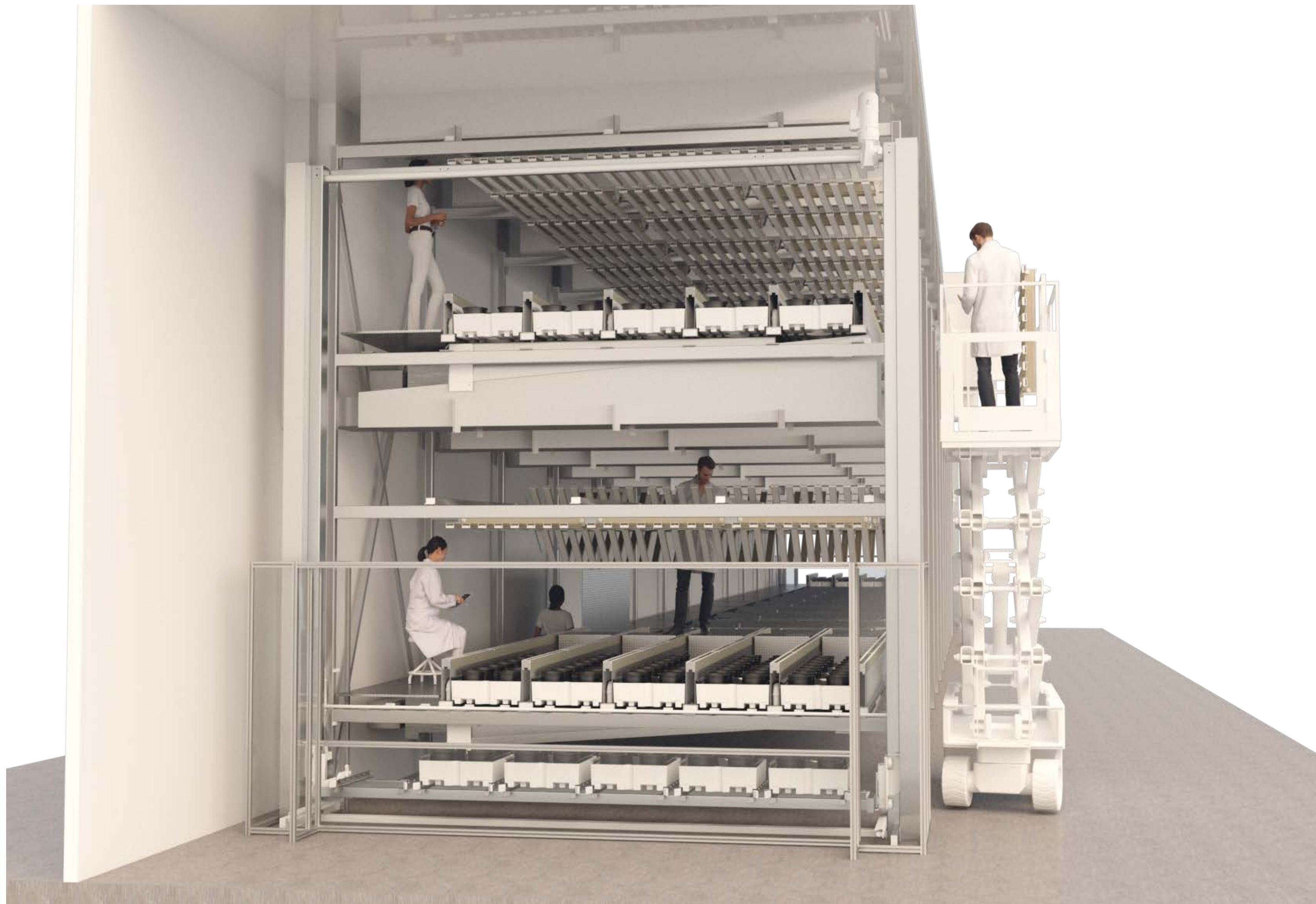| Scale 1:200 | Sheet 1 of 1 | Size A1 |

INTRAVISION – Plant factories for food- and medicinal plants
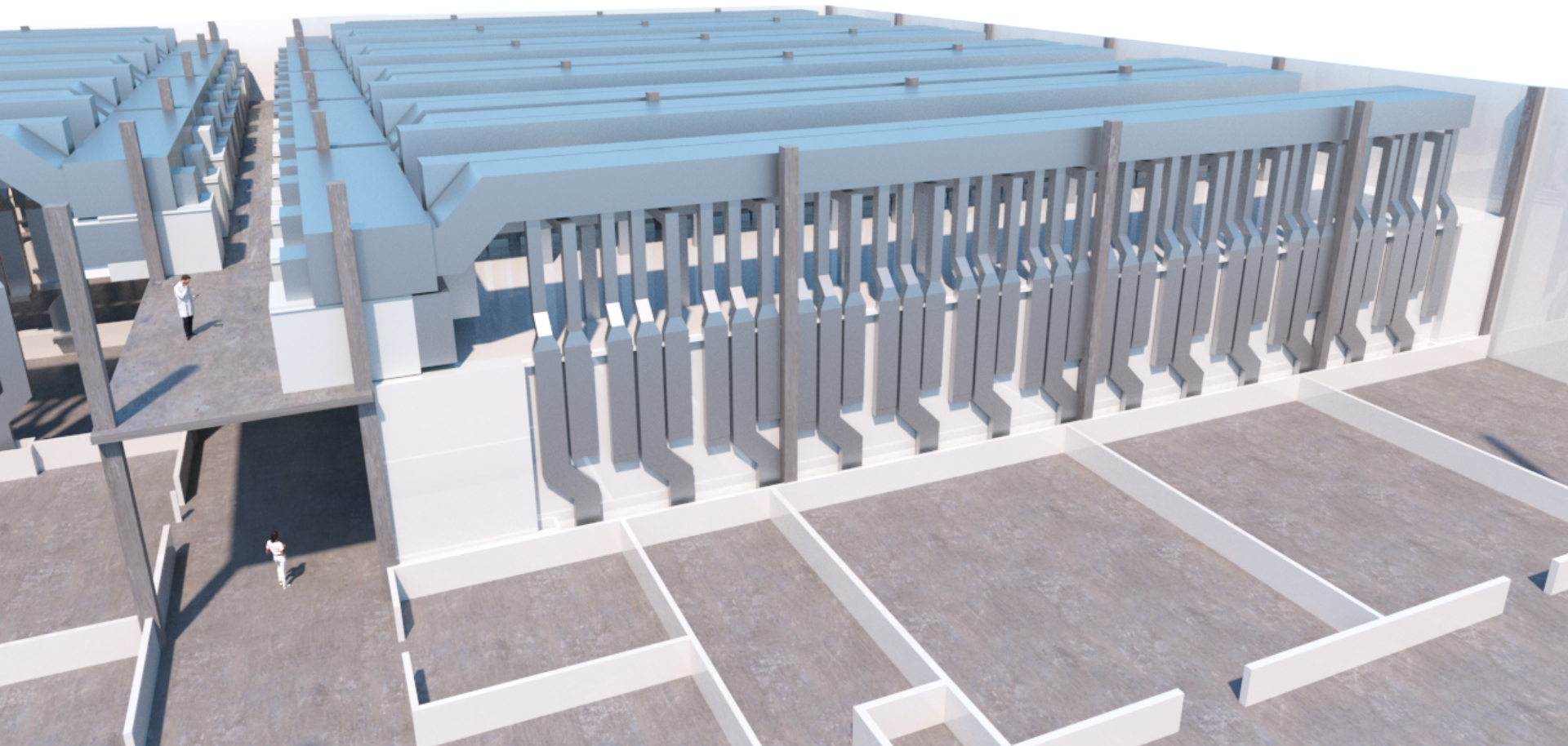
Half system seen from wall side

View from aisle

View seen through the wall.

Intravision / Cannabis Vegetation System

The Vegetation System

The illustration to the left shows a 7-layer vegetation GravityFlow system designed for a 3-week cycle and 18-inch tall plants at end cycle.

The integrated LED lights system is a 2-channel spectrum empowering the grower to regulate the compactness of the plants.

Intravision / Cannabis Flower Room

The Flower Room

Intravision / Cannabis Flower Room

The Flower Room

Intravision / Cannabis Flower Room

The "Vertical Loop".

The 2-layer Flower Room system loops the plants vertically using automated lift systems on each side, this allows for:

(1) Access to load/ unload on ground floor.
(2) Establishment of large homogeneous fields.
(3) Establishment of automated plant inspection systems on the re-stacking lift.
(4) Stationary plant inspection / pruning station.
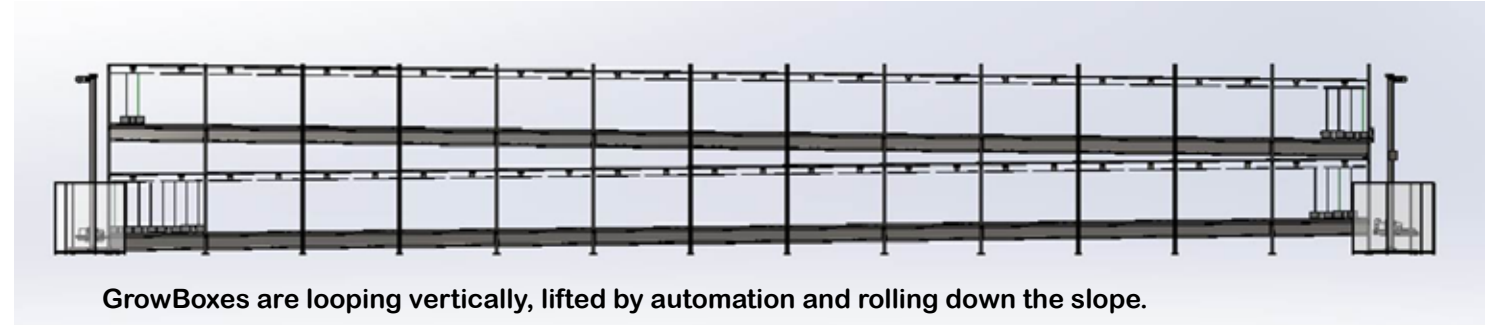
GrowBoxes are looping vertically, lifted by automation and rolling down the slope.

Intravision AURORA lights at VIVO Cannabis

Thank you

GravityFlow System Pilot Plant, Toronto